PHYSIOLOGICAL STUDIES OF SOME GROWTH REGULATORS ON THE GROWTH AND FLOWERING OF CINERARIA HYBRIDA

By

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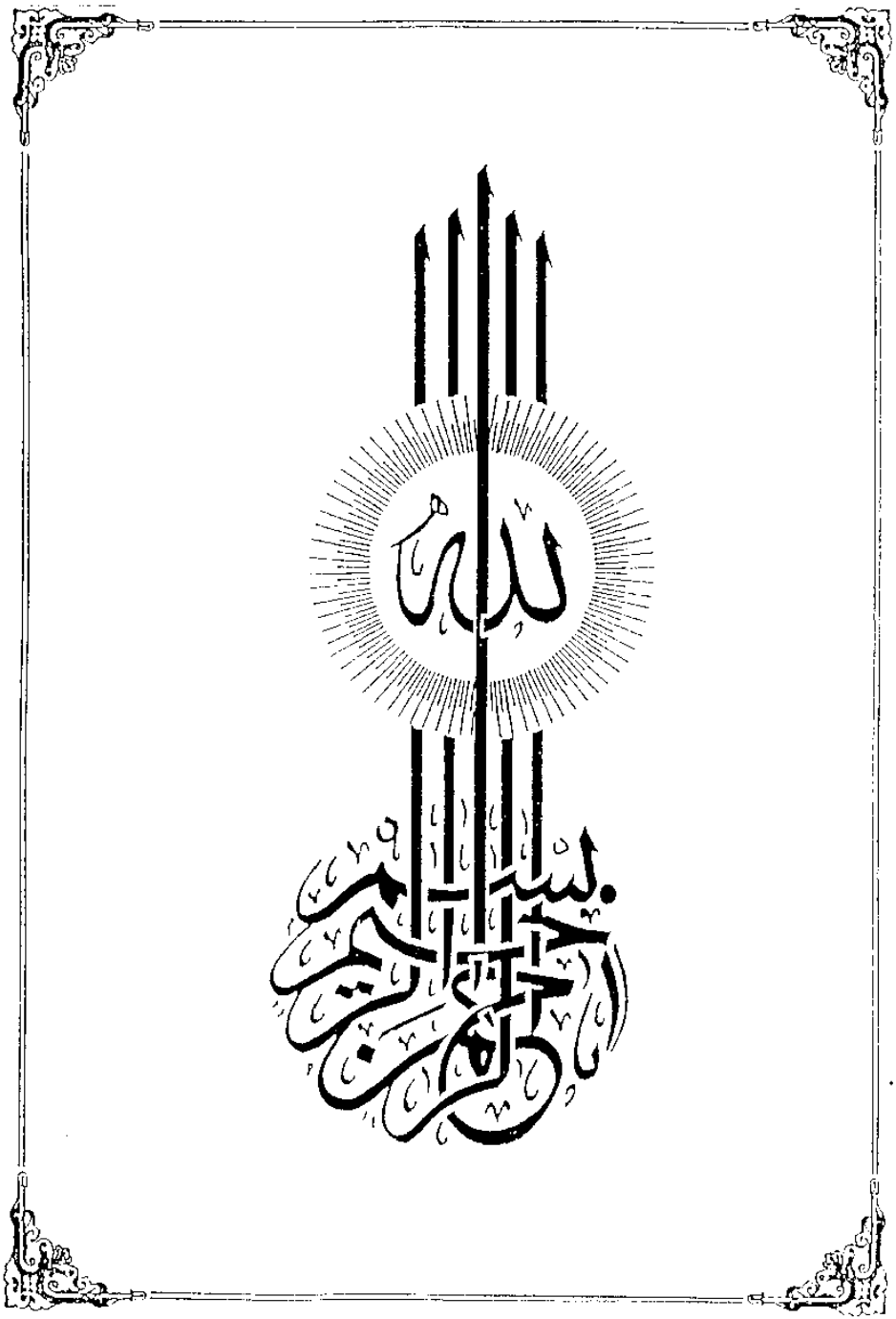

A C K N O W L E D G M E N T

This work has been carried out under the supervision of Dr. W.A. Ashour, Professor and Head of Plant Pathology Dept., Faculty of Agric., Ain Shams University, at Shobra El-Kheima, Dr. M.B. Mostafa, Associate Prof. in Plant Production Dept., Faculty of Agric., Ain Shams University at Zagazig and Dr. M.A. Amer, Lecture of Plant Physiology in Plant Pathology Dept., Faculty of Agric., Ain Shams University at Shobra El-Kheima. To them, the writer wishes to express his deepest gratitude and indebtedness for their supervision, progressive criticism and encouragement throughout this work.

