RESEARCH PAPER International Journal of Agricultural Sciences, June, 2010, Vol. 6 Issue 2 : 553-556

Growth parameters of late sown Bt cotton as influenced by different plant spacings, fertilizer levels and NAA applications under irrigation

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ABSTRACT

A field experiment was conducted to study the growth parameters of late sown Bt cotton as influenced by plant spacings, fertilizer levels and NAA application under irrigation in vertisol during 2006-07 at College of Agriculture, Raichur farm, University of Agricultural Sciences, Dharwad. The results of the investigation indicate that at harvest plant height was significantly higher with 90 x 60 cm spacing (127.88 cm), 150 per cent RDF (125.13 cm) and three sprays of NAA (126.00 cm). At harvest, 90 x 60 cm spacing (24.04), 150 per cent (23.39) and three sprays of NAA recorded significantly higher number of main stem nodes per plant (23.53). At harvest 90 x 60 cm row spacing (77.11 dm^2 $plant^{-1}$,), 150 per cent RDF (71.54 dm^2 $plant^{-1}$) and three sprays of NAA (71.90 dm^2 $plant^{-1}$) recorded significantly higher leaf area. LAI recorded at harvest was significantly superior with 90 x 60 cm spacing (1.42), 150 per cent RDF (1.86) and three sprays of NAA (1.86). At 135 DAS, 90 x 60 cm spacing (22.37), 150 per cent RDF (21.12) and three sprays of NAA (21.32) recorded significantly higher number of sympodial branches per plant. Similar trend was observed at harvest. The influence of spacings, different levels of fertilizer and NAA sprays at 90 and 135 DAS and at harvest was found significant on total dry matter production per plant. Interaction effect were also found to be non significant.

Key words : Plant height, Leaf area, Total dry matter, Bt cotton, Spacing, Fertilizer levels, NAA sprays

INTRODUCTION

Cotton is very specific to its climatic requirements and reacts unfavorably for any shift in dates of sowing from the normal period. In Tungabhadra project (TBP) area of Karnataka, the optimum time for sowing of hybrid cotton is upto July second fortnight. In this region, delay in sowing beyond normal time becomes inevitable due to partially or total failure of early rains and/or late release of canal water in *Kharif* season (Rao and Janawade, 2006). This compels the farmers to go in for late sowing of cotton. In the present study, attempt was made to study the growth parameters 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 Vertisol at College of Agriculture, Raichur, farm University of Agricultural Sciences, Dharwad (Karnataka). The experiment was laid out on medium black soil 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

At harvest plant height was significantly higher with 90 x 60 cm spacing (127.88 cm) than 90 x 45 cm spacing (122.26 cm) which inturn was significantly superior to 90 x 30 cm spacing (118.74 cm). Significantly higher plant height was recorded with the application of 150 per cent RDF (125.13 cm) as compared to application of 100 per cent RDF (120.78 cm) at harvest. Significantly higher plant height (126.00 cm) was recorded with three sprays of NAA as compared to two sprays of NAA (122.33 cm) which inturn was significant over control – water spray (120.46 cm) (Table 1).

Number of main stem nodes per plant differed significantly at harvest due to application of different levels of fertilizer. The plant spacing 90 x 60 cm recorded significantly higher number of main stem nodes per plant (24.04) as compared to 90 x 45 and 90 x 30 cm spacings, while the number of nodes per plant was significantly lower with 90 x 30 cm spacing (21.51). Application of 150 per cent recorded significantly higher number of nodes per plant (23.39) over 100 per cent RDF (22.10). And three sprays of NAA recorded significantly higher

number of main stem nodes per plant (23.53) as compared to two sprays of NAA and control (22.62 and 22.0, respectively) (Table 1).

Significantly higher leaf area was recorded at harvest with the plant spacing of 90 x 60 cm (77.11 dm^2 $plant^{-1}$,) over 90 x 45 and 90 x 30 cm spacings. Significantly lower leaf area $plant^{-1}$ was noticed with plant spacing of 90 x 30 cm (61.39 dm^2 $plant^{-1}$). Application of 150 per cent RDF recorded significantly higher leaf area (71.54 dm^2 $plant^{-1}$) as compared to application of 100 per cent RDF (66.40 dm^2 $plant^{-1}$). And significantly higher leaf area was recorded with three sprays of NAA (71.90 dm^2 $plant^{-1}$) as compared to two sprays of NAA (69.28 dm^2 $plant^{-1}$). Significantly lower leaf area was recorded with control (65.71 dm^2 $plant^{-1}$) (Table 1).

At harvest, 90 x 30 cm spacing recorded significantly higher leaf area index (2.26,) compared to 90 x 45 cm which inturn was significantly superior over 90 x 60 cm spacing (1.42). Significantly higher leaf area index (1.86) was recorded with application of 150 per cent RDF over 100 per cent RDF (1.71). LAI recorded at harvest was significantly superior with three sprays of NAA (1.86) as compared to two sprays of NAA (1.80). Significantly lower leaf area index was recorded with control (1.69) (Table 1).

