

## **Effect of fertilizer levels on growth parameters, yield components and seed cotton yield of Bt cotton hybrids under irrigated condition in TBP area**

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Cotton is an important commercial fiber crop in world and India as well. India ranks first with 7.61 million hectares of area in the world. While, its production is third after China and USA. The average yield is being 375 kg lint per hectare in India is one of the lowest in the world. As such cotton production in India is only about 14.8 per cent of the total production of the world even though it covers 23.3 per cent area (Anon. 2004). The low yield is owing to many constraints in cotton production major among them are non availability of high yielding hybrids, less responsive to agronomic manipulation and resistant to insect pest and diseases. In Karnataka TBP area comprising Raichur and Bellary district lying partly in Northeastern Dry Zone and North Dry Zone of Karnataka is known for cultivation of cotton. The enormous potentiality of newly released Bt hybrids has attracted the farmers of Tunga Bhadra Project (TBP) area. The information on the performance of these hybrids is very much limited for this area. With this background the present study was carried out to study the response of Bt cotton hybrids to fertilizer levels under irrigated condition in TBP area.

A field experiment was conducted during *kharif* season of 2003-04 at the agricultural college farm, Raichur on medium black soil having 206.7, 28.30 and 353.00 kg ha<sup>-1</sup> available N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O respectively. Soil had pH of 8.18 and organic carbon content of 0.75 per cent. The treatment consisted of four hybrids of which three Bt cotton hybrids MECH-184 Bt, MECH-162 Bt and RCH-2 Bt and one non-Bt cotton hybrid (NHH-44) of following duration 140-150, 160-170, 155-165, and 160 days respectively were assigned to main plots and fertilizer levels (100, 150 and 200 per cent RDF application) to subplots. The experiment was laid out in split plot design and replicated thrice. Sowing was done by dibbling on 8<sup>th</sup> August 2003 following common spacing of 90cm X 60 cm. The seeds were dibbled per spot in the rows. To ensure even stand and to maintain required plant population, gap filling was done on 13 days after sowing and thinning was done at 19 days after sowing. Only one plant per spot was retained after thinning. Three-hand weeding (20, 45 and 60 DAS) was carried out during crop growing period. Inter cultivation was done at 30 (DAS). Five plants from

each net plot were selected at random and tagged for the purpose of recording various observations. Biometric observations were recorded at 30, 60, 90 and 120 days after sowing and yield components were recorded at harvest. First picking was done on 22-12-2003 for MECH-184 Bt, MECH-162 Bt and RCH-2 Bt. Second, third and 4<sup>th</sup> picking were done on the given below

2<sup>nd</sup> Picking : 23-01-2004 (1<sup>st</sup> picking date of NHH-44)

3<sup>rd</sup> Picking : 18-02-2004 (2<sup>nd</sup> picking date of NHH-44)

4<sup>th</sup> Picking : 19-03-2004 (3<sup>rd</sup> picking date of NHH-44)

Among different hybrids, RCH-2 Bt recorded significantly higher seed cotton yield (2720 kg.ha<sup>-1</sup>) compared to other three hybrids. Significantly lowest yield was recorded with NHH-44 hybrid (1264 kg ha<sup>-1</sup>). The variation in the seed cotton yield was mainly attributed to the number of bolls harvested per plant, yield per plant and boll weight yield per plant, boll weight and number of bolls harvested per plant were significantly higher with RCH-2 Bt (135.9 g/pl., 4.66 g/boll and 37.22) compared to other three hybrids (Table 2). These results are in line with earlier findings of Khadi *et al.* (2002), Singh *et al.* (2003). Similarly plant height, number of sympodial branches per plant, leaf area per plant and total dry matter production per plant were significantly higher with RCH-2 Bt cotton hybrid compared to other hybrids.

