



RESEARCH PAPER

Bt cotton hybrids performance for different spacing under rainfed conditions in black cotton soils of Adilabad district in Telangana

Rajeshwar Malavth*, Ravinder Naik¹, T. Pradeep² and Sreedhar Chuhan³

Department of Soil Science and Agricultural Chemistry, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad (Telangana) India
(Email : rajeshoct31naik@pjtsau.edu.in)

Abstract : A field experiment was conducted in black cotton soils during *Kharif* 2008-09 and 2009-10 seasons in Adilabad district of Andhra Pradesh at three different locations through farmers participatory mode to find out the response of BG-II cotton hybrids under two different spacings in rainfed conditions. These experiments were carried out by the district Agricultural Advisory and Transfer of Technology Center, Adilabad in collaboration with ATMA project functioning at Adilabad. Three cotton hybrids *viz.*, Mallika BG-II, Rasi BG-II and Paras Brahma BG –II which are most popular among the farmers were sown under two different spacing's in different soils. The data revealed that, hybrids did not differ significantly in plant height, number of sympodial branches/plant, number of bolls/plant, boll weight and kapas yield in both the years of testing and also in both the soils. But, spacings had significantly influenced number of bolls/plant, boll weight and kapas yield. However, interaction effect was significant only for plant height. Closer spacing of 90 x 60 cm in BC soils (2300 and 2450 kg ha⁻¹) gave significantly higher kapas yield than wider spacing of 120 x 90 cm (1767 and 1983kg ha⁻¹) during both the years of investigation, respectively. Thus, it is concluded that Bt hybrids need to be planted with higher plant density to realize good yields.

Key Words : Bt cotton, Spacing, Black soil, Rainfed

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INTRODUCTION

Cotton is one of the most important commercial crops playing a key role in economic and social affairs of the world even though the cost of cotton production is

excessively high in some areas. It is an important fibre crop, which is cultivated in more than 80 countries of the world but ten countries *viz.*, USA, CIS, China, India, Brazil, Pakistan, Turkey, Mexico, Egypt and Sudan

* Author for correspondence:

¹Krishi Vigyan Kendra, Adilabad (Telangana) India

²Agricultural Research Station, Adilabad (Telangana) India

³Regional Agricultural Research Station, Jagtial (Telangana) India

account for nearly 85 per cent of the total production. In India, there are nine major cotton growing states which are divided into three zones viz., North Zone (Punjab, Haryana and Rajasthan), Central Zone (Maharashtra, Madhya Pradesh and Gujarat), and South Zone (Andhra Pradesh, Karnataka and Tamil Nadu). Nearly 65 per cent of the cotton crop is grown under rainfed conditions. In these areas, the irrigated crop is sown from March-May and the rainfed crop in June-July with the commencement of the monsoon. The pre-monsoon dry sowings practiced in parts of Gujarat and Madhya Pradesh in the end of May or in early June have been found to give an early start with the resultant increased yields. In Tamil Nadu, the major portion of the irrigated and rainfed crop is planted in September-October, whereas the sowing of the rainfed crop in the southern districts is extended upto November. In parts of Karnataka and Andhra Pradesh, the desi cotton is usually sown in August-September. Early sowings done in the Dharwad and Gadag area in the beginning of September have been found to give better yields. In addition, summer sowings in Tamil Nadu are done during February- March. The sowings of cotton in the rice fallows of Andhra Pradesh and Tamil Nadu extend from the second half of December to the middle of January. Cotton is grown on a variety of soils ranging from well drained deep alluvial soils in the north to black clayey soils of varying depth in central region and in black and mixed black and red soils in south zone. Cotton is semi-tolerant to salinity and sensitive to water logging and thus prefers well- drained soils (Revolution in Indian Cotton, 2009).

The cotton cultivated area constantly increased in Adilabad district after introduction of Bt cotton hybrids, it is grown on area of about 2.794 lakh hectares during the year 2008-09 and 2.922 lakh hectares during the year 2009-10 as against the normal cultivated area of 1.745 lakh hectares mainly due to the Bt cotton, genetically modified to make insecticidal protein(s) from the soil bacterium *Bacillus thuringiensis* was first commercialized in 2002 against bollworms, Bt cotton spread rapidly, resulting in greatly increased productivity and reduced insecticide use (APCoAB, 2009).

The soils of the district are predominantly black which constitutes about 80 per cent. Cotton is the major commercial crop grown in the district for the last 50 years. Sorghum is the staple food crop followed by paddy. Under rainfed condition soybean, redgram, paddy-irrigated, maize cultivated during *Kharif* season and sorghum,

wheat, irrigated paddy, Bengalgram, sesamum, safflower, groundnut etc. cultivated during *Rabi* season. Primitive agriculture with local varieties popularly known as Gourani varieties is still prevailing in remote and tribal villages. For sustainability, farmers are adopting different inter crops with main crops since a long time.

