Volume : 1 | Issue : 1 | October 2011 ISSN - 2249-555X

Research Paper AGRICULTURE

EFFECT OF NAPHTHALENE ACITIC ACID ON GROWTH, YIELD ATTRIBUTES AND YIELD IN IRRIGATED BT COTTON *(Gossypium hirsutum* L.*)*

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ABSTRACT

A field experiment was conducted on Cotton Research Station, JAU, Junagadh during kharif 2010 to evaluate the impact of foliar application of the growth regulator naphthalene acetic acid (NAA) on growth, yield and yield attributes in irrigated Bt cotton. The experiment was comprised of total ten treatments with control (water spray) and laid out in randomized block design with three replications. Cotton plants were sprayed with the growth regulator NAA @ 20, 30 and 40 ppm concentrations, once 50 days after planting (DAP), or twice (50 and 70 DAP) or three times (50, 70 and 90 DAP), during the square, flowering and boll initiation stage. The results revealed that total no. of boll(56), average boll weight(4.49 g), total DMP (6.662 t/ha), seed index(9.7 g), lint index (5.8 g) and seed cotton yield (3043 kg/ha), were recorded significantly highest at harvest in spray of NAA (30 ppm) at 50 & 70 DAS as compared to control.

Keywords :- Growth regulator, lint index, seed index, squares, sympodia.

Introduction

Cotton (*Gossypium spp* L.) as "King of Fiber" is one of the most ancient and important cash crop next to food grains in India and playing a pivotal role in agriculture, industrial development and employment generation in India and national economy. Cotton is grown chiefly for its fibre, which is used in the manufacturing of cloth for mankind. Presently, India is the second largest producer of cotton in the world having the largest acreage, which is 1/$_3$rd of the world's cotton area. In India cotton is cultivated in an area of 110 lakh hectares with a production of 325 lakh bales (170 kg/bale) and an average productivity of 516 kg of lint ha^{-1} against the world average productivity of 759 kg lint ha^{-1} (Anonymous, (2010). Many attempts have been made to alter the growth habit of the crop (through mechanical and chemical means) so as to improve productivity and to bring about some more amenability for cultural manipulations. Plant growth regulators viz., promoters, play an important key role in control physiological mechanism of plant growth. Plant growth regulators are capable of increasing yield up to 10 - 15 per cent in the field conditions (Kiran Kumar, 2001). Application of NAA 40 ppm concentration twice at 45 and 60 days after sowing increased the growth, yield attributes and seed cotton yield (Srinivasan, 2004). The present investigation was conducted to study the effect of NAA on growth attribute and their relationship with seed cotton yield.

Materials and Methods

A field experiment was conducted at the Cotton Research Station, Junagadh Agricultural University, Junagadh during ***Kharif* 2010**. NHH-44 Bt hybrid was seeded on medium black soil with a spacing of 120 X 45 cm in a RBD with three replications. Cultural practices and plant protection measures were undertaken as the recommendations. The experiment consisted of following ten treatments : T_1 – NAA (20 ppm) at 50 DAS, T_2 – NAA (20 ppm) at 50 & 70 DAS, T_3 – NAA (20 ppm) at 50, 70 & 90 DAS, T_4 – NAA (30 ppm) at 50 DAS, T_5 – NAA (30 ppm) at 50 & 70 DAS, T_6 – NAA (30 ppm) at 50, 70 & 90 DAS, T_7 – NAA (40 ppm) at 50 DAS, T_8 – NAA (40 ppm) at 50 & 70 DAS, T_9 – NAA (40 ppm) at 50, 70 & 90 DAS, T_{10} – Control (water spray). The observations on growth characters, yield attributes and seed cotton yield were recorded.

Five plants from each treatment were selected randomly and tagged for recording various observations on morphological, growth, physiological parameters & yield components at periodically and at harvest. Seed cotton yield was worked out based on the mean of two cotton row's yield and expressed as Kg ha^{-1}. Statistical analysis was carried out following the procedure of Panse and Sukhat, (1985).

Results and Discussion

Growth characters

All the growth characters of cotton viz., plant height, sympodial length and dry matter production (DMP) were significantly influenced by the application of plant growth regulator 1-naphthalene acetic acid. The number of sympodia was found non significant. Application of NAA @ 30 ppm at 50 & 70 DAS significantly increased the maximum plant height in T_5 (137.33 cm) and it was at par with treatment T_2 (131.0 cm), sympodial length was found significantly maximum in T_5 (42.33 cm), it was at par with T_2 (39.50 cm) and T_8 (39.46 cm)as compare to control, total number of squares per plant was produced significantly height in T_5(106) where as dry matter production (DMP) was accumulated significantly maximum (6.662 t ha^{-1}) in T_5 and it was at par with T_6 (6.533 t ha^{-1})as compare to control(T_{10}), presented in Table 1. This was due to NAA, which mainly attributed to its physiological role in stimulation of stem elongation, cell elongation and promotion of cell division. This is in conformity with the findings of Nagabhushana et al., (1993); Pothiraj et al., (1995); Zakaria Mohamed Saawan and Ramadan Arafa Sbakr (1998); Copur, et al., (2010); Avtar and Dargan (1963).

