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Original Research Article

Effect of Different Crop Geometry on Growth, Yield and Economics of Bt Cotton

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Crop geometry, growth, yield, economics and Bt cotton

A B S T R A C T

A field experiment entitled "Effect of different spacing on growth, yield and economics of Bt cotton" was conducted during *kharif* season 2009-10 at Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The plant spacing of 150 x 30 cm recorded significantly higher number of *sympodia* per plant and also dry matter per plant. The number of picked bolls per plant and seed cotton per plant were significantly higher in crop geometry of 150 x 30 cm over 90 x 60 cm and 180 x 30 cm. Hence the growth and yield attributes of Bt cotton were improved in crop geometry of 150 x 30 cm.

Introduction

Cotton (*Gossypium sp.*) is an important fiber crop of global significance and cultivated in tropical and sub-tropical regions of more than seventy countries of the world. Cotton is the major cash crop of India and account for 65 per cent of the fiber used in the textile industries. Cotton play a key role in the national economy in terms of both exchange earnings. Cotton impacts the lives of estimated 60 million peoples in India. By way of export foreign exchange earnings of cotton amount to about 10 billion dollars which is one third of the total foreign exchange earnings of the country.

Crop geometry is the most important factor of crop production. Also, from the various factors influencing production of Bt cotton, spacing plays a very significant role.

Materials and Methods

The present investigation was carried on field during *kharif* season of 2009-10 at AICRP on IFS MKV., Parbhani. The field was fairly uniform, leveled and had a good drainage. The soil of experimental plot was clayey in texture, low in available nitrogen and phosphorus and high in available potassium. The soil was slightly alkaline in reaction

Geographically Parbhani comes under sub tropical climate. The average precipitation of last 30 years (1974 – 2004) is 963.1 mm distributed 44 rainy days. August is the wettest month of the year covering about 28 percent of annual rainfall. Most of the rainfall is received from south west monsoon. The daily mean maximum temperature varied from 28.7 ^{o}C to 41.3 ^{o}C

and mean minimum temperature varied from 14.4 ^{o}C to 26 ^{o}C. Thus, Parbhani climate is characterized by hot and dry summer and cold winter. Agro climatically, it is classified under assured rainfall zone.

The experiment was laid out in split plot design with four replications. There were nine treatment combinations comprising three plant spacing's viz. 90x60 cm, 150x30 cm and 180x30 cm as well as three fertility levels viz. 100: 50: 50, 125: 62.5: 62.5 and 150: 75: 75 NPK kgha^{-1}. The fertilizer levels were allotted to main plot and plant geometries were accommodated in sub plots. The gross plot size was 9.0 x 4.5 m, where as net plot size was 9.0 x 3.6 m.

A popular Bt. Cotton hybrid i.e. NCS-207 was selected for experiment purpose. The crop was sown on 10th July 2009 by dibbling one cotton seed per hill and fertilizer was applied as per the treatments. Requared plant protection measures were taken. All the growth and yield attributing characters were recorded periodically and statistically analyzed by using of technique of analysis of varience and significance was determined to evaluate treatment effects.

Results and Discussion

Growth attributes and plant geometry

The various growth and yield aspects of Bt. Cotton hybrid NCS-207 (Bt. Mallika) as influenced by various plant geometry under rainfed condition have been studied and the results of these were recorded (Table 1). In case of plant height it was more in wider inter row and closer intra row spacing i.e. 180x30 cm. It might be due to competition for solar radiation in closer spacing for the process of photosynthesis and thereby plants produced more height in search of light. Bastia *et al.,* (2007) also observed that plant height was highest in closer intra row spacing.

Besides the plant geometry 150 x 30 cm recorded significantly more leaf area per plant than 90 x 60 cm and 180 x 30 cm.

The number of sympodia per plant was more in crop geometry of 150x30 cm than 90x60 cm and 180x30 cm. And it might be due to moisture and light interception for optimum growth and development leading to production of more sympodia. Simillar results were obtained by Hake *et al.,* (1992), Nayak *et al.,* (1997), Singh *et al.,* (2007) and Brar *et al.,* (2008).

Total dry matter accumulation per plant at all the crop growth stages was influenced due to different crop geometries. From the data it was revealed that, the crop geometry of 150 x 30 cm recorded maximum dry matter accumulation per plant as against crop geometry of 90 x 60 cm. It might be due to wider intra row spacing and more plant population. Simillar results were found by Hake *et al.,* (1992), Venugopalan and Blaise (2001), Nehra *et al.,* (2004) and Ram and Giri (2006).

Yield attributes and plant geometry

The number of picked bolls per plant was affected significantly due to plant geometry i.e. 150x30 cm recorded more number of picked bolls per plant than 180x30 cm and 90x60 cm (Table 2). This effect might be due to more competition of light aeration and moisture which resulted into better growth and more translocation of photosynthesis towards sink. Hake *et al.,* (1992), Nehra and Chandra (2001), Venugopalan and Blaise (2001), Nehra *et al.,* (2004), Singh *et al.,* (2007) and Narayan *et al.,* (2007) were also reported similar results.