Adilabad district is located in Northern Telangana Zone of Andhra Pradesh, situated between 77° 46' and 80° 01' of the Eastern Longitude and 18° 40' and 19° 56' of Northern Latitudes. The soils of the district are predominantly black which constitutes about 80 per cent. Cotton is one of the most important commercial crop grown in the district for the last 50 years under rainfed conditions. Cotton yields under rainfed ecosystem are low owing to erratic rainfall and hence the crop suffers from moisture stress during post monsoon season which coincides with flowering and boll development stages. Majority of the farmers in the district do not follow the recommended spacing which is most important agronomic practice under rainfed conditions to get good crop yield. In order to provide a base line data a systematic study was undertaken to assess the performance of three Bt cotton hybrids in black cotton (BC) soils with two different spacings. Three locations continuously two years appropriate to farming situation were chosen in the district.

MATERIAL AND METHODS

The experiment was conducted on farmer's fields as farmers participatory approach during *Kharif* 2008-09 and 2009-10 seasons at three locations. An average rainfall of 1093.6 mm in 2008 and 1137.0 mm during 2009 season was received in 55 and 57 rainy days, respectively. The experiment was laid out in Split Plot Design with Bt hybrids as main plots and spacing as sub plots with 7 replications. However, spacings varied in subplots. In BC soils, treatmental spacing was taken as 90 x 60 cm which is the recommended spacing and tested against the farmers practice of 120 x 90 cm. Three popular hybrids viz., Mallika BG-II, Rasi BG-II and Paras Brahma BG –II were included and the crop was sown in second fortnight of June during both the years of study. Standard crop management practices were adopted to raise a good crop. Observations were recorded on yield attributes and the crop was harvested periodically in three pickings and the yield was recorded.

RESULTS AND DISCUSSION

There was no significant difference observed among the varieties tested for plant height at harvest, number of sympodial branches per plant, number of bolls per plant and kapas yield (kg ha⁻¹). With regard to boll weight pooled mean over two years indicated that Mallika BG II recorded significantly higher boll weight (5.37 g) compared to Raasi BG II in black cotton soils (Table 1).

Effect of spacing :

Spacing did not have any significant influence on either the plant height at harvest or the number of sympodial branches per plant during individual years and also mean over two years in black cotton soils (Table 1). Wider spacing of 120x90 cm produced significantly higher number of bolls per plant (37.5) and boll weight (5.39 g) compared to closer spacing of 90x60 cm (35.5 and 5.22 g, respectively). It might be due to better aeration and adequate interception of light as well as lesser competition for nutrients due to low plant population per unit area. On the contrary significantly higher seed cotton yield

was recorded in closer spacing (2375 kg ha⁻¹) compared to wider spacing (1874 kg ha⁻¹). Similar results were observed by Rajendran *et al.* (2010). The effect of spacing on number of sympodial branches per plant was non significant during individual years and also mean over two years. As regards number of bolls per plant, boll weight and seed cotton yield the effect of spacing where hybrids in closer spacing had lesser number bolls per plant, lesser boll weight and more kapas yield compared to wider spacing. Similar results were obtained by Bhalerao *et al.* (2010) under rainfed condition. The kapas yield of black cotton soils obtained was higher and this could be mainly due to the high water holding capacity in black cotton soils.

Interaction effect :

Interaction among the hybrids tested and spacing was non significant for all the parameters in both the soils except for plant height at harvest in both the soils.

Overall, the cotton yields recorded during 2008-09 was comparatively low as compared to 2009-10. Though

Table 1 : Effect of spacing on number of bolls per plant, boll weight and seed yield of cotton in black cotton soils *Kharif* 2008-09 and 2009-10

