



## Productivity, Quality and Economics of Bt Cotton Hybrids as Influenced by Planting Density

P Krishna Veni, Ch Pulla Rao, K Srinivasulu, G Subbaiah and R Veera Ragavaiah

Department of Agronomy, Agricultural College, Bapatla 522 101, Andhra Pradesh

### ABSTRACT

A field experiment carried out during Kharif, 2006-07 at Agricultural College Farm, Bapatla revealed that Bt cotton hybrids (RCH-20 Bt, Mallika Bt, Bunny Bt) recorded significantly higher seed cotton yield over Bunny non-Bt hybrid. Mallika Bt and Bunny Bt hybrids recorded significantly higher seed cotton yield hectare<sup>-1</sup> over RCH-20 Bt and Bunny non-Bt. The highest plant density of 37,037 plants ha<sup>-1</sup> recorded the highest seed cotton yield ha<sup>-1</sup>, gross returns, net returns and BCR. The quality parameters viz., ginning percentage, 2.5% span length and fibre strength were not significantly influenced by either cotton hybrids or plant densities. Mallika Bt with the plant density of 37,037 plants ha<sup>-1</sup> gave the highest yield, net returns and B:C ratio than the remaining treatment combinations of Bt cotton hybrids and plant densities.

**Key words :** Bt Cotton Hybrids, Economics, Plant Density, Productivity, Quality.

Cotton, the most important commercial crop of India is cultivated for its fibre and by-products. There is an increasing demand among the cotton growers to take up commercial cultivation of Bt cotton hybrids in Andhra Pradesh. Hence, the present experiment was conducted to study the response of Bt cotton hybrids in comparison with a non-Bt hybrid under different planting densities on yield and quality of cotton.

### MATERIAL AND METHODS

A field experiment was conducted at Agricultural College Farm, Bapatla to study the productivity and economics of Bt cotton hybrids as influenced by planting densities during kharif, 2006-07. The experimental field was clayey in nature, having 26% sand, 28% silt and 46% clay content with pH of 7.8, EC 0.4 ds/m, organic carbon 0.27%, available nitrogen 284 kg ha<sup>-1</sup>. The treatments consisted of four cotton hybrids (RCH-20 Bt, Mallika Bt, Bunny Bt and Bunny non-Bt) and four planting densities (13,889; 18,518; 27,778 and 37,037 plants ha<sup>-1</sup>). The experiment was laid out in RBD with factorial concept and replicated thrice. The crop was sown on 23.8.2006 by adopting recommended package of practices. A quantity of 120-60-60 kg NPK ha<sup>-1</sup> was applied. Entire quantity of phosphorus was applied at time of last ploughing. Nitrogen and potassium were applied in 3 equal splits at 30,60 and 90 DAS. All the fertilizers were applied by pocketing method. The crop was raised purely under

rainfed conditions except two irrigations on 20-11-2006 and 19-1-2007 in order to protect the crop from moisture stress. Three pickings were taken up during the entire crop season. A total rainfall of 827.8 mm was received in 35 rainy days during the crop growth period. Data on yield, quality parameters and economics were recorded and subjected to statistical analysis as per Panse and Sukhatme (1978).

### RESULTS AND DISCUSSION

Data on seed cotton yield (Table 1) revealed that the cotton hybrids as well as plant densities had a significant influence on seed cotton yield but not by their interaction. The hybrids, Mallika Bt and Bunny Bt recorded significantly higher seed cotton yield which were significantly superior to that of RCH-20 Bt and Bunny non-Bt hybrid. The higher seed cotton yield recorded with Mallika Bt and Bunny Bt might be due to production of more number of bolls (41.1 and 38.4 respectively), heaviest bolls (5.1 and 4.9 respectively) and seed cotton yield per plant (139.6g and 135.3g/plant respectively). The results are in concurrence with the findings of Battar and Paramjit singh (2006).

Higher plant density (37,037 plants ha<sup>-1</sup>) produced higher seed cotton yield (3820 kg ha<sup>-1</sup>) which was significantly superior to remaining plant densities. The lowest cotton seed yield (1978 kg ha<sup>-1</sup>) was recorded with the lowest plant density (13,889 plants ha<sup>-1</sup>). The lesser yield recorded plant<sup>-1</sup>

Table 1. Seed cotton yield (kg/ha) of the cotton hybrids as influenced by planting density