Yield attributes and yield

Foliar application of plant growth regulator NAA significantly increased the yield attributes and seed cotton yield (table 1). The maximum number of squares plant^{-1} (42.33) was produced

significantly in the treatment T_5, where as plant retained significantly maximum number of bolls plant^{-1} (56) was found in T_5 treatment as compare to control (T_{10}). Photosynthate was transported maximum toward boll development and plant attained significantly height boll weight (4.49 g) in T_5 treatment. In case of seed index (9.7) and Lint Index (5.8) were found significantly maximum in T_5 treatment as compare to control. Cotton crop was matured near one week earlier than control (T_{10}). Lint yield (1134 kg ha^{-1}) and seed cotton yield (3043 kg ha^{-1}) were significantly registered height with the application of NAA @30 ppm at 50 & 70 DAS in treatment T_5 as compare to control T_{10}, data presented in table 1. There were no treatments differences found in case of oil percentage and oil yield, it was found non significant. Actually, such result may be attributed to the promoting effect of NAA on numerous physiological processes to attained highest seed cotton yield (Avtar and Dargan, 1963 and Tamas et al., 1972). The NAA is a growth promoter, known to enhance the production of squares and flowers and reduces the abscission of plant parts thus favorably retained more bolls plant^{-1} and diversion of higher proportion of photosynthate to reproductive organs and to the delayed senescence of leaves, which helped in increasing the photo-assimilate supply for an extended period (to reproductive sink). This is in conformity with the findings of Patel (1993); Brar et al., (2001); Murty et al., (1976); Jadhav and Kalbhor (1981) and Tamas et al., (1972).

Conclusion

Based on the results of the present study, it could be concluded that, from the economical point of view, it is recommended to apply of NAA @ 30 ppm concentration twice at 50 and 70 days after sowing during squares and boll initiation stage to realized the most efficient effects on improving yield and yield components of irrigated Bt cotton. Hence, this is considered to be a suitable agro-technique for realizing higher economic benefit by the cotton growers.

Table-1: Effects of NAA on growth characters, yield attributes and seed cotton yield.

Treatment	Plant Height (cm)	No of sympodia plant^{-1}	Sympodial Length (cm)	Total Squares plant^{-1}	No. of bolls plant^{-1}	Av. Boll wt. (g)	Oil (%)	Oil yield (kg/ha)	Seed index (g)	Lint index (g)	Days to Maturity	Cal. lint yield (Kg/ha)	Seed cotton yield (Kg/ha)	DMP (t/ha)
T_1	122.67	11.00	37.84	89	42	3.73	19.5	302.15	8.4	4.6	231	839	2387	5.041
T_2	131.00	10.87	39.50	98	49	3.94	19.4	359.60	8.9	4.8	231	1005	2859	5.273
T_3	122.00	10.93	36.00	89	40	3.88	19.3	299.71	8.3	4.6	231	857	2409	4.784
T_4	120.00	10.80	35.02	92	43	3.67	19.4	265.55	9.1	5.0	229	761	2127	4.552
T_5	137.33	12.07	42.33	106	56	4.49	19.4	371.05	9.7	5.8	230	1134	3043	6.662
T_6	119.67	11.73	37.17	88	43	3.56	19.5	309.04	9.6	5.1	230	844	2428	6.533
T_7	122.33	10.87	35.33	93	42	3.66	19.5	306.86	8.8	4.7	233	846	2422	4.810
T_8	122.33	11.60	39.46	98	48	3.25	19.4	341.22	8.7	4.8	231	970	2726	4.990
T_9	130.33	11.20	37.93	86	43	3.59	19.5	304.51	9.0	4.9	233	843	2404	5.144
T_{10}	118.67	11.67	34.73	87	41	3.55	19.5	301.88	8.8	4.7	236	818	2371	5.221
S.Em.±	3.86	0.47	1.535	4.015	3.21	0.21	0.06	22.89	0.275	0.213	1.18	58.81	173.69	0.456
CD at 5%	11.46	NS	4.561	11.929	9.53	0.62	NS	NS	0.816	0.631	3.50	174.75	516.07	1.354
CV %	5.36	7.19	7.08	7.51	12.43	9.67	0.55	12.54	5.33	7.52	0.88	11.42	11.95	11.49

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