Application of 150 per cent RDF noticed significantly higher seed cotton yield compared to 100 per cent RDF. Further increase to 200 per cent RDF did not increase the seed cotton yield significantly in all the hybrids. The results indicated that 150 per cent RDF application was found optimum for Bt cotton hybrids under TBP area. The variations in seed cotton yield can be attributed to significant variation in yield components, mainly yield per plant, harvested bolls per plant and mean boll weight. There was significant increase in yield components with application of 150 per cent RDF over 100 per cent RDF, but was on par with 200 per cent RDF application. The results are conformity of the findings of Ganajaxi *et al.* (1996). Similarly number of Sympodial branches per plant, leaf area and total dry matter production per plant significantly increased with increase in the levels of

fertilizer from 100 to 150 per cent RDF application. Increase in yield is due to the better performance of yield components, eventually these better yield components can be attributed mainly because of better growth parameters viz., higher number of sympodial branches (21.7), leaf area ( $249.3 \text{ dm}^2 \text{ plant}^{-1}$ ) and total dry matter per plant at harvest ( $460.6 \text{ g plant}^{-1}$ ) (Table.1). Since each of these growth factors were interrelated with each other. Better the plant height with better number of Sympodial branches led to higher TDM per plant which in turn help in retaining higher number of leaves per plant which contributes for higher production of photosynthates and higher number of bolls per plant. Ultimately combined effect of all these factors had led for attaining higher seed cotton yield in RCH-2 compared to other cotton hybrids

In all the hybrids seed cotton yield increased with increase in the levels of fertilizer from 100 to 150 per cent RDF, further increase in the levels of fertilizer to 200 per cent RDF did not respond significantly. RCH-2 Bt hybrid recorded significantly higher seed cotton yield (2545, 2803 and  $2812 \text{ kg ha}^{-1}$ ) compared to other three hybrids at all the levels of fertilizer. Hybrid RCH- 2 Bt at all the levels of fertilizer increased the seed cotton yield by 126, 111 and 110 per cent over NHH-44 hybrid (non-Bt). Selection of suitable hybrids and application of optimum dose of fertilizer under irrigated condition increased the leaf area, sympodial branches per plant and total dry matter production per plant has reflection on seed cotton yield of cotton hybrid. The results of the present investigation are in agreement with Hoogar and Gidnavar (1997). From this study, it is clear that among the four hybrids studied including

three Bt hybrids (RCH-2 Bt, MECH-184 Bt and MECH-162 Bt) and popular check (NHH-44 hybrid) coupled with different levels of NPK (100, 150 and 200 per cent RDF), RCH-2 Bt hybrid with 150 per cent RDF gave highest yield of cotton, net returns and B:C ratio.

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**Table 1: Influence of different fertilizer levels on growth cotton**

Treatments	Plant height at harvest (cm)				Sympodial branches per plant				Total dry matter production at harvest (g)				Leaf area per plant at 120 DAS (dm <sup>2</sup> plant <sup>-1</sup> )			
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean
H <sub>1</sub> :MECH-184(B <sub>i</sub> )	104.3	115.6	118.3	<b>112.7</b>	19.2	21.1	21.8	<b>20.7</b>	408.5	456.0	464.1	<b>442.9</b>	225.1	234.6	237.5	<b>232.4</b>
H <sub>2</sub> :MECH-162(B <sub>i</sub> )	110.3	123.4	125.8	<b>119.8</b>	19.9	22.1	23.1	<b>21.7</b>	380.9	416.0	423.5	<b>406.8</b>	228.3	240.4	241.7	<b>236.8</b>
H <sub>3</sub> :RCH-2(B <sub>i</sub> )	105.4	119.8	122.3	<b>115.8</b>	20.1	22.2	22.8	<b>21.7</b>	433.5	470.2	478.3	<b>460.6</b>	237.1	255.3	255.6	<b>249.3</b>
H <sub>4</sub> :NHH-44(non-B <sub>i</sub> )	121.7	132.4	135.3	<b>129.8</b>	21.7	22.6	24.2	<b>22.9</b>	369.9	410.4	418.4	<b>399.6</b>	218.2	244.0	245.7	<b>236.0</b>
<b>Mean</b>	<b>110.4</b>	<b>122.8</b>	<b>125.4</b>	<b>119.6</b>	<b>20.2</b>	<b>22.0</b>	<b>23.0</b>	<b>21.7</b>	<b>398.2</b>	<b>438.1</b>	<b>446.1</b>	<b>427.5</b>	<b>227.2</b>	<b>243.6</b>	<b>245.1</b>	<b>238.6</b>
	SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)	
Hybrids (H)	0.43		<b>1.48</b>		0.07		<b>0.24</b>		3.64		<b>12.61</b>		1.23		<b>4.26</b>	
Fertilizer levels (F)	0.28		<b>0.71</b>		0.10		<b>0.30</b>		2.33		<b>6.99</b>		1.05		<b>3.13</b>	
F at the same H	0.47		<b>1.42</b>		0.20		<b>0.60</b>		4.67		<b>13.98</b>		2.09		<b>6.26</b>	
H at the same or different F	0.58		<b>1.73</b>		0.18		<b>0.53</b>		5.27		<b>15.79</b>		2.10		<b>6.30</b>	