Treatments	Actual yield (kg/ha)	Gross returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
<b>Hybrids</b>					
RCH-20 <i>Bt</i>	2706	54,932	22,737*	32,195	1.41
Mallika <i>Bt</i> (NCS-207 <i>Bt</i> )	3162	64,189	23,232*	40,957	1.76
Bunny <i>Bt</i> (NCS-145 <i>Bt</i> )	2997	60,839	22,762*	38,077	1.70
Bunny non- <i>Bt</i> (NCS-145)	2601	52,800	23,946**	28,854	1.20
<b>Planting density (Plants/ha)</b>					
13,889 (120 cm × 60 cm)	1978	40,153	18,726	21,427	1.14
18,518 (90 cm × 60 cm)	2323	47,157	21,348	25,809	1.21
37,037 (90 cm × 30 cm)	3820	77,546	27,445	50,101	1.82
27,778 (60 cm × 60 cm)	3345	67,903	24,899	43,004	1.73

with highest plant density was compensated by increased number of plants and ultimately higher seed cotton yield. Therefore, the highest plant density gave maximum yield compared with lower plant density (Table 1). These results are in agreement with the findings of Hake *et al* (1999), Solanke *et al* (2001), Raut *et al* (2005) and Srinivasan (2006).

All the quality parameters *viz.*, ginning percentage, 2-5% span length and fibre strength (Table 2) were not significantly influenced by either cotton hybrids or plant densities and their interactions as well. Similar results were also reported by Mukundam and Janardhanam (1991).

Ginning percentage ranged from the highest of 36.1 recorded with cotton hybrids, Mallika *Bt* and Bunny *Bt* to the lowest of 35.8 with RCH-20 *Bt* hybrid. Similarly, the highest ginning 36% was recorded with plant densities of 13,889; 18,518; 37,037 plants ha<sup>-1</sup> and the lowest (35.9%) was recorded with plant density of 27,778 plants ha<sup>-1</sup>.

The higher and lower span length of 31.0 and 30.5 mm were observed with cotton hybrids, Mallika *Bt* and Bunny *Bt* respectively, whereas, Span length ranged from a highest of 31.0 mm with 18,518 plants

ha<sup>-1</sup> to a minimum of 30.6 mm with 13,889 plants ha<sup>-1</sup>.

From the economics computed, the data (Table 3) clearly indicated that the higher gross returns, net monetary returns and benefit cost ratio were obtained with Mallika *Bt* hybrid followed by Bunny *Bt*. Similar results were also reported by Chandra Sekhar Reddy *et al* (2006).

The highest plant density of 37,037 plants ha<sup>-1</sup> recorded the maximum gross returns (Rs. 77,546 ha<sup>-1</sup>), net returns (Rs. 50,101 ha<sup>-1</sup>) and benefit cost ratio (1.82). It might be due to production of higher seed cotton yield ha<sup>-1</sup>. It is clear that Mallika *Bt* with the density of 37,037 plants ha<sup>-1</sup> gave the highest yield, net returns and B:C ratio than the remaining treatment combinations of cotton *Bt* hybrids and plant densities in agreement with Mane *et al* (1999) and Raut *et al* (2005).

From the present investigation, it can be concluded that cultivation of Mallika *Bt* hybrid with the adoption of higher plant density of 37,037 plants/ha recorded higher seed cotton productivity and maximum monetary returns than the other cotton hybrids evaluated at different plant densities.

Table 2 : Seed cotton yield and yield quality parameters of cotton hybrids as influenced by planting densities.

Treatments	Seed Cotton Yield (kg ha <sup>-1</sup> )	Ginning Percentage	2.5% Span Length	Fibre Strength (g tex <sup>-1</sup> )
<b>HYBRIDS</b>				
RCH- 20 Bt	131.1	35.8	30.8	22.0
Mallika Bt	139.6	36.1	31.0	22.8
Bunny Bt	135.3	36.1	30.5	22.8
Bunny non-Bt	126.8	35.9	30.9	22.6
<b>PLANT DENSITIES</b>				
13,889	154.7	36.0	30.6	22.3
18,518	137.7	36.0	31.0	22.4
37,037	106.9	36.0	30.7	22.8
27,778	122.2	35.9	30.8	22.8
Interaction	NS	NS	NS	NS
SE m ±	2.8	0.11	0.22	0.29
CD (P=0.05)	8.1	NS	NS	NS
CV(%)	7.3	1.1	2.5	4.6

NS : Not significant

Table 3. Economics of the cotton hybrids influenced by planting density

Treatments	Seed cotton yield (kg ha <sup>-1</sup> )	Gross returns (Rs ha <sup>-1</sup> )	Cost of cultivation (Rs ha <sup>-1</sup> )	Net returns (Rs ha <sup>-1</sup> )	B:C ratio
<b>Hybrids</b>					
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Seed cost is Rs. 750/- and Rs. 450/- in case of *Bt* and non-*Bt* cotton hybrids as per 450 g respectively. Cost of picking is calculated @ Rs. 3/- per kg of seed cotton. Price of seed cotton is Rs. 2030/- per quintal.

\* Variations in pickings lead to variations in cost of cultivation

\*\* Number of sprays more in case of non-*Bt* hybrid

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