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Response of Plant Growth Regulator on Yield Attributes of Cotton

B. ASHOK PRAVIN KUMAR*, R. POONGUZHALAN AND K. JEEVANKUMAR

Department of Agronomy, Pandit Jawaharlal Nehru College of Agriculture Karaikal

**email: ashokpravin28@gmail.com*

ABSTRACT

A field experiment was conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, during 2012 to study the effect of plant growth regulators on yield attributes of cotton. The trail was laid out in randomized block design with three replications. The highest sympodia plant^{-1} was recorded with application of triacontanol 5 ppm. The highest number of bolls plant^{-1} (12.7 and 14.3) and fruiting points plant^{-1} (19.7 and 26.9) were recorded with application of triacontanol 5 ppm at 75 and 90 DAS. Among the different plant growth regulators, application of NAA 25 or 50 ppm recorded the least number of bolls and fruiting points plant^{-1}.

Key words *Plant growth regulators, cotton, yield.*

Cotton (*Gossypium hirsutum* L.), the king of fibre crops it can also called as white gold in textile industry. Growth is organized, well co-ordinated complex process where metabolism provides the energy and the building blocks. Several attempts have been made to increase the yield potential of cotton crops, but they are primarily concerned with the use of chemical fertilizers. Almost negligible attention has been given to the basic physiological process, which limit the crop productivity. However, it is the relative hormone level that regulates the pace of growth of each individual plant parts, to produce a form that is recognized as a plant. Plant growth regulators are increasingly being employed to modify the physiological processes in the plant leading to enhanced production of crops.

According to Nickele (1978), the plant growth regulators are new chemicals and are expected to play an important role in overcoming the hurdles in mainfestation of biological yield even in crops. Plant growth regulators are the substances when added in small amounts modify the growth of plant usually by stimulating or inhibiting a part of natural growth regulation. These are considered as new generation agro-chemicals after fertilizers, pesticides and herbicides. The plant growth regulators serve as highly influential agents by which growth is regulated, both in time during ontogeny and in space at any point of time. Hence, there is an urgent need to study the effect of plant growth regulator on cotton.

MATERIALS AND METHODS

A field experiment was conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, during 2012 (feb-july) to study the effect of plant growth regulators on yield attributes of cotton. The soil at the site of trail is sandy clay with good drainage. The fertility status of soil was low in available nitrogen and medium in available phosphorus and potassium respectively. The trail was laid out in randomized block design with three replications. Each treatment was accommodated with 29.7 m^2. The crop sprayed with different growth regulators such as NAA at concentration of 25 and 50 ppm, Triacontanol 5.0 and 7.5 ppm, brassinosteroids 0.1 and 0.2 ppm, GA_3 10 ppm + NAA 20 ppm + BA 10 ppm . These plant growth regulators were sprayed twice at 60 and 75 DAS using a hand operated knapsack sprayer

RESULTS AND DISCUSSION

Yield components

Sympodia plant^{-1}

The data on number of sympodia plant^{-1} as influenced by plant growth regulators is presented in Table 1. The plant growth regulators did not significantly influence the sympodia plant^{-1} at 60 DAS. However, at 75 and 90 DAS the sympodia plant^{-1} was significantly influenced by plant growth regulators.

The highest sympodia plant^{-1} (8.6 and 10.4 at 75 and 90 DAS, respectively) was recorded with application of triacontanol 5 ppm and was comparable with spraying GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (7.9 and 10.0 at 75 and 90 DAS, respectively). The least number of sympodia plant^{-1} was recorded in control. Increase in number of sympodia plant^{-1} due to application of triacontanol (Khafaga, 1982).

Table 1. Influence of plant growth regulators on number of sympodia plant^{-1} at different growth stages

Treatments	60 DAS	75 DAS	90 DAS
T_1: Control	5.4	5.7	7.8
T_2: NAA 25 ppm	5.7	6.3	8.3
T_3: NAA 50 ppm	6.1	6.8	8.5
T_4: Triacontanol 5 ppm	6.3	8.6	10.4
T_5: Triacontanol 7.5 ppm	6.2	7.4	9.1
T_6: Brassinosteroids 0.1 ppm	5.4	7.8	9.6
T_7: Brassinosteroids 0.2 ppm	5.6	7.3	8.9
T_8: GA_3 10 ppm +NAA 20 ppm + BA 10 ppm	5.7	7.9	10.0
S.Ed	0.5	0.4	0.3
C.D (p = 0.05)	NS	0.9	0.7

Number of bolls plant^{-1}

The data on number of bolls plant^{-1} recorded at different growth stages as influenced by foliar application of plant growth regulators is presented in Table 2.

The number of bolls plant^{-1} varied significantly among the plant growth regulators at all the stages of growth except at 60 DAS. The highest number of bolls plant^{-1} (12.7 and 14.3) was recorded with application of triacontanol 5 ppm at 75 and 90 DAS which remained on par with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (12.3), brassinosteroids 0.1 ppm (11.5), triacontanol 7.5 ppm (10.5) and brassinosteroids 0.2 ppm (10.3) at 75 DAS and with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (14.1), brassinosteroids 0.1 ppm (13.1), triacontanol 7.5 ppm (12.7), brassinosteroids 0.2 ppm (12.6) and NAA 50 ppm (12.4) at 90 DAS. The control treatment registered the least number of bolls per plant^{-1} (8.5 and 10.1 at 75 and 90 DAS, respectively). Pothiraj *et al.* (1995a) and Goyal *et al.* (1998) were also of the opinion that application of triacontanol enhanced the number of bolls plant^{-1}

Table 2. Influence of plant growth regulators on number of bolls plant^{-1} at different growth stages

Treatments	60 DAS	75 DAS	90 DAS
T_1: Control	8.0	8.5	10.1
T_2: NAA 25 ppm	7.8	9.1	11.8
T_3: NAA 50 ppm	8.1	9.7	12.4
T_4: Triacontanol 5 ppm	8.9	12.7	14.3
T_5: Triacontanol 7.5 ppm	8.6	10.5	12.7
T_6: Brassinosteroids 0.1 ppm	8.9	11.5	13.1
T_7: Brassinosteroids 0.2 ppm	8.7	10.3	12.6
T_8: GA_3 10 ppm +NAA 20 ppm + BA 10 ppm	8.7	12.3	14.1
S.Ed	0.9	1.2	1.0
C.D (p = 0.05)	NS	2.6	2.1

Fruiting points plant^{-1}

The data on number of fruiting points plant^{-1} recorded at different growth stages as influenced by foliar application of plant growth regulators is presented in Table 3.

