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Economics of late sown Bt cotton (*Gossypium hirsutum* L.) as influenced by different plant spacing, fertilizer levels and NAA applications under irrigation

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ABSTRACT

A field experiment was conducted on medium black soil to study the economics of late sown Bt cotton as influenced by different plant spacings, fertilizer levels and NAA applications under irrigation during 2006-07 at College of Agriculture, Raichur farm, University of Agricultural Sciences, Dharwad. The results of the investigation indicate that net returns were significantly higher with 90 x 30 cm (Rs. 38,603 ha^{-1}) which was at par with the 90 x 45 cm spacing (Rs. 36,661 ha^{-1}). The net returns realized with 150 per cent RDF were Rs. 37,227 ha^{-1} which was 7.5 per cent higher than that with 100 per cent RDF (Rs. 34,617 ha^{-1}). Benefit: Cost ratio was not significantly influenced by both spacing and fertilizer levels. Three sprays of NAA (Rs. 39,813 ha^{-1}) resulted in significantly higher net returns than two sprays of NAA (Rs. 36,022 ha^{-1}) and control (Rs. 31,932 ha^{-1}). Benefit cost ratio was significantly higher with three sprays of NAA (3.18) than two sprays of NAA (2.98) and control- water spray (2.79). Interaction effect were found to be non significant.

Key words : Economics, Bt cotton, Spacing, Fertilizer levels, NAA sprays

INTRODUCTION

Indian government is now looking for many ways to improve the production of cotton in order to boost the economy. In addition, it is also looking to boost production of edible cotton seed oil to help and feed India's growing population of one billion people (James, 2004). Under this context, in India genetically modified cotton hybrids resistant to bollworms have been developed and released for commercial cultivation in 2001-02. The preliminary investigation on Bt cotton proved that Bt hybrids are early in maturity and resistant to bollworm. Possibly for this reason, Bt cotton performs better than other hybrids under delayed sowing condition (Sankaranarayanan *et al.*, 2004). Hence, it is necessary to develop production technology for Bt cotton under late sown situations. In the present study, attempt was made to study the economics of late sown Bt cotton as influenced by different plant spacings, fertilizer levels and NAA applications under irrigation in vertisol in the Deccan zone.

MATERIALS AND METHODS

The field experiment was conducted during 2006-07 in medium black at College of Agriculture, Raichur, farm University of Agricultural Sciences, Dharwad (Karnataka). The experiment was laid out with a split-split plot design. There were 18 treatment combinations replicated three times with three plant spacings (90 x 30 cm, 90 x 45 cm, 90 x 60 cm) in main plots, fertilizer levels (100 % RDF and 150 % RDF) in sub plots and growth regulator sprays control (water spray), NAA @ 10 ppm-two sprays at flower commencement and full blooming stage and NAA @ 10 ppm-three sprays at squaring, flower commencement and full blooming stage) in sub-sub plots. The recommended dose of fertilizer (RDF) for cotton comprised of 150:75:75 NPK kg ha^{-1}.

The cultivar used was Bunny Bt. The crop was sown by delaying one and half month beyond optimum schedule on 25th September, 2006. The other cultivation practices were followed as per recommended package.

RESULTS AND DISCUSSION

Different plant populations at varied spacings caused significant differences in net returns. Plant population of 37,036 plants ha^{-1} at 90 x 30 cm spacing fetched significantly higher net returns (Rs. 38,603 ha^{-1}) over plant population of 18,518 plants ha^{-1} at 90 x 60 cm spacing (Rs. 32,503 ha^{-1}). However, this treatment (90 x 30 cm) was at par with net returns realized with a population of 24,691 plants ha^{-1} at 90 x 45 cm spacing (Rs. 36,661 ha^{-1}) (Table 1 and Fig 1). The higher net returns with 90 x 45 cm spacing were mainly because of lower cost of cultivation on account of seed cost when compared to 90 x 30 cm spacing and apart from this, higher seed cotton yield per hectare compared to 90 x 60 cm spacing. These results are in accordance with the findings of Satyanarayana Rao and Janawade (2006) and Srinivasulu *et al.* (2006). Even though, the seed cotton yields were higher with higher population at 90 x 30 cm spacing (2479 kg ha^{-1}) compared to 90 x 45 cm spacing (2343 kg ha^{-1}), the spacing of 90 x 45 cm recorded lower and at par net

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returns (Rs. 36,661 ha^{-1}) with 90 x 30 cm spacing (Rs. 38,603 ha^{-1}).

Population levels at different spacings tried did not show any marked influence on B: C ratio (Table 1 and Fig. 1) on account of higher cost of cultivation with higher population levels adopted at 90 x 30 and 90 x 45 cm spacings.

