



Performance of Cotton Hybrids (*Gossypium hirsutum* L.) under different spacings and Nitrogen levels in Black Cotton Soils of Coastal Andhra Pradesh

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ABSTRACT

A field experiment was conducted during *kharif* 2007 to find out the optimum spacing and nitrogen levels for prereleased cotton hybrid *viz.*, INDAM 178 along with check entry NCS 145. Wider row spacing of 120 x 60 cm recorded significantly more plant height and number of bolls per plant as compared to closer spacing of 90 x 60 cm. Similarly, wider plant spacing with same row spacing of 90 x 90 cm recorded significantly higher plant height and more number of bolls plant⁻¹ than that of closer plant spacing in intra row of 90 x 60 cm. Growth and yield contributing characters significantly improved on increase in nitrogen levels. Of the two hybrids tested, INDAM 178 recorded significantly higher seed cotton yield than NCS 145. Similar trend was observed in economic point of view, where INDAM 178 recorded more net returns of Rs 3,300 ha⁻¹ and BCR of 2.0 as compared to NCS 145.

Key words : Cotton, Nitrogen levels, Spacing.

Cotton plays an important role in Indian agriculture industry. Even though, India is the largest cotton grower, the productivity (440 kg ha⁻¹) is very low and it is less than the world average productivity (682 kg ha⁻¹) (Anonymous, 2008). India is the only country which grows all the four species of cotton commercially and 80% of area under *Gossypium hirsutum* hybrids. Development of location specific practices is of prime importance in enhancing the productivity which can be increased by adoption of appropriate agronomic practices. Among various factors influencing *Gossypium hirsutum* cultivation, hybrid seed and soil fertility play very significant role. Though, at present there is a recommended spacing of 120 x 60 cm for hybrids, farmers are hardly adopting it and needs to be corrected. Similarly the recommended dose of 120 kg N ha⁻¹ is not followed by farmers and mostly applying even up to 200 kg N ha⁻¹. Thus, there is a confusion regarding both spacing and nitrogen levels for hybrids and there is a need to reduce the cost of cultivation by working out optimum spacing and nitrogen level. Keeping it in view, the present study was carried out to find out the suitable nitrogen dose and spacing for the new cotton hybrid INDAM - 178 as against check entry NCS – 145.

MATERIAL AND METHODS

A field experiment was carried out at the research farm of Regional Agricultural Research Station, Lam, Guntur, to study the effect of spacing and nitrogen levels on the performance of cotton hybrids under rainfed conditions in coastal Andhra Pradesh during *kharif* 2007. The site of the experiment was clayey (vertisols) with 55.84% clay, P^H of 7.84, medium organic carbon (0.59%), low available Nitrogen (268 kg ha⁻¹), medium available Phosphorus (20.69 kg ha⁻¹) and high available Potash (353 kg ha⁻¹). The treatments consists of two hybrids INDAM – 178 (H₁) and NCS – 145 (H₂) as main plots, three spacings of 120 x 60 cm (S₁), 90 x 60 cm (S₂) and 90 x 90 cm (S₃) as sub plots and three nitrogen doses of 120 Kg ha⁻¹(N₁), 150 Kg ha⁻¹(N₂) and 180 Kg ha⁻¹(N₃) as sub sub plots replicated thrice under strip – split design. The gross plot size was 7.2 x 5.4 m² and net plot size was 5.2 x 4.2 m². The two cotton hybrids INDAM 178 and NCS 145 were sown as per the treatments mentioned above. Nitrogen was applied as per the treatments in three split doses at 20, 40 and 60 DAS, where as P₂O₅ was applied as basal @ 60 kg ha⁻¹ and K₂O @ 60 kg ha⁻¹ in three split doses at 20,

Table 1. Response of pre released cotton hybrids to various spacings and nitrogen levels

Treatments	Plant Height (cm)	No. of Monopodia	No. of Sympodia	Bolls plant ⁻¹	Boll wt. (g)	Kapas yield (kg ha ⁻¹)
Hybrids (H)						
H ₁ -INDAM 178	140.3	1.68	21.29	35.4	4.58	3000
H ₂ - NCS 145	131.9	1.79	21.33	38.2	4.38	2810
S _{Em} +	0.11	0.05	0.18	0.11	0.04	270
CD (P=0.05)	0.66	NS	NS	0.67	NS	160
Spacings (S)						
S ₁ - 120 x 60 cm	128.9	1.48	21.22	39.3	4.51	2790
S ₂ - 90 x 60 cm	136.6	1.72	21.16	34.1	4.46	2900
S ₃ - 90 x 90 cm	142.8	2.00	21.55	37.0	4.47	3040
S _{Em} +	1.10	0.06	0.12	0.12	0.04	120
CD (P=0.05)	6.69	0.41	NS	0.78	NS	NS
H x S	Sig	NS	NS	Sig	NS	Sig
N- Levels (N)						
N ₁ - 120Kg ha ⁻¹	132.6	1.81	21.00	37.0	4.49	2860
N ₂ - 150 Kg ha ⁻¹	136.1	1.56	21.27	34.5	4.48	2910
N ₃ - 180 Kg ha ⁻¹	139.6	1.83	21.66	38.8	4.46	2960
H x N	NS	NS	NS	Sig	NS	NS
S x N	NS	NS	Sig	Sig	NS	NS
H x S x N	Sig	Sig	Sig	Sig	NS	NS
S _{Em} +	0.75	0.031	0.16	0.17	0.06	70
CD (P=0.05)	4.56	0.19	0.66	1.06	NS	NS

