GROWTH, FLOWERING, YIELD AND QUALITY OF COTTON AS FFECTED BY TREATING COTTON SEED AND PLANT WITH SOME GROWTH REGULATORS

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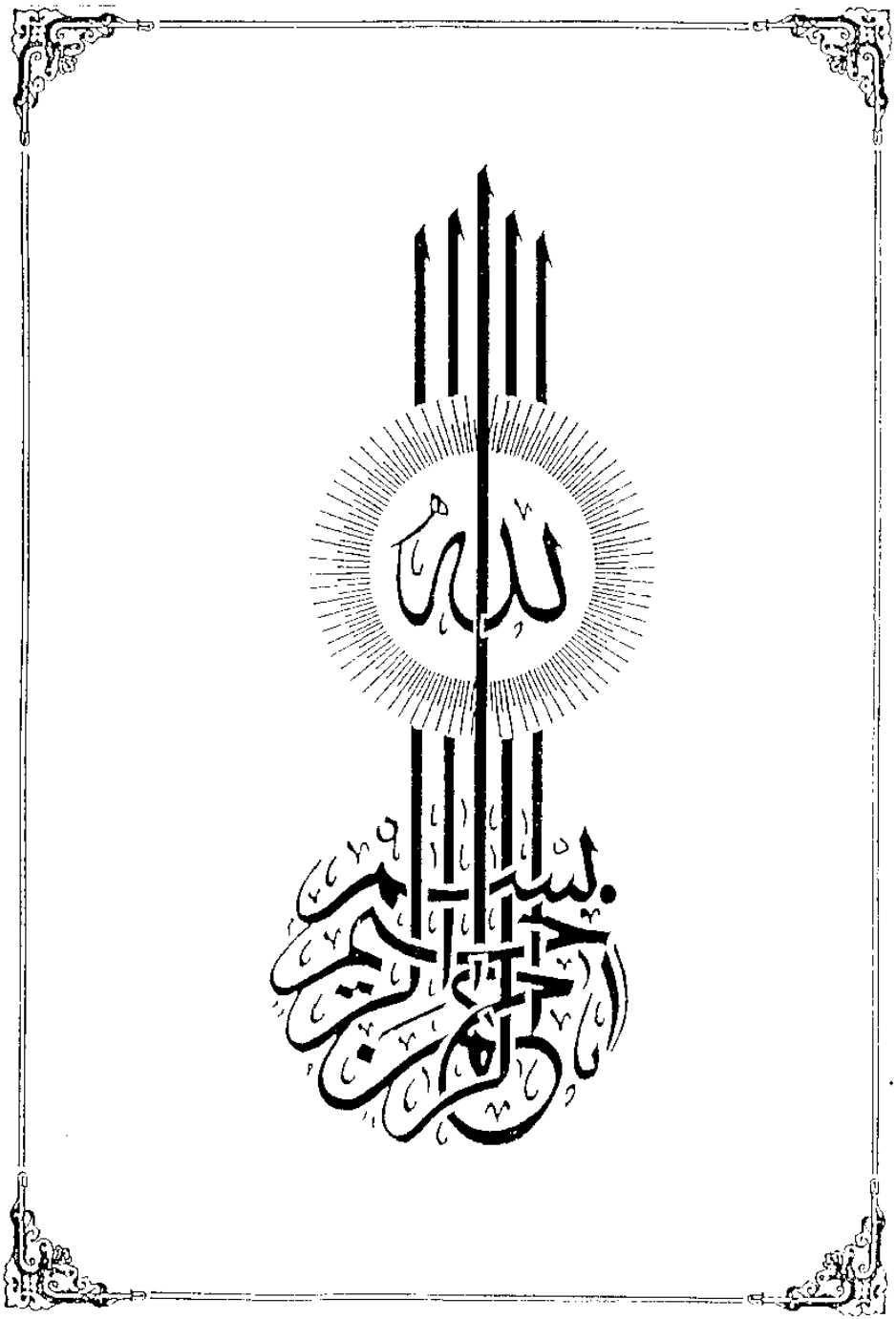

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INTRODUCTION

Cotton is considered an important source of textile fibre crop all over the world. Although the compitition of made man fibre, the man preferable cotton textile according to its characteristics. In Egypt cotton still backbon of our national economy because it is considered a main source of foreign exchange. Cotton consider a chief earnings for many peoples and factories. The total annual production of cotton amounts to about 10 million kentars. Egyptian cotton presented longest cotton fibre length at all the world although another source of compition coming from foreign high quality cottons.

Growth regulating substances have assumed an important role in the culture of plants during the last years. Some of these regulators such as auxins, gibberellins, kinens, morphactins and phenols modify many physiological processes which influenced by enviromental conditions by application of a wide variety of exogenous application.

The experiments which made to study the effects of auxins broadened the basis of our knowledge of auxins, for it brought to light the fact that the auxins control many activities of the life of plants.

