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Short Note

Effect of Chlormequat Chloride Spray on Bt Cotton Yield with Different Spacings

K. Shekar*, M. Venkataramana and S. Sri Devi
Department of Agronomy, College of Agriculture
Rajendranagar, Hyderabad - 500 030

Field experiment was conducted during *kharif*, 2010 at College Farm, Rajendranagar, Hyderabad to study the effect of different spacings and growth regulator- chlormequat chloride on Bt cotton with twelve treatments replicated thrice in RBD. Among plant spacings, 90 cm x 30 cm recorded significantly higher number of sympodial branches per plant (19.81), boll number plant^{-1}(20.76) and seed cotton yield (1668 kg ha^{-1}) over that of 90 cm x 45 cm and 90 cm x 60 cm spacings. Quality parameters did not differ significantly between different spacings. Among the canopy management practices, number of squares per plant was significantly higher with growth regulator treatments when compared to control plot and de-topping treatment. The sympodial branches per plant (20.76), number of bolls per plant (35.89) and seed cotton yield (1635 kg ha^{-1}) were significantly higher with two sprays of chlormequat chloride when compared to single spray, de topping and control respectively. Spraying of chlormequat chloride at 90 cm x 60 cm spacing recorded significantly higher number of squares per plant over all other treatment combinations. Quality parameters did not differ significantly with canopy management practices except fibre strength.

Key words: Bt cotton, plant spacing, chlormequat chloride, de-topping

Cotton is a subtropical, perennial plant with an indeterminate growth habit, grown as important cash crop. India ranks first in area and second in cotton production after china, occupying 110 lakh ha with a production of 325.5 lakh bales. At present, around 40 per cent area under cotton is occupied by Bt cotton hybrids in the country. In Andhra Pradesh it is occupying 17.10 lakh ha with a production of 65.68 lakh bales (Anonymous., 2011). Maximum yield potential of cotton can be realized by adopting optimum plant density, fertilizer and better agronomic practices. Vegetative and reproductive development occurs simultaneously and under the excessive vegetative growth situations, fruit abortion may be increased, crop maturity may be delayed and all these may lead to low yield. Application of growth regulator results in greater number of potential fruiting sites because of increased main stem nodes (Jones and Wells, 1997), sympodial branch length (Kerby *et al.*, 1990) and increased boll retention (Galanopoulou-Sendouka *et al.,* 1980). An attempt has, therefore, been made to evaluate the impact of chlormequat chloride on yield attributes and yield at different spacings in cotton.

Materials and Methods

The field experiment was conducted during *kharif*, 2010 under rainfed condition at College Farm, College of Agriculture, Rajendranagar, Hyderabad which is geographically situated at 17$_{o}$ 19' N latitude 78$_{o}$-28' E longitude and at an altitude of 542.3 m above the mean sea level. The experiment was conducted in sandy clay loam soil having 277 kg ha^{-1} available nitrogen (medium), 32.4 kg ha^{-1} available phosphorus (medium), 225 kg ha^{-1} available potassium (high) and pH of 8.1. An intra hirsutum cotton hybrid Brahma (Boll gard II) having semi determinant plant type was used as a test cultivar. The experiment was laid out in Randomized Block Design (factorial concept) with three replications. The treatments consisted three different spacings *viz*., 90 cm x 60 cm (18,518 plants ha^{-1}), 90 cm x 45 cm (24,691 plants ha^{-1}) and 90 cm x 30 cm (37,037 plants ha^{-1}) and four canopy management practices such as control (no spray), de-topping at 50-60 DAS, single spray of growth regulator chlormequat chloride @ 0.2 ml l^{-1} at 50-60 DAS and two sprays of chlormequat chloride @ 0.2 ml l^{-1} at 50-60 DAS and at 80-90 DAS.

*Corresponding author email: shekaragrico@gmail.com

Results and Discussion

The data on yield attributes and seed cotton yield as influenced by different treatments is presented in Table 1. The perusal of the data on number of squares per plant indicated that peak square formation occurred between 55 and 85 DAS. At wider spacing of 90 cm x 60 cm, square number was significantly higher (42.8) over that of 90 cm x 45 cm (35.1) and 90 cm x 30 cm (34.6) at 85 DAS. The yield parameters such as number of sympodial branches per plant and boll number plant^{-1} were lower at

Table 1. Effect of spacings and chlormequat chloride on number of squares per plant and yield parameters of Bt cotton.