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C O N T E N T S

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I N T R O D U C T I O N

Cineraria hybrida, hort., (the single hybrid cinerarias) is one of the most beautiful flowering-pot plants. It is a sensitive compact -growing plant with broad leaves and numerous flowers in dense clusters, which last for a considerable time in blossom due to different environmental and physiological factors. These characters render the plant as a suitable material for physiological studies including growth factors and spray treatments as well.

Recently different groups of growth regulators have been reported belonging to quite distinct chemical classes. They have been advised for different purposes according to their physiological effect on plant growth and flowering. Some of these compounds are known as growth stimulators,while the others are known as growth retardants, since their main effect on most plants is the inhibition of stem elongation without any malformation, though several investigators reported that they also have a promotive effect on growth and flowering.

Therefore, this study was carried out aiming to detect the physiological response of cineraria plants to some growth regulators namely GA and Chloromquat chloride (CCC). These

substances were selected according to their previous classification, since the former is a growth promotor, while the latter is a growth retardant.

It is hoped that the present work may gave some information on the possibilities of adjusting the pattern of growth and flowering of cineraria plants by using these two growth regulators.

REVIEW OF LITERATURE

The effect of GA on the height, vegetative growth, flowering and chemical composition of plants :

Plant height :

Lindstrom et al. (1957) stated that low concentration of GA had no effect on stem elongation of chrysanthemum, but the high one resulted in greatly elongated and weakened stem. Duysen (1961), found that GA was most effective in stimulating the top growth of Salvia officinalis. Mittal (1967) applying GA solution at the concentrations of 50, 100, 200, 300 and 500 ppm on dahlia plants found that the 200 ppm concentration significantly increased plant height and internode length. Pih and Toop (1968) found that the application of GA at 0, 10, 50 or 100 ug./ml as foliar sprays on Antirrhinum majus , Utah white, in an atmosphere enriched with 0.03 or 0.09% CO_2, significantly increased the stem length.

Shimada (1959) reported that spraying GA at a concentration of 50 ppm on Foeniculum vulgare for 4 to 8 weeks under short days, caused internode elongation of the main shoots. Galun (1959) found that application of 1 - 100 ppm GA solution to cucumber plants, initially stimulated internode

elongation, but continuous application reduced internode length. Simao et al. (1960) found that treating lettuce plants with 1 - 10 ppm GA, increased the height of the shoot. Haesloop (1961) indicated that treating Lycopersicum esculentum with GA, caused an increase in stem height. Kato and Ito (1962) revealed that the application of 100 ppm gibberellin to celery plants increased the height of plants by 88.3%. The microscopic examination of the petioles showed that the increase in height was due to increase in cell size than in cell number. Wheeler and Humphries (1964) mentioned that the application of GA to the leaves or the epicotyls of young dwarf french bean, increased internode extension.

Vegetative growth :

Matuhin & Maksimova(1960) reported that the leaves of chrysanthemum plant treated with GA_3 at 0.02% were much larger than the control. Ruge (1963) found that gibberellin applied to young fuchsia after stopping increased the number of side shoots produced. Mittal (1967) mentioned that the application of 200 ppm GA, significantly increased the dry and fresh weights of dahlia plants. Shedeed et al. (1971) indicated that GA had primary effects on vegetative growth such as the mean length and width of leaves in

lachenalia, freesia and tritonia were used at the rate of 100 ppm. Mostafa et al. (1972) found that GA spraying on Anemone coronaria increased the number of leaves per plant.

Stwowa and Yamaki (1957) stated that the leaf number was increased by treating cucumber plants with GA. Gray (1957) obtained an increase in the dry weight of saccharum plants as a result of gibberellin treatment. Humphries and French (1960) stated that GA-spray at 50 ppm in aqueous solution on Majestic potato with low or high nitrogen supply, did not affect the rate of leaf production on the main axis, but increased the leaf area and hastened senescence of leaves. Simao et al. (1960) found that treating lettuce with GA at 1 - 10 ppm increased the number of leaves and the stem weight, but reduced the weight of leaves and the diameter of the stem. Haesloop (1961) found that treating Lycopersicum esculentum with GA resulted in an increase in the rate of leaf formation and the dry weight of the stem. Verner (1961) indicated that younger active growing tissues were more sensitive to stimulation though GA_3 and its application in the early phase of the plant was most effective. Guttridge & Thompson(1963)indicated that the application of GA on strawberry petioles increased both the length and number of cells. Wheeler and Humphries (1964) mentioned that the application of A to the leaves or the epicotyls of young dwarf french bean

increased primary leaf growth and produced larger primary leaves than the control. Singh and Saimbhi (1967) reported that GA treatment on Lactuca sativa increased the number, size and the fresh as well as the dry weight of leaves. Bora and Selman (1969) found that treating tomato plants with GA_3 at a concentration of 5 ppm, increased the leaf area and the whole plant weight.