During the last few years many reports have been developed which indicated that many plant species respond to gibberellin treatments. The effects of GA_3 and GA_{4-7} exerts on many phenomena, such as stem elongation, flowering, the modification

of responses to environmental factors. Although gibberellins similar to auxin in cell-extension character they are quite different. For example, auxin inhibit root growth, gibberellins have little effect, auxins suppress growth of lateral buds in shoots from which the apical bud has been removed, gibberellins encourage the growth of such laterals; auxins stimulate production of adventitions roots on stem cuttings, gibberellins inhibit rooting.

So, this work was design to study the effect of GA_3, GA_{4-7} and I.A.A. on growth, flowering, yield and cotton fibre properties of cotton plant. Due consideration was given to the effect of soaking seeds or spraying plants with different concentrations for different periods on the quality of cotton plants.

REVIEW OF LITERATURE

For the diversity of the work performed on the effect of different growth regulators on the growth, flowering, yield and fibre properties of cotton plants, the review has been discussed under the following headings:-

I. Effect of Gibberellins: Giberellic acid (GA_3) and Gibberellin A_{4-7} (GA_{4-7})

II. Effect of auxins : Indole-3-acetic acid (I.A.A.)

I. Effect of GA_3 and GA_{4-7}

1. Effect on emergence and growth:

Lots of cotton seed were submerged in solutions of 0, 50, 100 and 200 ppm of GA for 24 hrs. and for 30 minutes before planting. Other seed lots were sprayed with solutions of 0, 100, 500 and 1000 ppm of GA_3. Bradford and Ewing (1958) found that all methods of seed treatment resulted insignificant reductions in stand and significant increases in seedling height and length and width of cotyledons. Newly emerged cotton seedlings were sprayed with solutions of 0, 25, 50, 100, 200 and 500 ppm of GA using just enough solution to wet the seedlings. Increases occurred in seedling height, length and width of cotyledons and length of first internode. Decreases occurred in length and width of second leaves.

In preliminary greenhouse experiments, 25 gm lots underlined seed were treated with 10 mgm. of GA with 1 gm. of carbon powder and similar quantities of acid delinted seed were soaked for 5 minutes in 50 ml. of a 2.5 per cent aqueous solution of methyl cellulose containing 10 mg. of GA and allowed to become air dry before planting. Ergle and Bird (1958) show that the seed planted in sand showed no effect of GA on germination or time of emergence, but an increase in seedling height and stem dry weight. GA appeared to inhibit growth of seed planted in loam. A comparable rate had no effect on emergance and stimulated early growth of seed sown in sand in the greenhouse, but not of seed sown in loam.

They also (1961) in laboratory tests of GA_3 as a seed treatment on twelve cotton varieties which differed significantly in rate of seedling emergence and seedling height, found that the response of the cotton varieties to potassium gibberelate at rates equivalant to 0, 1 and 10 grams of GA_3 per 100 lb. of acid delinted seed increased emergence significantly up to the fifth day compared with emergence of the controls, but no response was evident from the sixth through the eleventh day. GA_3 also increased seedling height significantly, the taller varieties responding most. The treatment-variety interaction for height was significant, indicating that varieties vary in their response to GA_3.

Bukovac, and Wittwer, (1959), reported that gibberellin GA_4 is much more active in inducing stem-extension than gibberellic acid.

Dransfield (1961) reported that when applied GA to cotton seed did not affect dormancy breaking, resulted in cell elongation in the hypocotyls and increased seedling height, cotyledon and leaf length. When GA was applied as a spray of 0, 1, 10, 25, 50 and 100 ppm to 8 to 43 day old cotton seedlings similar responses were obtained, plus increases in length of the lower internodes, in fresh weight of aerial parts, but root weight, stem diameter and the length of upper internodes were reduced.

Agakisiev (1962, 63, 64) found that when cotton plant, var 213, grown on saline and non-saline soils were sprayed with 50 mg. GA/L. the treatment stimulated growth and caused elongation of the internodes of the stems. In tests on non-saline soils, GA did not affect times of development of the plants. The amounts of water-soluble substances and chlorophyll in the leaves were reduced. The leaves of treated plants grown under saline conditions were normal in colour. The highly hydrophilic mature of the colloids of the leaf plasm, a condition which is associated with saline soils apparently serves as a protection against the action of GA on chlorophyll.

Jackson and Fadda (1962) reported that GA_3 at up to 500

ug/plant applied to the upper leaves of G. barbadense var. XLI initially increased internode length.

Mathur and Mittal (1964) reported that 5 weeks-old plant of Gossypium hirsutum cv. H 14 were sprayed with GA at 50, 100, 150 and 200 mg/L. just before anthesis. Plants given the 2 highest concentrations were taller than the controls.

In an experiment conducted by Said et al (1965) to study the effects of soaking cotton seeds in gibberellic acid solutions at different concentrations, i.e. 0, 10, 100 ppm for 24 hrs. and then planted out of doors in pots, found that GA_3 treatments reduced plant height, number of leaves per plant, fresh and dry weights of both shoots and roots. Plants previously treated with 10 ppm GA_3 showed temporary recovery at 10-weeks-stage.

