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Original Research Article

Effect of Homobrassinolide on Morpho Physiological Traits in Upland Cotton

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A B S T R A C T

An experiment on "Effect of homobrassinolide on morpho physiological traits in upland cotton " was conducted at experimental field of Cotton Research Unit, Dr. PDKV Akola, during *kharif* season 2013 in randomized block design with Bt cotton hybrid-Ajeet-155 BG II with four treatments and five replications. Treatments comprised of T1- control, T2 - spraying of Homobrassinolide 100 ml per acre at 55 days after sowing, T3 - Homobrassinolide 150 ml /acre at 55 days after sowing and T4 -Homobrassinolide 200 ml in two split doses, i.e. 1st spray 100 ml per acre at 55 days after sowing and 2nd spray 100 ml acre 15 days after 1st spray. Results exhibited that the treatment of two split doses 1st at 55 days and spray at 65 days recorded maximum plant height (89.90cm), number of leaves(97.58/plant), leaf area (12.41dm^2/plant), sympodial branches(18.88/plant), dry matter (72.09g/plant). In respect to phenological observations, the same treatment of two split doses spray minimizes days for 50% flowering by 4 days, days to 50% boll bursting by 3 days and days to maturity by 3 days were recorded. All these physiological traits helpful to increase yield and yield attributes by the same treatment which gave seed cotton yield 50.80g/plant, seed cotton yield 1390.60 kg/ha, single boll weight (4.29 g), ginning out turn (38.11%) and harvest index (40.89%). This investigation will helpful in determination of physiological traits responsible for yield of Bt cotton hybrids. However it needs further conformity over multilocation basis.

Keywords

Growth regulator, Homobrassinolide, Morpho-physiological traits and cotton

Introduction

Cotton (*Gossypium spp* L.), family *malvaceae* is playing a vital role in the history of mankind and civilization providing basic fibre for livelihood and most important source for natural fibre. Chromosome number of cotton is 2n= 2 (*arboreum*) and 2n=52 (*hirsutum*) and is of origin was Central America.

India is the only country in the world where all the four cultivated species of cotton, viz. *G. hirsutum, G. arboreum, G. herbaceum* and *G. barbadense,* are cultivated on commercial scale, besides their hybrid combinations. The diversity of cotton cultivars and cotton agroclimatic zones in India is considerably larger as compared to other major cotton growing countries in the world. *Gossypium hirsutum* is a upland cotton, native to Central America, Mexico, the Caribbean and southern Florida, (90% of world production). *Gossypium barbadense* known as extra-long staple cotton, native to tropical South America (8% of world production) *Gossypium arboreum* tree cotton, native to India and Pakistan (less than 2%) *Gossypium*

herbaceum Levent cotton, native to southern Africa and the Arabian Peninsula (less than 2%). Cotton comprise of 49species in which *G. hirsutum, G. herbaceum, G. arborium* and *G.barbadens* are grown commercially under diverse ecosystem in India.Cotton seed contain about 15 to 20 % oil and it is used as vegetable oil and in soap industries. After extraction of oil the left over cake is very proteinitious and used as cattle feed. It is also used as manure as it contains 6.4 %N, 2.9 %P and 2.2% K, respectively.

The cotton cultivation sector not only engages around six million farmers, but also involve 40 to 50 million people relating to cotton trade and its processing. The Indian textile industry consumes a diverse range of fiberes and yarn, but is predominantly cotton based. Apart from providing one of the basic necessities of life, the textile industries also plays a pivotal role through its contribution to industrial output, employment generation and export earnings for the country.

Materials and Methods

The experiment was carried out on the experimental field of Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola located at 304.415 meter altitude, 20°30' N latitude and 72o02' longitude during *Kharif* season of 2013. Five replication and four treatment were selected for this experiment in randomized block design with one Bt cotton hybrid-Ajeet-155 BG II .The spacing between row to row was 90 cm and plant to plant is 45 cm. The gross plot size is 5.4 x4.5 m and net plot size is 4.5 x 3.6 m. The fertilizer dose applied by the plot was 60:30:30 NPKkg/ha. The treatment details were T_1- Control (No spray), T_2 - Homobrassinolide (@ 100 ml per acre) at 45-55 days after sowing, T_3- Homobrassinolide (@ 150 ml per acre) at 45- 55 days after sowing, T_4- Homobrassinolide @ 200 ml per acre in two split doses i.e. a) 1st spray 100 ml at 45-55 days after sowing b) 2nd spray 100 ml 15 after first spray.

The observations on plant height, number of leaves, leaf area, mumber sympodia per plant dry matter production (g/plant), days to 50% flowering, days to 50% boll bursting, days to maturity were recorded by the intervals 30,60,90,120 and at harvest time. The data were analyzed statistically by following standard outlined by Panse and Sukhatme (1985).