Treatments	Plant height at harvest (cm)			No. of sympodial branches / plant			No. of bolls / plant			Boll weight (g)			Kapas yield (kg/ha)		
	2008-09	2009-10	Mean	2008-09	2009-10	Mean	2008-09	2009-10	Mean	2008-09	2009-10	Mean	2008-09	2009-10	Mean
Main plot - Bt. Hybrid															
Mallika BG II	119.0	127.5	123.2	20.5	22.5	21.5	34.5	38.5	36.5	5.25	5.50	5.37	2090	2250	2170
Raasi BG II	118.0	120.0	119.0	19.5	21.0	20.2	35.5	37.0	36.2	5.04	5.35	5.20	1960	2190	2075
Brahma BG II	121.0	122.5	121.7	20.5	21.5	21.0	35.5	38.0	36.7	5.25	5.42	5.34	2050	2207	2129
Mean	119.3	123.3	121.3	20.2	21.7	20.9	35.2	37.8	36.5	5.18	5.42	5.30	2033	2216	2125
S.E.m ±	3.6	2.9	2.5	0.88	0.73	0.59	0.79	0.97	0.69	0.09	0.01	0.04	65.0	57.0	43.0
S.E.d ±	5.1	4.1	3.5	1.24	1.04	0.84	1.11	1.38	0.98	0.13	0.02	0.06	91.0	81.0	60.0
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.05	0.14	NS	NS	NS
C.V. (%)	17.9	16.2	17.0	11.5	8.9	10.2	15.9	16.8	16.3	14.9	10.8	12.8	18.4	16.8	17.6
Sub plots - Spacing															
90 x 60 cm	121.7	123.3	122.5	19.6	21.0	20.3	34.3	36.6	35.5	5.10	5.33	5.22	2300	2450	2375
120 x 90 cm	117.0	123.3	120.2	20.6	22.3	21.5	36.0	39.0	37.5	5.26	5.52	5.39	1767	1983	1874
Mean	119.4	123.3	121.4	20.1	21.7	20.9	35.2	37.8	36.5	5.2	5.4	5.3	2034	2216	2125
S.E.m ±	4.7	4.4	2.7	0.98	1.11	0.72	0.58	0.75	0.43	0.08	0.07	0.04	64.6	44.6	29.1
S.E.d ±	6.7	6.3	3.8	1.39	1.57	1.02	0.82	1.06	0.61	0.11	0.10	0.07	91.3	63.0	41.2
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	1.74	2.23	1.29	0.02	0.20	0.14	192.0	132.5	86.6
CV (%)	12.8	11.8	12.3	15.8	16.6	16.2	15.4	16.4	15.9	14.7	14.1	13.4	10.3	16.5	13.4
Interactions															
S.E.m ±	3.8	3.6	2.2	0.8	0.9	0.6	0.5	0.6	0.3	0.1	0.1	0.0	51.8	35.7	23.3
S.E.d ±	5.3	5.0	3.1	1.1	1.3	0.8	0.7	0.9	0.5	0.1	0.1	0.1	73.2	50.5	33.0
C.D. (P=0.05)	11.2	10.7	6.5	NS	NS	NS	1.4	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	12.9	11.8	12.3	15.8	16.6	16.2	15.4	16.4	15.9	14.7	14.1	13.4	10.3	16.5	13.4

NS=Non-significant

Table 2 : Rainfall of the district during the year 2008-09 and 2009-10

Month	2008-09		2009-10	
	Total rainfall received (mm)	No. of rainy days	Total rainfall received (mm)	No. of rainy days
June	126.3	6	101.2	8
July	220	14	166.5	18
August	378.8	16	185.3	15
September	141.87	4	122.5	5
October	12.2	1	39.6	5
November	14	1	26.4	3
December	0.0	0	-	0
January	0.0	0	16.1	1
February	0.0	0	7.5	1
March	2.0	0	0.8	0
April	0.0	0	0.0	0
May	0.5	0	1.0	0
Total	894.5	42	683.0	56

the quantity of rainfall was high during 2008-09 (894.5 mm with 42 rainy days) might be due to high intensity and uneven distribution. Whereas during 2009-10, though rainfall was comparatively low (683.0 mm with 56 rainy days), its uniform distribution for longer period with low intensity enhanced the yield levels (Table 2).

Performance of non Bt cotton hybrids under recommended spacing of 90x90 cm or 120x90 cm even under rainfed situation during eighties was more than satisfactory due to better control of sucking pests and boll worms with predicted behaviour of weather conditions particularly the rainfall. However, due to fluctuations in weather parameters, spread of cotton crop to newer areas and indiscriminate use of insecticides leading to resurgence of certain pests drastically affected the yield potential of hybrids in due course of time. It was at this juncture *i.e.*, a decade back Bt cotton hybrids were introduced and as a result the menace of boll worms was over come and relatively good retention of bolls was witnessed. Retention of maximum number of bolls also sometimes made the plants to change their growth habit (determinate/indeterminate) according to the prevailing seasonal conditions. Under closer spacing due to reduced canopy and more number of plants per unit area plants exhibited determinate growth particularly when monsoon ceased early and the farmers got good yields.

Therefore, due to these frequent changes in macro and micro weather conditions the performance of Bt hybrids become unpredictable and the farmers suffered huge losses. It is in this context that the results of the

present experimentation have got immense practical utility. Thus, it is suggested to adopt closer spacing in both types of soil as it provides better opportunity for Bt hybrids to express their potential under rainfed conditions in Adilabad district.

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REFERENCES

- APCoAB (2009). Bt cotton in India - A status report. Asia-Pacific Consortium on Agricultural Biotechnology, New Delhi, India. p. 1-37.
- Bhalerao, P.D., Patil, B.R., Ghatol, P.U. and Gawande, P.P. (2010).** Effect of spacing and fertilizer levels on seed cotton yield under rainfed condition. *Indian J. Agric. Res.*, **44** (1) : 74 – 76
- Rajendran, K., Mohamed Amanullah, M. and Vaiyapuri, K. (2010).** Effect of spacing and nutrient levels on Bt cotton. *Madras Agric. J.*, **97** (10-12) : 379-380.
- Revolution in Indian Cotton (2009). Published by Directorate of Cotton Development Department of Agriculture and Cooperation Ministry of Agriculture, Govt. of India Mumbai National Center of Integrated Pest Management ICAR, Pusa Campus, New Delhi pp. 1-59.

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