Among fertilizer levels, 150 per cent RDF resulted in significantly higher net returns (Rs. 37,227 ha^{-1}) which was 7.5 per cent higher over 100 per cent RDF application (Table 1 and Fig. 1). This was mainly because of higher seed cotton yields obtained with 150 per cent RDF (Table 1 and Fig. 1). Benefit: Cost ratio did not follow trend of net returns due to variation in cost of cultivation (Table 1).

Among NAA applications, three sprays of NAA at squaring, initiation of flowering and full blooming stages

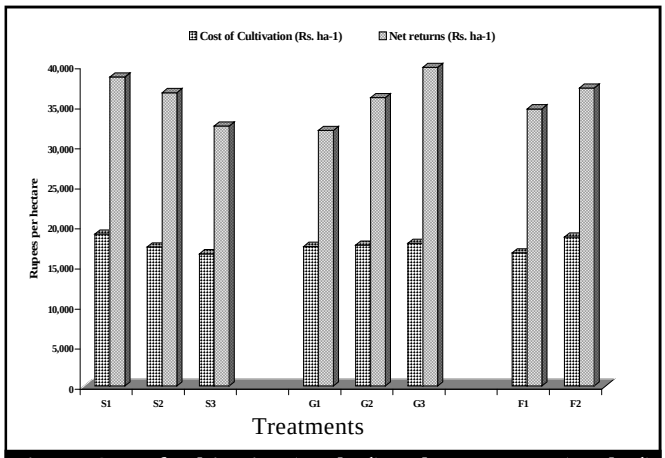

Fig. 1 : Cost of cultivation (Rs. ha^{-1}) and Net returns (Rs. ha^{-1}) in Bt cotton yield as influenced by management practices under late sown conditions

Table 1 : Seed cotton yield (kg ha^{-1}), cost of cultivation (Rs. ha^{-1}), gross returns (Rs. ha^{-1}), net returns (Rs. ha^{-1}) and benefit cost ratio in Bt cotton as influenced by management practices under late sown conditions

Treatments	Seed cotton yield (kg ha^{-1})	Cost of Cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	Benefit cost ratio
Plant spacings (S)					
S_1- 90 x 30 cm (37,036 plants ha^{-1})	2479	18,994	56,777	38,603	2.98
S_2- 90 x 45 cm (24,691 plants ha^{-1})	2343	17,383	53,663	36,661	3.07
S_3- 90 x 60 cm (18,518 plants ha^{-1})	2101	16,517	48,129	32,503	2.90
S. E. ±	35.24	34	816	741	0.04
C.D. (P=0.05)	137.97	134	3205	2910	NS
Fertilizer levels (F)					
F_1- 100% RDF	2195	16,640	50,278	34,617	3.01
F_2- 150% RDF	2420	18,623	55,434	37,227	2.96
S. E.±	28.37	30	649	477	0.03
C.D. (P=0.05)	98.22	103	2248	1651	NS
Growth regulator sprays (G)					
G_1- Control (water spray)	2138	17,453	48,983	31,932	2.79
G_2- NAA @ 10 ppm (2 sprays)	2297	17,603	52,604	36,022	2.98
G_3- NAA @ 10 ppm (3 sprays)	2488	17,839	56,981	39,813	3.18
S. E.±	49.34	49	1130	829	0.05
C.D. (P=0.05)	144.03	143	3298	2422	0.19
Interactions					
S x F					0.05
S. E.±	49.15	52	1125	826	NS
C.D. (P=0.05)	NS	NS	NS	NS	
S x G					
S. E.±	85.47	85	1957	1437	0.09
C.D. (P=0.05)	NS	NS	NS	NS	NS
F x G					
S. E.±	69.78	69	1598	1173	0.07
C.D. (P=0.05)	NS	NS	NS	NS	NS
S x F x G					
S. E.±	120.87	120	2768	2032	0.13
C.D. (P=0.05)	NS	NS	NS	NS	NS

NS = Non significant

recorded significantly higher net returns as well as benefit: cost ratio (Rs. 39,813 ha^{-1} and 3.18) as compared to two sprays of NAA at squaring and flower commencement stages (Rs. 36,022 ha^{-1} and 2.98) and control (Rs. 31,932 and 2.79) (Table 1 and Fig 1). Net returns realized with three sprays of NAA were 24.6 per cent higher over control which received the water spray alone. The higher net returns and B: C ratio were mainly because of higher seed cotton yields with this treatment. Similar observations were reported by Venkatakrishanan and Pothiraj (1994) and Satyanarayan Rao and Janawade (2006).

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