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Study of LAD, RDMP and CGR of late sown Bt Cotton (*Gossypium hirsutum* L.) as influenced by different plant spacings, fertilizer levels and NAA applications under irrigation

VISHWANATH BIRADAR
Agricultural Research Station, BIDAR (KARNATAKA) INDIA

ABSTRACT

A field experiment was conducted on medium black soil to study the LAD, RDMP and CGR 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 Leaf area duration (LAD) between 46 and 90 and 91 and 135 DAS, 90 x 30 cm spacing recorded significantly higher LAD (54.82 and106.65 days, respectively), 150 per cent RDF (44.78 and 88.87 days, respectively) and three sprays of NAA (44.78 and 89.10, respectively). Rate of dry matter production (RDMP) between 46 to 90 and 91 and 135 DAS was significantly higher with 90 x 60 cm spacing plant spacings (5.49 and 3.92 g plant^{-1} day$^{-1,}$ respectively), 150 per cent RDF (5.42 and 4.03 g plant^{-1} day^{-1}, respectively) and three sprays of NAA (5.42 and 4.15g plant^{-1} day^{-1}, respectively). Crop growth rate (CGR) between 46 and 90 and 91 and 135 DAS was significantly higher with 90 x 30 cm plant spacings (18.98 and 14.05 g m^{-2} day^{-1}, respectively), 150 per cent RDF (14.33 and 10.75 g m^{-2} day^{-1}, respectively) and three sprays of NAA (14.41 and 11.07 g m^{-2} day^{-1}, respectively. The interaction effects were non significant.

Key words : LAD, RDMP, CGR, 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

Leaf area duration (LAD) between 46 and 90 and 91 and 135 DAS varied significantly due to spacing levels. The data revealed that between 46 to 90 DAS, 90 x 30 cm spacing recorded significantly higher LAD (54.82 days) than 90 x 45 cm (40.42 days) and 90 x 60 cm (33.94 days) spacings. Similar trend was observed between 91 to 135 DAS (Table 1).

LAD was significantly influenced by fertilizer levels between 46 to 90 DAS and 91 to 135 DAS. Between 46 to 90 DAS, application of 150 per cent RDF produced significantly higher LAD (44.78 days) over 100 per cent RDF (41.34 days). The LAD recorded between 91 to 135 DAS followed similar trend (Table 1).

LAD differed significantly due to NAA sprays between 46 to 90 and 91 to 135 DAS. Between 46 to 90 DAS, significantly higher LAD (44.78 days) was recorded

with three sprays of NAA as compared to two sprays of NAA (43.54 days) and control (40.86 days). Similar trend was noticed between 91 to 135 DAS (Table 1).

The interaction effects were non significant between 46 to 90 and 91 to 135 DAS.

Rate of dry matter production (RDMP) between 46 to 90 DAS was influenced significantly by different plant spacings. Between 46 to 90 DAS, significantly higher RDMP (5.49 g plant^{-1} day^{-1}) was recorded with 90 x 60 cm spacing as compared to 90 x 30 and 90 x 45 cm spacings. Between 46 to 90 DAS, significantly lower RDMP (5.12 g plant^{-1} day^{-1}) was recorded with 90 x 30 cm spacing. Between 91-135 DAS, non significant difference in RDMP due to spacings was observed (Table 1).

RDMP differed significantly due to different levels of fertilizer at all the growth stages. Between 46 to 90 DAS, significantly higher RDMP (5.42 g plant^{-1} day^{-1}) was recorded with application of 150 per cent RDF than 100 per cent RDF (5.17 g plant^{-1} day^{-1}). Between 91 to 135 DAS, significantly higher RDMP was recorded with the application of 150 per cent RDF (4.03 g plant^{-1} day^{-1}) as compared to application of 100 per cent RDF (3.65 g plant^{-1} day^{-1}) (Table 1).

Table 1 : Leaf area duration (days) and rate of dry matter production (g plant^{-1} day^{-1}) of Bt cotton as influenced by management practices under late sown conditions

Treatments	Leaf area duration (days)		Rate of dry matter production (g plant^{-1} day^{-1})	
	46 to 90 DAS	91 to 135 DAS	46 to 90 DAS	91 to 135 DAS
Plant spacings (S)				
S_1- 90 x 30 cm (37,036 plants ha^{-1})	54.82	106.65	5.12	3.79
S_2- 90 x 45 cm (24,691 plants ha^{-1})	40.42	79.87	5.27	3.81
S_3- 90 x 60 cm (18,518 plants ha^{-1})	33.94	67.50	5.49	3.92
S. E..±	0.82	1.46	0.060	0.08
C.D. (P=0.05)	3.22	5.77	0.14	NS
Fertilizer levels (F)				
F_1- 100% RDF	41.34	80.55	5.17	3.65
F_2- 150% RDF	44.78	88.87	5.42	4.03
S. E..±	0.50	1.27	0.056	0.06
C.D. (P=0.05)	1.74	4.39	0.12	0.21
Growth regulator sprays (G)				
G_1- Control (water spray)	40.86	80.10	5.06	3.46
G_2- NAA @ 10 ppm (2 sprays)	43.54	84.82	5.27	3.91
G_3- NAA @ 10 ppm (3 sprays)	44.78	89.10	5.42	4.15
S. E..±	0.77	1.32	0.054	0.10
C.D. (P=0.05)	1.07	4.15	0.15	0.20
Interactions				
S x F				
S. E..±	0.87	2.20	0.11	0.10
C.D. (P=0.05)	NS	NS	NS	NS
S x G				
S. E..±	0.135	2.82	0.17	0.18
C.D. (P=0.05)	NS	NS	NS	NS
F x G				
S. E..±	1.10	2.30	0.13	0.14
C.D. (P=0.05)	NS	NS	NS	NS
S x F x G				
S. E..±	1.91	3.99	0.24	0.25
C.D. (P=0.05)	NS	NS	NS	NS

NS-Non significant DAS – Days after sowing

The variation in RDMP due to NAA sprays was significant at all the growth stages. Between 91 to 135 DAS, significantly higher RDMP was recorded with the three sprays of NAA (4.15 g plant^{-1} day^{-1}) as compared to two sprays of NAA (3.91 g plant^{-1} day^{-1}) which inturn showed significant superiority over control (3.46 g plant^{-1} day^{-1}) (Table 1).