Table 3. Influence of plant growth regulators on number of fruiting points plant^{-1} at different growth stages

Treatments	60 DAS	75 DAS	90 DAS
T_1: Control	12.1	13.3	19.3
T_2: NAA 25 ppm	12.0	13.4	21.6
T_3: NAA 50 ppm	12.1	14.2	21.8
T_4: Triacontanol 5 ppm	12.9	19.7	26.9
T_5: Triacontanol 7.5 ppm	12.8	14.9	23.8
T_6: Brassinosteroids 0.1 ppm	13.4	17.1	24.5
T_7: Brassinosteroids 0.2 ppm	12.7	15.0	23.0
T_8: GA_3 10 ppm +NAA 20 ppm + BA 10 ppm	12.9	17.4	26.3
S.Ed	0.9	1.0	1.9
C.D (p = 0.05)	NS	2.2	4.0

The plant growth regulators did not significantly influence the number of fruiting points plant^{-1} at 60 DAS. However, at 75 and 90 DAS the number of fruiting points plant^{-1} significantly varied due to application of plant growth regulators. The highest number of fruiting points plant^{-1} (19.7 and 26.9) was recorded with application of triacontanol 5 ppm at 75 and 90 DAS. However, it was comparable with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (17.4) and brassinosteroids 0.1 ppm (17.1) at 75 DAS and with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (26.3), brassinosteroids 0.1 ppm (24.5), triacontanol 7.5 ppm (23.8) and brassinosteroids 0.2 ppm (23.0) at 90 DAS. Application of NAA either at 25 or 50 ppm recorded significantly lesser number of fruiting points^{-1} as compared to other growth regulators at 90 DAS. The lowest number of fruiting points plant^{-1} (13.3 and 19.3) was recorded in control at 75 and 90 DAS.

Boll setting percentage

The data on boll setting percentage at various stages as influenced by plant growth regulators are presented in Table 4.

The boll setting percentage was not significantly influenced by plant growth regulators throughout the crop growth period. However, the highest boll setting percentage (97.8) was recorded with application of triacontanol 7.5 ppm at 60 DAS, with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (71.4) at 75 DAS and with application of NAA 50 ppm (57.5) at 90 DAS. The lowest boll setting percentage was recorded in control throughout the crop growth period.

Table 4. Influence of plant growth regulators on boll setting percentage at different growth stages

Treatments	60 DAS	75 DAS	90 DAS
T_1: Control	66.5	63.9	52.5
T_2: NAA 25 ppm	65.3	68.2	55.4
T_3: NAA 50 ppm	67.9	68.3	57.5
T_4: Triacontanol 5 ppm	68.8	64.5	53.8
T_5: Triacontanol 7.5 ppm	97.8	70.9	53.7
T_6: Brassinosteroids 0.1 ppm	67.5	67.2	53.8
T_7: Brassinosteroids 0.2 ppm	68.9	68.7	55.8
T_8: GA_3 10 ppm +NAA 20 ppm + BA 10 ppm	69.5	71.4	52.7
S.Ed	10.2	8.9	7.7
C.D (p = 0.05)	NS	NS	NS

Boll weight (g)

The data on boll weight at different growth stages as influenced by foliar application of plant growth regulators is presented in Table 5.

The plant growth regulators did not significantly influence the boll weight throughout the crop growth period. However, higher boll weight (1.48 g) was recorded with triacontanol 5 ppm at 60 DAS and with GA_3 10 ppm + NAA 20 ppm + BA 10 ppm (1.91 and 1.62 at 75 and 90 DAS, respectively). The lowest boll weight (1.38 to 1.48 g) was recorded in control.

Table 5. Influence of plant growth regulators on boll weight (g) at different growth stages

Treatments	60 DAS	75 DAS	90 DAS
T_1: Control	1.38	1.48	1.47
T_2: NAA 25 ppm	1.42	1.72	1.55
T_3: NAA 50 ppm	1.43	1.85	1.58
T_4: Triacontanol 5 ppm	1.48	1.86	1.60
T_5: Triacontanol 7.5 ppm	1.45	1.72	1.54
T_6: Brassinosteroids 0.1 ppm	1.42	1.70	1.62
T_7: Brassinosteroids 0.2 ppm	1.45	1.69	1.58
T_8: GA_3 10 ppm +NAA 20 ppm + BA 10 ppm	1.46	1.91	1.62
S.Ed	0.10	0.31	0.7
C.D (p = 0.05)	NS	NS	NS

CONCLUSION

The highest sympodia plant^{-1} was recorded with application of triacontanol 5 ppm. The highest number of bolls plant^{-1} (12.7 and 14.3) and fruiting points plant^{-1} (19.7 and 26.9) were recorded with application of triacontanol 5 ppm at 75 and 90 DAS. Among the different plant growth regulators, application of NAA 25 or 50 ppm recorded the least number of bolls and fruiting points plant^{-1}.

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