Flowering :

Lindstrom and Wittwer (1957) observed an increase in number of flowers produced on geranium plants as a result of GA application. Ono (1960) mentioned that the greatest response to gibberellin spray was shown by summer chrysanthemum and freesias as acceleration of flowering and elongation of the flower stalk. Matuhin and Maksimova (1960) mentioned that chrysanthemum plants grown under natural day length developed more rapidly and flowered one and half months earlier when treated with gibberellin. Also, the flowers of the treated plants were much larger than those of the control. Van Onsem and Haegeman (1962) observed that the application of GA caused initiation of some abnormal flowers of rose plants. Biswas and Rogers (1963) found that the application of GA on geranium plants increased flower size as the concentrations of GA were increased. The

[illegible] inflorescence size with 100 ppm. The [illegible] inflorescence size among the different concentrations of GA were found to be statistically significant, with few exceptions. The higher concentrations caused lodging of the inflorescence. The increased inflorescence size was due mainly to the increase in the length of petals and pedicels. Varga (1963) found that flower initiation in two geranium varieties was inhibited by GA treatment, but the time required for the development of initiated inflorescence was reduced by 8 to 13 days. The length of the flower stalk as well as the petal size increased with the treated plants. Kijuka (1963) stated that GA_3 induced earlier flowering and prolonged the flowering period of the essential oil bearing rose. Barbat and Ochesanv (1964) reported that treating chrysanthemum varieties grown under non inductive condition with GA, induced flowering, although this was not so rapid as when the plants were induced to form flower buds under short-day conditions. Corini (1965) indicated that spraying of GA at the concentrations of 10, 30 and 50 ppm once, twice, 3 or 4 times the foliage and buds of cyclamens during September, hastened and improved flowering. The greater improvement in earliness and abundance of flowering was achieved with the 10 ppm solution applied 3 - 4 times at 24-hour intervals beginning when the buds were 4 - 5 cm

tall. Pih and Toop (1968) reported that the application of GA_3 on Antirrhinum majus at 0, 10, 50 or 100 ug./ml significantly increased the inflorescence length. This effect, in general, increased by increasing the GA concentration. Abou-Leila (1969) mentioned that GA treatment increased flower diameter and size in chrysanthemum plants. Shedeed et al. (1971) mentioned that GA had a promising effect on flowering of lachenalia, freesia and tritonia, particularly when used at the 100 ppm concentration. The growth regulator increased the number of spikes per pot, the length of the spike and the number of flowers per spike, Kays et al.(1971) reported that treating Lilium longiflorum with 1000 ppm GA, significantly reduced the number of initiated floral buds. Mostafa et al. (1972) found that foliar application of gibberellic acid to Anemone coronaria plants resulted in earlier flowering by about two weeks. The treated plants produced more flowers with long stalks than the control.

Chemical composition :

Mosolov and Mosolova (1959) reported that GA spraying at 50 - 100 mg./L on lettuce, celeriac, onion and garlic, increased the uptake and assimilation of nutrients with consequent increase in their content in plant tissue. Janisevskii (1961) found that the spraying of Cannabis

sativa with 0.01% GA solution, decreased the total N and protein N, but increased the soluble N. Aseeva and Evdokimova (1964) reported that the total nitrogen and that of the amino acids and protein of the fruits and roots of dwarf pea, decreased with GA treatment. Broughion and McComb (1967) mentioned that the amount of soluble N present in expending internodes of dwarf pea was increased with GA treatment. Singh and Saimbhi (1967) reported that the application of GA on Lactuca sativa had no effect on the protein content of the leaves. Bora and Selman (1969) working with tomato plants, found that the total N in leaf and stem increased by the application of GA.

Brain et al. (1954) found that treating some varieties of plants with GA_3, resulted in more soluble carbohydrates than the control. Aseeva and Evdokimova (1964) reported that GA_3-treatment of dwarf pea plants brought about considerable changes in the carbohydrate level. The number of reducing sugars in the above ground area increased 3-fold and 2-fold in the fruits and roots. The polysaccharide , cellulose and total sugar content increased to much less degree. Ting and Lockhart (1965) revealed that in bean seedlings, the movement of applied GA is related to carbohydrate transport within the plants. Hegazy and Khalil(1966) found that GA treatment increased reducing sugars content of