Results and Discussion

Plant height is an important morphological character in cotton which provides seat for nodes and internodes from where monopodial and sympodial branches emerges and thus it plays an important role in determining the morphological framework leading to productivity, Eaton (1955). Plant height was recorded at different intervals of growth (Table 1). The statistical difference among the treatments at 30 DAS found non significant, whereas at subsequent growth stages it remained statistically significant. All the treatment resulted in increased in plant height as the crop grows up to the harvest.

From the table 1, treatment T_4 (0.01% spray) at harvest (89.20cm) recorded. Statistically more number of plant height than the other treatment and least plant height was noted by treatment T_1 (78.90cm). The data revealed that mean number of functional leaves plant increased progressively up to 120 and decreased thereafter towards maturity because of leaf shading and senescence. At 120 DAS crop possessed maximum T_4 (97.58) mean number of leaves per plant. The assimilatory surface of plant measured in term of LA (dm2) at different intervals. It was observed that LA was less at 30 DAS and increased up to 120 DAS, then decreased

at harvest due to leaf shading and senescence. The statistical difference among the treatments at 30 DAS found non significant. The highest canopy structure was at 120 DAS observed in T4 (12.41 dm2/plant) which remained superior over the other treatments.

The data related to mean number of sympodial branches per plant as affected periodically by different treatments. Mean number of sympodial Branches per plant was progressively increased with advancement of crop age from 90 DAS up to the harvest. The treatment differences in respect of mean number of sympodial branches per plant were significant during all the growth stages of cotton. During the growth stages, average number of sympodial branches per plant at 90, 120 and at harvest were 15.88, 18.88 and 18.88 repectively. The number of sympodial branches per plant is important component of the cotton crop. The number of sympodial branches were recorded at different growth stages and expressed as mean number of sympodia per plant. The dry matter is the summation of dry matter produced by leaves, stem and of the reproductive parts (i.e. flower buds and bolls) at different stages of growth. Dry matter production of cotton increase continuously with the age of plant. At harvest maximum dry matter was synthesized by the treatment T_4 (0.1% spray). Data on seed cotton yield (g/plant), seed cotton yield/ha, single boll weight (g), ginning out turn (%), harvest index (%) as influenced by different treatments are presented in table 2. It is observed from the table 2 That the mean seed cotton yield (g/plant), seed cotton /ha, single boll weight (g), ginning out turn (%), harvest index(%) were 46.35, 1292.17, 4.1, 35.27, 39.61respectively.

In respect of phenological observation, the days to 50% flowering character differ non significantly. The minimum days required for the treatment T_4 (0.01%spray) (65.84). The treatment differences found significant for 50% boll bursting. The lowest days for the treatment T4 (117.62 days) which leads earliness in respect of 50% boll bursting. The data on days to maturity differ significantly among each other. The lowest days required for maturity to the treatment T4 (162.20 days) may be the effect of growth regulator i.e. HBR. The growth regulator like homobrassinolide alters the physiological cell elongation which affects the physiological maturity giving striggering effects. However, the present findings needs further confirmation on multiplication basis.

In conclusion, the treatment T4 (HBR 200ml) in two split doses increased the plant height (89.20 cm) among all the treatments at harvest, whereas control noted (78.90 cm)**.**Have maximum number of leaves (97.58) than the other treatments. The remaining treatment were T3,T2, T1 beared 87.12, 87.20, 76.76 number of leaves/plant, respectively, recorded maximum leaf area (12.41dm2/plant). The number of sympodial branches recorded more in treatments T4 (HBR 200 ml) (18.88). At harvest the treatments T4 (HBR 200 ml) exhibited higher dry matter production (72.09 g/plant) as compared to other treatments. In respect of phenological observations the minimum days required for 50% flowering was (65.84 days), the miminum days required for 50% boll bursting (117.62 days), the minimum days for maturity was (162.20 days) was recorded in the treatment T_4 (HBR 200 ml) spray as comparing the other treatments. Significantly maximum seed cotton yield (50.80 g/plant), seed cotton yield (13.90.60 kg/ha), single boll weight (4.29 g), ginning out turn (38.11%), harvest index (40.89%) resulted good seed cotton yield under rainfed condition (Table 3–8).

Table.1 Effect of growth regulator- Homobrassinolide on plant height (cm) at different growth stages in Ajeet-155 BGII, Bt. Cotton

Treatment (s)	Days after Sowing				
	30	**60**	**90**	**120**	**At harvest**
T_1 - Control	17.59	50.54	70.06	78.52	78.90
T_2 - 0.05% HBR	19.10	54.45	72.56	76.64	80.00
T_3 - 0.075% HBR	19.14	53.23	73.28	81.49	85.90
T_4 - 0.1% HBR	19.52	56.32	75.32	84.86	89.20
Mean	26.89	65.31	89.61	96.96	100.81
S.E.(m)±	0.601	1.263	0.880	1.689	0.653
CD at 5%	N.S.	3.726	2.594	4.983	1.927