Blesa and Gomez (1966) recorded that the pre-soaking cotton seeds with GA at 0.5 - 20 ppm for 1.5, 3 and 6 hrs., treatment for 1.5 hrs. stimulated root growth, treatment for 6 hrs. slightly stimulated it but treatment for 3 hrs. inhibited it. The GA_3 concentrations required to stimulate root growth decreased with age, indicating that seedlings control their response to exogenous GA through endogenous production, or activation of auxins.

A series of seed treatment trials was carried out by Bygott (1965) in the laboratory and under field conditions to stimulate earlier emergence of seedlings under soil temperature. While gibberellic acid hastened emergence significantly, it has the undesirable effect of producing a spindly type of plant and reducing total emergence.

Borris and Heinrich (1967) found that the influence of several gibberellins was investigated on the germination of seed from a variety of plants. The stimulation of germination by the gibberellins is affected by several environmental factors. Gibberellins are able to bring about the protrusion of the radicale through the seed coat only in connection with other factors, but they strengthen special reactions promoting the development of the embryo. Higher H^+ concentrations (PH. 3.5 - 4.5) enhance the effect of gibberellins, the entrance of the gibberellin molecule into the seed apparently taking place more readily at increased acidity. The nature and concentration of the ions was also important, with citrate appearing to act as a germination promoter. Among the gibberellins investigated, GA_4 and GA_7 exhibited special activity. Their ability to promote germination was 5-1000-fold greater than that of gibberellic acid. The comparative investigation of seeds of ten species differing markedly in their germination behaviour (reaction to light and temperature)

suggests that the native gibberellins (perhaps similar to GA_4 and GA_7) control the germination process as hormonal regulators of enzyme reactions. However, other factors, acting together with gibberellins or independently also determine developmental processes.

Chavan and Chaudhari, (1967) stated that 0.1 ppm concentration of GA stimulated cotton seed germination of Gossypium herbaceum L. var. Digvijay in darkness but inhibited it in white light. Seed treatment with 0.1 - 2.5 ppm, GA stimulated radish growth in red light but inhibited it in darkness. Hypocotyl growth was markedly stimulated by GA in darkness or white light; the stimulatory effect of GA out weighed the inhibitory effect of red light on hypocotyl growth.

Carmeli and Dor (1969) studied the effect of GA on growth of irrigated Acala 1517 C. GA was applied either to the seed only by soaking it 2 - 4 hrs. in solutions ranging in concentration between 50 and 400 ppm or to the seed first and then to the foliage by spraying it with solutions of 100 and 200 ppm GA at the time of initiation. Soaking the seed in GA drastically reduced germination. Even 2-hr seaking caused a 5 - 30% reduction in seedling emergence. Seedling height and cotyledonary node height were markedly increased by GA treatments, maximum height being attained at the highest concentration

tested. Final plant height was not affected by GA.

The effect of gibberellic acid used at concentrations of 0, 10, 50 and 100 ppm for 24 hrs. as soaking treatment of seeds or as spray at budding stage of cotton plant Gossypium barbadense var. Bahtim 86 was examined [El-fouly and Mostafa (1969)] . They found that in all treatments stem height was increased with increasing age of plants. Meanwhile the treatment with GA either as soaking treatment or as spray led to an increase in stem length.

Prathapasenan et al (1969) mentioned that sterilized seeds of cotton were germinated in Petri dishes containing sand and filter paper, respectively, moistened with 25 mg GA/L. or water. GA stimulated shoot growth in cotton, but retarded root growth except during the early stages of germination, the development of lateral root in cotton was also inhibited. GA decreased activity of catalase and peroxidase in shoots, but stimulated it in roots.

In an experiment conducted by Bhatt and Rumanujan (1971) to study the effects of spraying cotton plants of Gossypium hirsutum which grown in pots with 100 ppm at square-formation stage and again three weeks later, found that treated plants produced dull green leaves. At harvest treatment with GA significantly increased plant height, number of nodes and dry

weight.

2. Effect on flowering and boll setting:

Dransfield (1961) reported that when GA_3 applied to young seedling of cotton plant G. hirsutum at 8- to 43 day old as a single application of GA had little effect on flower formation. The depressing effect of a single application of 100 ppm GA was noticeable as long as 94 days after spraying.

Jackson and Fadda (1962) observed that when gibberellic acid used at up to 500 ug/plant applied to the upper leaves of G. barbadense did not result in earlier flowering. A dose of 100 ug or more per plant applied to young plants retarded flowering.

5-week-old plant of Gossypium hirsutum were sprayed with GA at 50, 100, 150 and 200 mg/L. just before anthesis. Mathur and Mittal (1964) found that plants given the 2 highest concentrations were produced a significantly greater number of flowers than the controls. All concentrations of GA increased the number of flowers shed during the first 8 weeks after treatment, but the number of flowers retained on plants given 200 mg GA/L. was greater than in untreated plants.

In an experiment conducted by Said et al (1965) to study the effects of soaking cotton seeds in gibberellic acid solutions on flowering. The seeds were soaked in 0, 10, 100 ppm GA for 24 hrs. and then planted out of doors in pots. They