F<sub>1</sub>: 100 per cent RDF F<sub>2</sub>: 150 per cent RDF F<sub>3</sub>: 200 per cent RDF (RDF: 150:75:75 N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub> O kg ha<sup>-1</sup>)

**Table 2: Influence of different fertilizer levels on yield parameters and yield of cotton hybrids**

Treatments	Seed cotton yield (kg/ha)				Seed cotton yield per plant (g)				Mean boll weight (g)				Total bolls harvested per plant			
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	Mean
H <sub>1</sub> :MECH-184(B <sub>0</sub> )	2175	2450	2466	<b>2364</b>	105.2	123.5	125.2	<b>118.0</b>	4.40	4.48	4.62	<b>4.50</b>	33.13	36.58	37.70	<b>35.80</b>
H <sub>2</sub> :MECH-162(B <sub>0</sub> )	1735	1922	1932	<b>1863</b>	92.3	100.8	104.3	<b>99.2</b>	4.81	3.98	4.16	<b>3.98</b>	31.60	34.93	37.66	<b>34.73</b>
H <sub>3</sub> :RCH-2(B <sub>0</sub> )	2545	2803	2812	<b>2720</b>	130.1	138.4	139.2	<b>135.9</b>	4.40	4.75	4.82	<b>4.66</b>	35.70	37.10	38.86	<b>37.22</b>
H <sub>4</sub> :NHH-44(non-B <sub>0</sub> )	1126	1329	1338	<b>1264</b>	69.8	82.9	84.1	<b>79.0</b>	3.43	3.74	3.83	<b>3.67</b>	22.13	25.25	26.50	<b>24.63</b>
<b>Mean</b>	<b>1895</b>	<b>2126</b>	<b>2137</b>	<b>2056</b>	<b>99.4</b>	<b>111.4</b>	<b>113.2</b>	<b>108.0</b>	<b>4.01</b>	<b>4.24</b>	<b>4.36</b>	<b>4.20</b>	<b>30.64</b>	<b>33.46</b>	<b>35.18</b>	<b>33.09</b>
	SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)		SEm (±)		LSD (P=0.05)	
Hybrids (H)	10		<b>35</b>		0.92		<b>3.20</b>		0.014		<b>0.047</b>		0.31		<b>1.08</b>	
Fertilizer levels (F)	7		<b>20</b>		0.74		<b>2.22</b>		0.013		<b>0.039</b>		0.19		<b>0.57</b>	
F at the same H	13		<b>39</b>		1.48		<b>4.48</b>		0.026		<b>0.078</b>		0.38		<b>1.14</b>	
H at same or different F	15		<b>44</b>		1.52		<b>4.56</b>		0.025		<b>0.075</b>		0.44		<b>1.32</b>	

F<sub>1</sub>: 100 per cent RDF F<sub>2</sub>: 150 per cent RDF F<sub>3</sub>: 200 per cent RDF (RDF: 150:75:75 N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub> O kg ha<sup>-1</sup>)