Table 2 Effect of hybrids x spacing interaction on seed cotton yield of cotton

Hybrids	Spacings		
	S ₁ - 120 x 60 cm	S ₁ -90 x 60 cm	S ₁ -90 x 90 cm
H ₁ - INDAM 178	2.90	2.70	3.42
H ₂ - NCS 145	2.67	3.11	2.65
S _{Em} ±		0.09	
CD (P=0.05)		0.54	

Table 3. Kapas yield, net returns, and BCR of *G.hirsutum* cotton hybrids as influenced by spacing and nitrogen levels

Treatments	Kapas yield (kg ha ⁻¹)	Net returns (Rs)	BCR
Hybrids (H)			
H ₁ - INDAM 178	3000	33,000	2.00
H ₂ - NCS 145	2810	28,820	1.87
Spacings (S)			
S ₁ - 120 x 60 cm	2790	28,380	1.86
S ₂ - 90 x 60 cm	2900	30,800	1.93
S ₃ - 90 x 90 cm	3040	33,880	2.02
N Levels (N)			
N ₁ - 120 Kg ha ⁻¹	2860	29,920	1.90
N ₂ - 150 Kg ha ⁻¹	2910	30,620	1.92
N ₃ - 180 Kg ha ⁻¹	2960	31,320	1.93

Sale Price of Cotton Rs 22,000 / ton

Table 4. Quality of cotton fibre to various spacings and nitrogen levels

Treatments	2.5% Span Length	Strength(g tex ⁻¹)	Micronaire (10 ⁶ g inch ⁻¹)	Uniformity Ratio	Elongation (%)
Hybrids (H)					
H ₁ - INDAM 178	29.5	21.2	3.66	45.5	5.51
H ₂ - NCS 145	30.6	21.9	3.50	45.0	5.52
SEm +	0.24	0.19	0.06	0.22	0.01
CD (P=0.05)	NS	NS	NS	NS	NS
Spacings (S)					
S ₁ - 120 x 60 cm	29.4	21.3	3.75	44.8	5.53
S ₂ - 90 x 60 cm	30.4	21.9	3.48	46.4	5.50
S ₃ - 90 x 90 cm	30.5	21.4	3.51	44.6	5.51
SEm +	0.21	0.15	0.03	0.12	0.01
CD (P=0.05)	NS	NS	0.18	0.73	NS
H x S	Sig	NS	Sig	NS	NS
N Levels (N)					
N ₁ - 120Kg ha ⁻¹	29.6	21.4	3.68	45.1	5.52
N ₂ - 150 Kg ha ⁻¹	30.5	21.7	3.44	44.7	5.51
N ₃ - 180 Kg ha ⁻¹	30.2	21.5	3.62	46.1	5.50
H x N	NS	Sig	Sig	Sig	Sig
S x N	NS	NS	Sig	NS	NS
H x S x N	NS	Sig	NS	Sig	Sig
SEm +	0.27	0.16	0.04	0.41	0.01
CD (P=0.05)	NS	NS	0.24	NS	NS

40 and 60 DAS. The cotton crop was sown on 14 – 7-20-07 and harvested on 21 – 1-20-08 by following standard package of practices. Data on plant height, number of monopodia, number of sympodia, number of bolls plant⁻¹, boll weight were averaged from 5 plants. Seed cotton yield, economics and fiber quality are worked out as per standard procedures by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Closer row and wide plant spacing of 90 x 90 cm (S₃) gave significantly higher plant height and monopodia as compared to wider row and narrow plant spacing of 120 x 60 cm and 90 x 60 cm (S₁ and S₂). Whereas wider row spacing recorded significantly more number of bolls per plant. (Narayana *et al.*, 2007). But the most interesting point to note is that by widening space in between plants recorded higher plant height and exhibited increasing trend even in respect of other growth parameters when row space remains same (Table 1). Similar trend was expressed in kapas yield, however, it was statistically not significant. Similar findings were reported by Patel *et al.*, (2004) and Kulvir Singh and J.S.Gill (2007). As the nitrogen dose increases, growth characters significantly increased but it did not exert any significant influence on yield. Similar results were reported by Mandeep Kaur and Brar (2008).

INDAM 178 recorded significantly more seed cotton yield (3000 kg ha⁻¹) to that of NCS 145 hybrid (2810 kg ha⁻¹) with a BCR of 2.00. The interaction of Hybrid x Spacing indicated that INDAM 178 recorded the maximum seed cotton yield of 3420 kg ha⁻¹ under 90 x 90 cm spacing, whereas NCS 145 recorded the maximum yield of 3110 kg ha⁻¹ under 90 x 60 cm. (Table 2 and 3).

INDAM 178 did not differ significantly on any of the fiber quality from check entry NCS 145. As spacing increased, there was an increase in micronaire of fibre; and 120 x 60 cm recorded

significantly superior micronaire as compared to rest of the spacings. Micronaire has been reduced on increasing N levels but there was a mixed trend and that needs to be ascertained. (Table 4).

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(Received on 14.10.2008 and revised on 29.12.2008)