At 135 DAS, 90 x 60 cm spacing recorded significantly higher number of sympodial branches per plant (22.37) over 90 x 45 and 90 x 30 cm spacings. Significantly lower number of sympodial branches per plant (18.43 $plant^{-1}$) was recorded with spacing of 90 x

Table 1 : Plant height (cm), number of nodes per plant, leaf area (dm^2 $plant^{-1}$) and leaf area index at harvest of Bt cotton as influenced by management practices under late sown conditions

Treatments	Plant height (cm) at harvest	Number of nodes per plant at harvest	Leaf area (dm^2 $plant^{-1}$) at harvest	Leaf area index at harvest
Plant spacings (S)				
S_1- 90 x 30 cm (37,036 plants ha^{-1})	118.74	21.51	61.39	2.26
S_2- 90 x 45 cm (24,691 plants ha^{-1})	122.26	22.69	68.39	1.68
S_3- 90 x 60 cm (18,518 plants ha^{-1})	127.88	24.04	77.11	1.42
S.E.±	1.00	0.24	1.18	0.039
C.D. (P=0.05)	3.96	0.94	4.67	0.15
Fertilizer levels (F)				
F_1- 100% RDF	120.78	22.10	66.40	1.71
F_2- 150% RDF	125.13	23.39	71.54	1.86
S.E.±	0.80	0.31	0.72	0.023
C.D. (P=0.05)	2.78	1.07	2.49	0.08
Growth regulator sprays (G)				
G_1- Control (water spray)	120.46	22.09	65.71	1.69
G_2- NAA @ 10 ppm (2 sprays)	122.33	22.62	69.28	1.80
G_3- NAA @ 10 ppm (3 sprays)	126.00	23.53	71.90	1.86
S.E.±	0.60	0.17	0.84	0.020
C.D. (P=0.05)	1.74	0.47	2.47	0.05
Interactions				
S x F				
S.E.±	1.39	0.53	1.24	0.040
C.D. (P=0.05)	NS	NS	NS	NS
S x G				
S.E.±	1.98	0.57	1.94	0.057
C.D. (P=0.05)	NS	NS	NS	NS
F x G				
S.E.±	1.62	0.47	1.58	0.047
C.D. (P=0.05)	NS	NS	NS	NS
S x F x G				
S.E.±	2.80	0.81	2.74	0.081
C.D. (P=0.05)	NS	NS	NS	NS

NS-Non significant

Table 2 : Number of sympodial branches per plant and total dry matter production (g plant^{-1}) of Bt cotton as influenced by management practices under late sown conditions

Treatments	Number of sympodial branches per plant		Total dry matter production (g plant^{-1})		
	135 DAS	At harvest	90 DAS	135 DAS	At harvest
Plant spacings (S)					
S_1- 90 x 30 cm (37,036 plants ha^{-1})	18.43	20.24	250.01	420.95	446.37
S_2- 90 x 45 cm (24,691 plants ha^{-1})	20.58	21.71	256.77	430.99	457.96
S_3- 90 x 60 cm (18,518 plants ha^{-1})	22.37	23.01	266.14	442.93	469.96
S.E.±	0.25	0.31	2.44	3.90	3.85
C.D. (P=0.05)	0.99	1.22	9.61	15.34	10.53
Fertilizer levels (F)					
F_1- 100 % RDF	19.80	21.97	252.52	418.57	452.52
F_2- 150 % RDF	21.12	23.16	262.76	444.68	463.68
S.E.±	0.24	0.21	1.84	1.89	1.64
C.D. (P=0.05)	0.83	0.75	6.37	6.55	5.70
Growth regulator sprays (G)					
G_1- Control (water spray)	19.45	21.18	252.05	408.21	430.82
G_2- NAA @ 10 ppm (2 sprays)	20.62	22.00	257.14	435.64	463.95
G_3- NAA @ 10 ppm (3 sprays)	21.32	22.93	263.73	451.02	479.51
S.E.±	0.19	0.23	1.34	4.65	4.73
C.D. (P=0.05)	0.57	0.69	3.93	13.57	13.81
Interactions					
S x F					
S.E.±	0.41	0.37	3.19	3.28	2.85
C.D. (P=0.05)	NS	NS	NS	NS	NS
S x G					
S.E.±	0.34	0.41	2.33	8.05	8.19
C.D. (P=0.05)	NS	NS	NS	NS	NS
F x G					
S.E.±	0.27	0.33	1.90	6.57	6.91
C.D. (P=0.05)	NS	NS	NS	NS	NS
S x F x G					
S.E.±	0.48	0.58	3.29	11.39	11.59
C.D. (P=0.05)	NS	NS	NS	NS	NS