Table.1 Growth attributing characters as influenced by plant geometry at various stages

Growth attributing characters	Treatments / Spacings (cm)	Days after sowing				
		30	60	90	120	150
Plant height (cm)	S_1-90x60	18.58	58.95	72.37	82.32	90.58
	S_2-150x30	19.66	59.23	72.79	83.06	90.88
	S_3-180x30	20.33	60.58	74.16	84.33	92.08
	SE+	0.35	0.46	0.44	0.64	0.59
	CD at 5%	1.04	NS	1.32	1.92	NS
No. of functional leaves / plant	S_1-90x60	21.68	52.45	70.23	84.00	51.36
	S_2-150x30	23.67	55.19	74.00	89.58	58.90
	S_3-180x30	22.72	53.41	72.32	85.63	51.95
	SE+	0.43	0.70	0.74	0.88	1.38
	CD at 5%	1.28	2.10	2.20	2.61	4.12
No. of Sympodia / plant	S_1-90x60	---	19.12	20.83	22.85	24.20
	S_2-150x30	---	20.32	21.48	23.90	25.81
	S_3-180x30	---	19.57	20.89	23.00	25.06
	SE+	---	0.46	0.21	0.41	0.47
	CD at 5%	---	NS	NS	NS	NS
Total Dry matter (g/plant)	S_1-90x60	3.50	34.21	110.94	153.70	128.61
	S_2-150x30	3.68	36.03	111.64	155.12	130.13
	S_3-180x30	3.52	35.27	111.19	154.68	129.61
	SE+	0.14	0.38	0.42	0.42	0.48
	CD at 5%	NS	1.13	NS	1.25	1.43

Table.2 Yield contributing characters and seed cotton yield as influenced by plant geometry

Treatments	No. of picked bolls / plant	Boll weight / plant (g)	Seed cotton weight / plant(g)	Seed cotton yield (kg/ha.)
S_1-90x60	17.00	3.31	56.48	1046.3
S_2-150x30	20.16	3.04	61.21	1360.9
S_3-180x30	17.33	3.46	60.52	1120.0
SE+	0.49	0.01	1.35	20.96
CD at 5%	1.45	0.04	4.03	62.18

Table.3 Economics of Bt. cotton as influenced by plant geometry

Treatments	Cost of cultivation (Rs/ha.)	GMR (Rs/ha.)	NMR (Rs/ha.)	B : C ratio
S_1-90x60	15793	31390	15431	1.97
S_2-150x30	16422	40828	24406	2.48
S_3-180x30	15940	33595	17644	2.09
SE+	147.64	1284.3	1176.2	0.06
CD at 5%	438.00	3809.9	3489.2	020

The plant geometry has marked influence on seed cotton weight per plant. The increase in seed cotton weight per plant was observed in crop geometry 150x30 cm than 90x60 cm and 180x30 cm. Simillar results were reported by Mane *et al.,* (1999), Shrinivasulu *et al.,* (2007), Reddy and Gopinath (2008) and Rao and Shetty (2008).

The seed cotton yield per hectare was also significantly influenced by crop geometry. The crop geometry of 150x30 cm recorded significantly higher cotton seed compared to 90x60 cm and 180x30 cm. It was due to more number of bolls and higher seed cotton weight per plant. Simillar findings were reported earlier by Shrinivasulu *et al.,* (2007) and Rao and Shetty (2008).

Economics of the Bt. Cotton

Plant geometry 150x30 cm recorded significantly higher gross monetary returns as well as net monetary returns than 90x60 cm and 180x30 cm plant geometry (Table 3). However, plant geometry 90 x 60 cm and 180 x 30 cm were at par with each other to gross monetary returns.

Besides, benefit: cost ratio was higher in 150 x 30 cm as compared to 90 x 60 cm and 180 x 30 cm similar to the results reported by Rao and Shetty (2008).

References

Bastia, D. K. 2000. Response of cotton hynrid Savita to to spacing and NPK treatments under rainfed conditions of Orrisa. Indian J. Agric. Sci., 70 (8): 541-542.

Brar, J. S., B. S. Shindu, K. S. Sekhon and G. S. Butter. 2008. Response of Bt. Cotton (*Gossypium hirsutum*) to plant geometry and nutrient combinations in sandy loam soil. J. Cotton Res. Dev., 22 (1): 59-61.

Dhoble, M. V., M. Z. Shaikh, V. D. Patil, D. G. Giri and B. R. Pawar. 1992. Performance of different cotton genotypes as influenced by various plant row spacing under rainfed conditions. J. cotton Res. Dev. 6 (1): 49-51.

Jadhav, J. K., A. M. Degaonkar and Narkhede W. N. 1993. Performance of hybrid cotton (*Gossipium hirsutum*) cultivars at different plant densities and nitrogen levels under rainfed conditions. Indian J. Agron. 38 (2): 340-341.

Patel, A. M., Patel, D. M. and G. M. Patel. 1992. Performance of H6 cotton to plant density and nitrogen levels under rainfed conditions. Indian J. Agron. 37 (3): 622-623.

Reddy, P. R. R., and M. Gopinath. 2008. Influence of fertilizer and plant geometry on performance of Bt. Cotton hybrid. J. cotton Res. Dev. 22 (1): 78-80.

Singh, K., Jindal, V., Singh, V. A. Ratore. 2007. Performance of Bt. Cotton hybrids under different geometrical arrangements. J. Cotton Res. Dev. 21(1): 41-44.