Table.2 Effect of growth regulator Homobrassinolide on number of leaves /plant at different growth stages in Ajeet -155 BGII, Bt. Cotton

	Days after sowing			
Treatment(s)	**30**	**60**	**90**	**120**
T_1 - Control	5.40	25.32	59.28	76.76
T_2 - 0.05% HBR	5.74	25.44	69.20	87.20
T_3 - 0.075% HBR	5.78	25.76	67.48	87.12
T_4 - 0.1% HBR	5.84	28.86	69.04	97.58
Mean	5.690	26.345	66.250	86.115
S.E.(m)±	0.274	0.779	2.363	1.972
CD at 5%	N.S.	2.298	6.970	5.817

Table.3 Effect of growth regulator - Homobrassinolide on leaf area (dm^2/plant) at different growth stages in Ajeet-155 BGII, Bt. Cotton

	Days after sowing			
Treatment(s)	**30**	**60**	**90**	**120**
T_1 - Control	1.56	3.49	7.30	10.47
T_2 - 0.05% HBR	1.74	3.98	8.77	10.84
T_3 - 0.075% HBR	1.83	4.38	8.87	11.37
T_4 - 0.1% HBR	1.77	4.41	9.27	12.41
Mean	1.747	4.064	8.549	11.275
S.E.(m) ±	0.160	0.163	0.456	0.338
CD at 5%	N.S.	0.480	1.344	0.996

Table.4 Effect of growth regulator-Homobrassinolide on number of sympodia/plant at different growth stages in Ajeet-155 BG II, Bt. Cotton

Treatment(s)	Days after sowing			
	60	90	120	Harvest
T_1 - Control	7.80	14.36	15.08	16.76
T_2 - 0.05% HBR	8.02	15.76	16.88	17.14
T_3 - 0.075% HBR	8.12	15.76	17.12	17.68
T_4 - 0.1% HBR	8.42	15.88	18.88	18.88
Mean	8.090	15.440	16.990	17.465
S.E.(m)±	0.107	0.335	0.779	0.279
C.D at 5 %	N.S.	0.988	2.299	0.824

Table.5 Effect of growth regulator- Homobrassinolide on days to 50% flowering, 50% boll bursting and maturity in Ajeet-155 BG II, Bt. Cotton

Treatment	Days to 50% flowering	Days to 50% boll bursting	Days to maturity
T_1 - Control	68.90	120.85	165.60
T_2 - 0.05% HBR	66.52	118.98	163.40
T_3 - 0.075% HBR	67.11	119.58	164.20
T_4 - 0.1% HBR	65.84	117.62	162.20
Mean	67.093	119.59	164.35
SE(m)±	0.730	0.335	1.900
CD at 5%	N.S.	0.988	1.805

Table.6 Effect of growth regulator- Homobrassinolide on days, 50% boll bursting and maturity in Ajeet-155 BG II, Bt. Cotton

Treatment	Days to 50% flowering	Days to 50% boll bursting	Days to maturity
T_1 - Control	68.90	120.85	165.60
T_2 - 0.05% HBR	66.52	118.98	163.40
T_3 - 0.075% HBR	67.11	119.58	164.20
T_4 - 0.1% HBR	65.84	117.62	162.20
Mean	67.093	119.59	164.35
SE(m)±	0.730	0.335	1.900
CD at 5%	N.S.	0.988	1.805

Table.7 Effect of growth regulator-Homobrassinolide on dry matter production (g/plant) at different stages in Ajeet-155 BG II, Bt. Cotton

Treatment(s)	Days after sowing				
	30	60	90	120	At harvest
T_1 - Control	1.70	17.15	26.37	50.78	60.67
T_2 - 0.05% HBR	1.73	18.29	28.56	52.19	63.99
T_3 - 0.075% HBR	1.66	20.09	28.78	55.34	67.68
T_4 - 0.1% HBR	1.89	21.73	32.73	59.46	72.09
Mean	1.747	19.313	29.108	54.44	66.109
SE (m) ±	0.063	0.363	0.301	0.819	0.548
CD at 5%	N.S.	1.071	0.886	2.415	1.617

Table.8 Effect of growth regulator-Homobrassinolide on seed cotton yield and its atteibutes at harvest different stages in Ajeet-155 BG II, Bt. Cotton

Treatments	Seed cotton yield (g/plant)	Seed cotton per yield /ha	Single boll weight (g)	Ginning out turn (%)	Harvest index (%)
T_1 - Control	35.60	1086.30	3.71	33.14	38.35
T_2 - 0.05% HBR	48.40	1366.60	4.27	34.34	38.46
T_3 - 0.075% HBR	50.60	1325.80	4.13	35.49	40.77
T_4 - 0.1% HBR	50.80	1390.60	4.29	38.11	40.89
Mean	46.350	1292.17	4.100	35.271	39.617
SE±	3.91	77.78	0.10	0.569	1.474
CD at 5%	11.53	229.52	0.31	1.677	N.S.

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