

COMPARATIVE RESPONSE OF TWO VARIETIES OF COTTON (*GOSSYPIUM HIRSUTUM* L.) TO NAA AND IAA APPLICATION

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A field trial was conducted to study the comparative response of two varieties of cotton i.e. B-557 and LH-62 to NAA and IAA foliar applications, alone as well as in combination, sprayed once and twice 30 and 55 days after sowing. In both the varieties, a significant increase was observed by hormones in various parameters like height of plant, number of branches, number of seeds per boll, 100-seed weight and seed cotton yield. NAA proved more effective than IAA and their combination while double spray yielded better results than single spray. Both the varieties responded differently to the two hormones and differed significantly from each other for days taken to flowering and boll formation. Comparatively B-557 exhibited less shedding than LH-62 after hormone application.

INTRODUCTION

Cotton yield can be increased to a great extent if shedding of flowers and bolls is prevented or minimized. Since the discovery of IAA, the use of growth hormones has become a common feature of modern agriculture. IAA can share its effectiveness with chemicals like NAA and can cause an increase in yield. The proper amount, time and method of application of these hormones have been found to be of great significance in various crops. The foliar spray of 0.5 % IAA increased seed cotton yield as observed by Prokof and Rasulov (1976). Chowdappan *et al.* (1979) observed that 20 ppm and 30 ppm NAA increased the number of bolls per plant in cotton cultivar MCU-8. As regards the time of application, Khan and Hanif (1980) recorded that one to three sprays of 20 ppm NAA from 15th July to 30th August resulted in maximum seed cotton yield.

Different varieties of a crop may respond differently to these hormones due to differences in genetic make up. Mote *et al.* (1975) observed that when *Capiscum annum* L. was sprayed with NAA, flower drop was controlled in all

varieties except Dharmabad. Okelana and Adedipe (1982) reported that GA_3 increased the number of floral buds in Adzuki and Ife brown cultivars of cow pea, but had no such effect in New Era cultivar. Keeping in view this situation, the present studies were undertaken to compare the response of two varieties of cotton to NAA and IAA foliar spray, alone as well as in combination applied at two stages of growth.

MATERIALS AND METHODS

These studies were undertaken at the experimental area of University of Agriculture, Faisalabad, during the year 1983-84. The experiment was conducted in a split plot design having nine treatments with three replicates. Two cotton varieties namely B-557 and LH-62 were sown with a single row cotton drill, keeping a row to row distance of one meter. Thinning was done two weeks after germination to maintain a plant to plant distance of 30 cms. Irrigation and other cultural practices were carried out according to the approved schedule. The soil of the field was clay-loam and no fertilizer was added. 10 ppm NAA and 20 ppm IAA alone as well as in combination were applied once or twice as foliar spray with a hand power sprayer, 30 and 55 days after sowing of crop. The data regarding the flowers and bolls were recorded after every fortnight while the data for the other characteristics were taken at the maturity of the crop. Leaf area of two leaves present at the fifth and sixth nodes of plant was measured with an electric leaf area meter. All these data were subjected to statistical analysis and treatment effects were compared by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Data in Table I indicate that cotton plants responded well to hormone application in building up leaf area and an enhancement was observed in various treatments ranging from 12.17 to 30.47% over control. Maximum leaf area was observed by IAA application. The differences within the two varieties and the treatment X variety interaction were non-significant. Plant height and number of branches per plant increased by hormones but both the varieties exhibited non-significant difference.

All the treated plants showed early flowering and boll formation, but the two varieties differed significantly in days taken to flowering. LH-62 showed