NS-Non significant DAS – Days after sowing

30 cm. Similar trend was observed at harvest. Significantly higher number of sympodial branches per plant (21.12) was recorded with application of 150 per cent RDF as compared to 100 per cent RDF (19.80). Similar trend was observed at harvest (Table 2). Nayak *et al.* (1997) also observed application of 150: 150: 150 kg NPK ha^{-1} produced significantly higher number of sympodial branches per plant. This variation in the number of sympodial branches per plant could be attributed to plant height. The plant height increased significantly with 150 per cent RDF as compared to 100 per cent RDF (Table 1). Similar positive relationship between plant height and number of sympodial branches per plant was reported by Chinawar (1986). Significantly higher number of sympodial branches per plant (21.32) was recorded with three sprays of NAA as compared to control which recorded significantly lower number of sympodial branches per plant (19.45). At harvest, three sprays of NAA recorded significantly higher number of sympodial branches per plant (22.93) as compared to two sprays of NAA (22.00) which in turn was significantly superior over control (21.18) (Table 2) (Fig. 1).

The influence of spacing was found significant on total dry matter production per plant at all the growth stages. At 90 DAS, significantly higher total dry matter production was recorded with 90 x 60 cm spacing (266.14

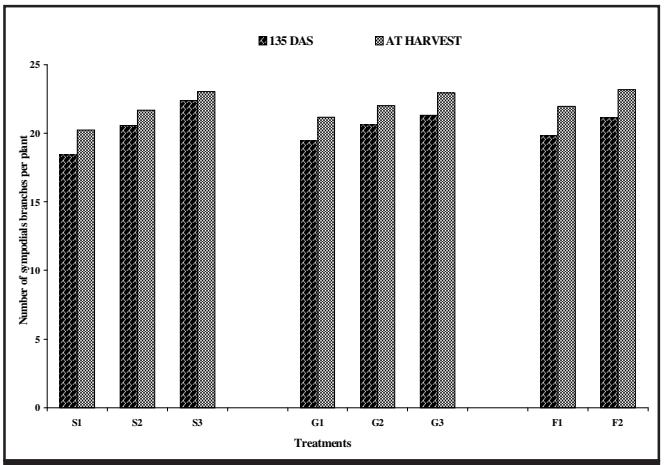

Fig. 1 : Number of sympodial branches per plant of Bt cotton as influenced by management practices under late sown conditions

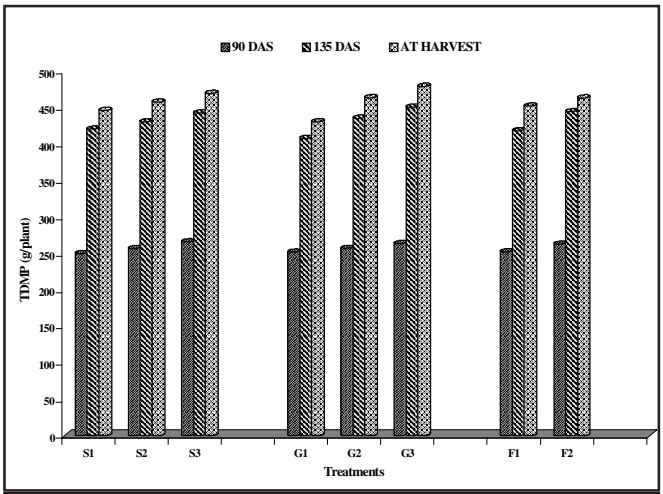

Fig. 2 : Total dry matter production (g/plant) of Bt cotton as influenced by management practices under late sown conditionsw

g plant^{-1}). Significantly lower total dry matter production was recorded with 90 x 30 cm spacing (250.0 g plant^{-1}). At 135 DAS and at harvest similar trend was noticed. Total dry matter production differed significantly at 90 DAS due to application of different levels of fertilizer. At 90 DAS, significantly higher total dry matter production (262.76 g plant^{-1}) was recorded with application of 150 per cent RDF than 100 per cent RDF (252.52 g plant^{-1}). At 135 DAS and at harvest similar trend was noticed (Table 2). Similar observations were made by Kubde and Lakhadive (1993) and Solanke *et al*. (2000) who reported significant increase in dry matter production with higher level of NPK fertilizers. At 90 DAS, significantly higher total dry matter production (263.73 g plant^{-1}) was recorded with three sprays of NAA compared to two sprays of NAA (257.14 g plant^{-1}) which inturn showed significant superiority over control (252.05 g plant^{-1}) (Table 2 and Fig. 2). Similar trend was observed at 135 DAS and at harvest. Similar results have been reported by Venkatakrishnan (1995) and Kulandaivel (2001).

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Received : February, 2010; Accepted : May, 2010