Treatment	No. of squares plant^{-1} at 55 DAS	No. of squares plant^{-1} at 65 DAS	No. of squares plant^{-1} at 75 DAS	No. of squares plant^{-1} at 85 DAS	No. of sympodial branches plant^{-1}	No. of bolls plant^{-1}	Seed cotton yield (kg ha^{-1})
Spacing							
S_1 : 90 cm x 60 cm	14.1	28.0	39.3	42.8	20.36	35.10	1247
S_2 : 90 cm x 45 cm	14.0	25.4	33.6	35.1	20.16	29.24	1423
S_3 : 90 cm x 30 cm	12.8	25.2	31.9	34.6	19.81	20.76	1668
S. Em ±	0.1	0.3	0.4	0.7	0.12	1.95	16
C.D. (P=0.05)	0.4	0.8	1.1	2.0	0.42	5.57	46
Canopy Management Practices							
C_1 : Control	13.7	25.4	32.7	36.7	19.61	22.33	1282
C_2 : De-Topping	13.0	26.0	33.7	33.7	19.64	22.89	1310
C_3 : Single spray	13.7	26.3	35.3	39.0	20.43	32.38	1556
C_4 : Two sprays	14.0	27.0	38.1	40.7	20.76	35.89	1635
S. Em ±	0.2	0.3	0.4	0.8	0.15	2.22	18
C.D. (P=0.05)	NS	NS	NS	2.3	0.60	6.39	53
S×C (Interaction)							
S. Em ±	0.3	0.5	0.7	1.4	0.31	3.60	31
C.D. (P=0.05)	NS	NS	NS	4.1	0.92	10.80	91

Two sprays: Spraying of Chlormequat chloride @ 0.2ml/l at 50-60 DAS and at 80-90 DAS, NS – Non Significant.
De-topping at 50-60 DAS, Singe Spray: Spraying of Chlormequat chloride @ 0.2ml/l at 50-60 DAS

closer spacing (90 cm x 30 cm) compared to 90 cm x 45 cm and 90 cm x 60 cm. But, the loss in number of bolls per plant at closer spacing was compensated by higher plant population per hectare there by resulting in higher seed cotton yield. The seed cotton yield (1668 kg ha^{-1}) was significantly higher with higher density followed by lower densities at 90 cm x 45 cm and 90 cm x 60 cm spacing. The quality parameters were not influenced by the population levels (Table. 2). The results are in conformity with the researches conducted elsewhere (Vishwanath, 2007; Manjunatha 2009).

Among the canopy management practices, squares per plant at 85 DAS were significantly higher with spraying of chlormequat chloride (40.7) when compared to the control (36.7) and de-topping (33.7). The total number of squares that a cotton plant bears is an important yield component having the greatest influence on yield. This character was greatly influenced by both physiological and environmental factors. Foliar application of chlormequat chloride @ 0.2 ml l^{-1} resulted in significant increase in the number of squares compared to control which was due to reduction in the abscission of buds and bolls. The chlormequat chloride counteracts the effect of abscissic acid and thus reduced the shedding of reproductive structures. Similar results were observed by Norton *et al.* (2005).

The yield parameters like sympodial branches

Table 2. Effect of spacings and chlormequat chloride on quality parameters of Bt cotton.

Treatment	2.5 % Span length (mm)	Uniformity Ratio (%)	Micronaire value (µg inch^{-1})	Fibre Strength (g tex^{-1})	Elongation (%)
Spacings					
S1 : 90 cm x 60 cm	29.10	48.15	3.06	22.74	6.22
S2 : 90 cm x 45 cm	29.58	49.48	3.65	22.26	6.29
S3 : 90 cm x 30 cm	30.17	48.78	3.35	23.80	6.34
S. Em ±	0.44	0.50	0.18	0.25	0.06
C.D. (P=0.05)	NS	NS	NS	NS	NS
Canopy Management Practices					
C1 : Control	29.42	49.47	3.51	21.87	6.35
C2 : De-Topping	29.08	49.10	3.26	22.93	6.23
C3 : Single spray	29.43	48.27	3.43	22.97	6.25
C4 : Two sprays	30.53	48.37	3.23	23.97	6.30
S. Em ±	0.51	0.57	0.21	0.29	0.07
C.D. (P=0.05)	NS	NS	NS	0.90	NS
S×C (Interaction)					
S. Em ±	0.88	0.99	0.36	0.51	0.12
C.D. (P=0.05)	NS	NS	NS	NS	NS

Two sprays: Spraying of Chlormequat chloride @ 0.2ml/l at 50-60 DAS and at 80-90 DAS, NS – Non Significant.
De-topping at 50-60 DAS, Singe Spray: Spraying of Chlormequat chloride @ 0.2ml/l at 50-60 DAS

per plant (20.76), number of bolls per plant (35.89) and seed cotton yield (1635 kg ha^{-1}) were greater with spraying of chlormequat chloride twice followed by single spray compared to control and de-topping treatment. The present result corroborates with the findings of Keith (2000) and Joseph and Johnson (2006). Among the quality parameters, fibre strength was significantly higher with two sprays of chlormequat chloride (23.97 g tex^{-1}) followed by single spray (22.97 g tex^{-1}) and de-topping (22.93 g tex^{-1}) when compared to control (21.87 g tex^{-1}). Similar research findings were reported by York (1983) that spraying of chlormequat chloride caused increase in fibre strength.

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