Table 1. Treatment and varietal comparison in cotton after hormone application

| Characteristics | T ₀ | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ | T ₆ | T ₇ | T ₈ | T ₉ | T ₁₀ |
|-----------------------------------|---------------------|----------------------|---------------------|----------------------|----------------------|-------------------------|----------------------------|-------------------------------|----------------------------------|-------------------------------------|----------------------------------------|
| | Control | 1st-30 days | 1st-30+35 days | 1st-30+35+40 days | 1st-30+35+40+45 days | 1st-30+35+40+45+50 days | 1st-30+35+40+45+50+55 days | 1st-30+35+40+45+50+55+60 days | 1st-30+35+40+45+50+55+60+65 days | 1st-30+35+40+45+50+55+60+65+70 days | 1st-30+35+40+45+50+55+60+65+70+75 days |
| Height of the plant (cm) | 147.73 ^a | 176.03 ^{ab} | 183.76 ^a | 166.65 ^{ab} | 178.59 ^{ab} | 186.11 ^{ab} | 174.79 ^{ab} | 176.17 ^{ab} | 177.74 ^{bc} | 174.70 ^a | 169.27 ^a |
| Number of branches per plant | 30.27 ^b | 40.76 ^a | 40.46 ^a | 38.16 ^a | 38.36 ^a | 40.60 ^a | 36.06 ^{ab} | 37.96 ^{ab} | 35.96 ^{ab} | 37.23 ^a | 37.70 ^a |
| Leaf Area (cm ²) | 112.57 ^a | 143.69 ^a | 134.92 ^a | 134.78 ^a | 140.26 ^a | 141.68 ^a | 137.15 ^a | 137.27 ^a | 128.88 ^a | 128.73 ^a | 122.71 ^a |
| Days taken to flowering | 69.75 ^a | 62.60 ^b | 64.28 ^b | 64.30 ^b | 62.03 ^b | 63.86 ^b | 62.26 ^b | 63.43 ^b | 64.68 ^b | 67.20 ^a | 67.70 ^b |
| Days taken to boll formation | 74.08 ^a | 68.66 ^b | 69.40 ^b | 69.43 ^b | 66.73 ^b | 68.63 ^b | 67.26 ^b | 70.23 ^b | 69.16 ^b | 72.36 ^a | 66.30 ^b |
| Days taken to opening of bolls | 105.37 ^a | 97.76 ^{cd} | 97.65 ^{bc} | 96.53 ^{cd} | 95.76 ^{cd} | 94.80 ^d | 96.54 ^{cd} | 96.66 ^{cd} | 102.46 ^{de} | 97.22 ^a | 102.32 ^b |
| Mean number of flowers per plant | 5.90 ^a | 9.45 ^{cd} | 8.05 ^b | 8.65 ^b | 8.35 ^b | 9.14 ^a | 8.20 ^a | 7.35 ^b | 6.73 ^{bc} | 6.90 ^a | 6.90 ^a |
| Maximum number of bolls per plant | 46.60 ^a | 71.66 ^c | 65.85 ^{bc} | 52.30 ^{de} | 62.35 ^{bc} | 65.82 ^{bc} | 53.63 ^{de} | 55.44 ^{de} | 56.05 ^{de} | 78.53 ^a | 70.37 ^a |
| Number of seed per boll | 29.06 ^a | 30.23 ^a | 30.33 ^a | 28.63 ^a | 27.79 ^a | 27.43 ^a | 27.73 ^a | 29.80 ^a | 28.76 ^a | 29.67 ^a | 30.14 ^a |
| 100-Seed weight (gms) | 6.30 ^a | 6.18 ^a | 7.86 ^b | 6.20 ^a | 7.51 ^a | 8.03 ^a | 7.26 ^{ab} | 7.48 ^a | 7.46 ^a | 7.37 ^a | 7.73 ^a |
| Seed cotton yield per plant (gms) | 48.70 ^a | 56.58 ^a | 60.93 ^a | 51.78 ^a | 53.02 ^a | 57.55 ^a | 48.08 ^a | 49.17 ^a | 52.73 ^a | 49.68 ^a | 47.79 ^a |

Any two means differing were letters are non-significant.

early flowering (61.10 days) as compared to B-557 which flowered 67.30 days after sowing. This varietal difference may be attributed to their genetic potential. Early flowering by IAA or NAA application has been observed by numerous workers in different crops (Pain and Sarkar, 1979; Tabbakh *et al.* 1982).

An increase was observed in number of flowers and bolls by hormone application for which the treatments as well as the two varieties differed from one another. In both varieties maximum increase in number of bolls was recorded by hormone sprayed twice 30 and 55 days after sowing but the two varieties responded differently to the two hormones. Enhancement in number of flowers and bolls occurred with NAA in B-557 and with IAA in variety LH-62. Maximum number of flowers in B-557 was 8.9 and bolls 73.53 while the corresponding values in control were 5.00 and 44.60, respectively. LH-62 had highest number of flowers as 9.90 and bolls 70.00 as compared to 6.80 flowers and 48.60 bolls in untreated plants. Okelana and Adedipe (1982) after recording differences in the behaviour of various cultivars of *Vigna unguiculata* L. concluded that some cultivars benefitted better than the other from a particular hormone at a specific concentration. Enhancement of flowers and bolls could be brought about through stimulation of cell division (Miller *et al.* 1956) at the point of induction of bud primordia, or by retention of more floral buds or retention of floral bud shedding. Comparatively B-557 showed less shedding as these plants developed lesser number of flowers than LH-62 but developed greater number of bolls. Mote *et al.* (1975) reported varietal difference for shedding when they found that NAA controlled flower drop in three varieties of *Capsicum annum* L. but not in Dharmabad variety. Due to genetical differences the plant species respond differently for flowering. As regards time interval, different dates showed different number of bolls per plant. Maximum number of bolls in both varieties was observed on 8th December. Non-significant increase in number of seeds per boll was observed with in the varieties and treatments on the whole, but the interaction between the varieties and treatments was significant. It means that different varieties responded differently to the exogenous hormones. Number of seeds per boll differed non-significantly within different treatments of B-557 while in LH-62 this difference was significant. An increase was observed in all treatments but IAA applied twice caused comparatively greater increase. Increase in number and size of seeds is also of importance due to their commercial use. Application of NAA and IAA caused an increase in 100 seed weight. Maximum

weight of 8.18 gms. was observed in NAA treatment. Both the varieties differed non-significantly in 100-seed weight. Dua and Bhardwaj (1978) concluded that regulatory role of growth substances on grain yield in wheat is exerted via their influence on grain setting or the ability of the grain to grow in weight. Increase in seed cotton yield by hormone spray ranged from 0.57 to 25.05 % and was significant within different treatments. Double spray of both the hormone proved comparatively more successful than single spray. Maximum increase was recorded by NAA treatments followed by IAA and IAA + NAA respectively. Similarly Dey (1980) reported that increase in yield of rice was greater due to NAA application as compared to IAA. Both varieties differed non-significantly for seed cotton yield per plant, being 49.63 gm and 47.79 gm. in B-557 and LH-62, respectively.

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