The interaction effects were non significant between 46 to 90 and 91 to 135 DAS.

Table 2 : Crop growth rate (g m^{-2} day^{-1}) of Bt cotton as influenced by management practices under late sown conditions

Treatments	Crop growth rate (g m^{-2} day^{-1})	
	46 to 90 DAS	91 to 135 DAS
Plant spacings (S)		
S_1- 90 x 30 cm (37,036 plants ha^{-1})	18.98	14.05
S_2- 90 x 45 cm (24,691 plants ha^{-1})	13.02	9.41
S_3- 90 x 60 cm (18,518 plants ha^{-1})	10.12	7.26
S.E.±	0.19	0.20
C.D. (P=0.05)	0.76	0.80
Fertilizer levels (F)		
F_1- 100% RDF	13.75	9.73
F_2- 150% RDF	14.33	10.75
S.E.±	0.16	0.17
C.D. (P=0.05)	0.45	0.61
Growth regulator sprays (G)		
G_1- Control (water spray)	13.71	9.23
G_2- NAA @ 10 ppm (2 sprays)	14.00	10.42
G_3- NAA @ 10 ppm (3 sprays)	14.41	11.07
S.E.±	0.17	0.19
C.D. (P=0.05)	0.13	0.54
Interactions		
S x F		
S.E.±	0.32	0.30
C.D. (P=0.05)	NS	NS
S x G		
S.E.±	0.43	0.54
C.D. (P=0.05)	NS	NS
F x G		
S.E.±	0.35	0.41
C.D. (P=0.05)	NS	NS
S x F x G		
S.E.±	0.61	0.71
C.D. (P=0.05)	NS	NS

NS-Non significant DAS – Days after sowing

Crop growth rate (CGR) differed significantly with different spacings. With different spacings there was significant difference in CGR during all growth periods. Between 46 to 90 DAS, significantly higher CGR (18.98 g m^{-2} day^{-1}) was recorded with 90 x 30 cm spacing compared to 90 x 45 and 90 x 60 cm spacings and significantly lower CGR (10.12 g m^{-2} day^{-1}) was noticed with 90 x 60 cm spacing. Between 91 to 135 DAS, significantly higher CGR recorded with 90 x 30 cm spacing (14.05 g m^{-2} day^{-1}) as compared to 90 x 45 cm (9.41 g m^{-2} day^{-1}). The spacing of 90 x 60 cm registered significantly lower CGR (7.26 g m^{-2} day^{-1}) (Table 2).

CGR differed significantly due to different levels of fertilizer application during both the periods. Between 46 to 90 DAS, significantly higher CGR (14.33 g m^{-2} day^{-1}) was recorded with application of 150 per cent RDF than 100 per cent RDF (13.75 g m^{-2} day^{-1}). Similar trend was also observed between 91 to 135 DAS (Table 2).

The variation in CGR due to NAA sprays was significant between 46 to 90 and 91 to 135 DAS. Between 46 to 90 DAS, CGR recorded with three sprays of NAA was significantly higher (14.41 g m^{-2} day^{-1}) over two sprays of NAA (14.00 g m^{-2} day^{-1}). Control treatment recorded significantly lower CGR (13.71 g m^{-2} day^{-1}). Between 91 to 135 DAS, significantly higher CGR was recorded with three sprays of NAA (11.07 g m^{-2} day^{-1}) as compared to two sprays of NAA and control (10.42 and 9.23 g m^{-2} day^{-1}respectively) (Table 2).

The interaction effects on CGR were non significant at both the growth periods studied (46 to 90 and 91 to 135 DAS).

These findings are in agreement with those of by Bastia (2000), Hake *et al.* (1992), Srivastava *et al.* (1998) and Rao (2004).

REFERENCES

Bastia, D. K. (2000). Integrated nutrient management in rainfed hybrid cotton. *Madras agric. J.*, **87**(7-9): 442-443.

Hake, D. A., Bharad, G. M., Kohale, S. K. and Nagdeva, M. S., (1992). Effect of plant population on growth and yield of pre-monsoon cotton (*G. hirsutum*) under drip irrigation system. *Indian. J. Agron.*, **37** (2): 393-395.

James, C. (2004). Preview: Global Status of Commercialized Transgenic Crops: 2003". *Int. Service Acqusition Agri-Biotech Applications,* January 2004 p. 7.

Rao, Satyanarayana (2004). Agronomic investigations for normal and late planted hybrid cotton in Tungabhadra Project area of Karnataka. Ph. D. Thesis, University of Agricultural Sciences, Dharwad (Karnataka).

Sankaranarayanan, K., Nalayini, P., Prabharaj, C.S. and Dharajothi (2004). Effect of dates of sowing on the productivity of Bt cotton hybrids. *Int. Symp. Strat. Sust. Cotton Prod. –A G Vis. Crop Production*, 23-25 November 2004, UAS, Dharwad, pp.103-104.

Srivastava, M.K., Jain, K.C. and Sudhanshu Jain (1998). Effect of spacing and fertilizer levels on seed cotton yield. *J. Cotton Res. Develop*., **12**(1): 38-40.

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