EFFECT OF SOME GROWTH REGULATORS ON FRUIT QUALITY OF "ANNA" APPLES.

THESIS

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BY

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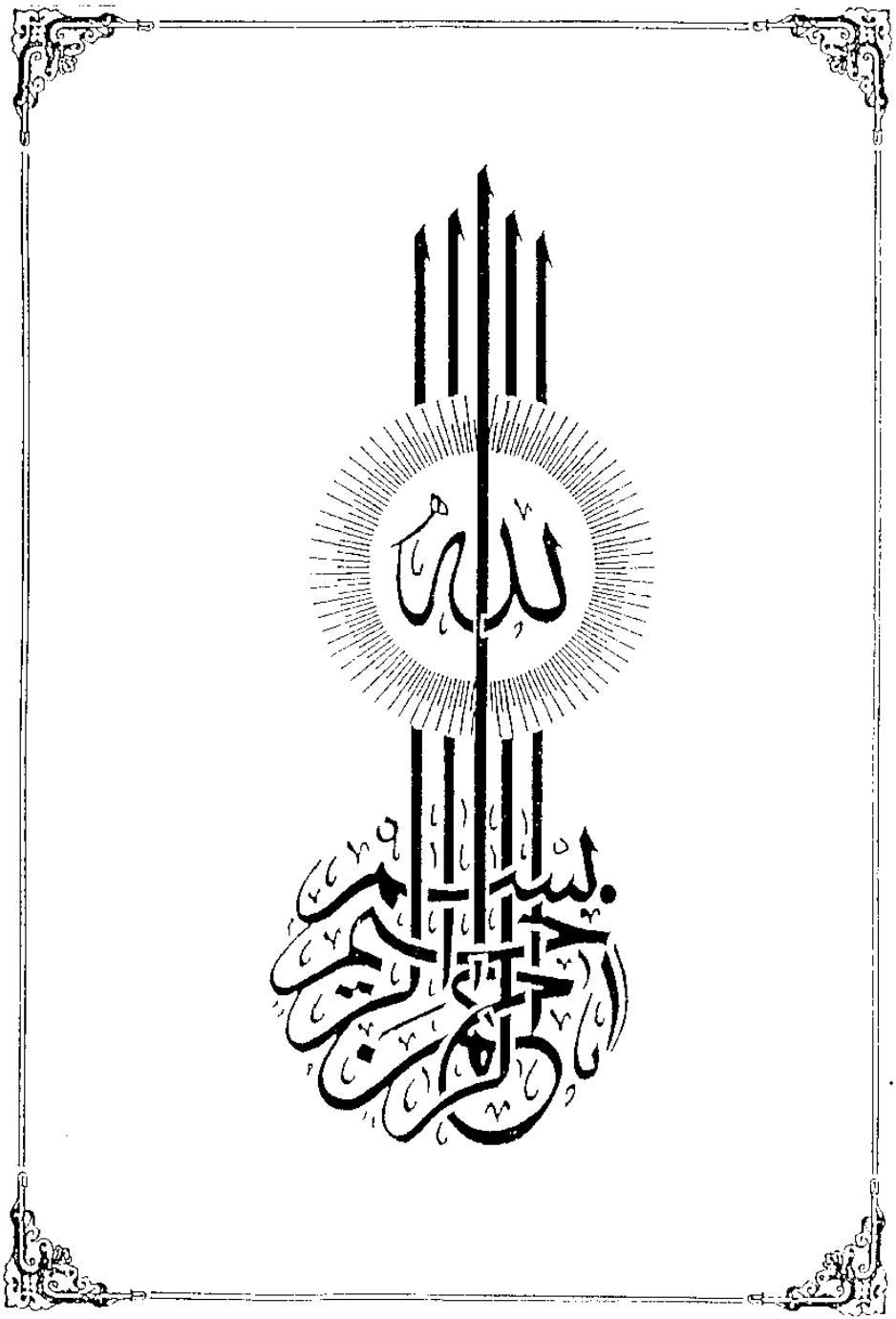

I dedicate this work to the spirit of the unforgatable and a live man in our heart, to my late Brother "Khaled".

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I also feel that I must extend my deep gratitude for the greatest man in my life, my father.

CONTENT

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FIRST PART

"Influence of pre-harvest application of CGA 152b1 and ethephon on fruit quality of (Anna) apples".

INTRODUCTION

The main apple cultivars grown in Egypt are Volos, Birkher and Balady, these cultivars are characterized by small size, poor colour and flavour, as well as difficulties lies behind handling, packing and marketing. Recently, in 1979 Ministry of Agriculture has introduced some low chilling requirement cultivars, i.e.; Anna, Ein Sheimer and Dorsett Golden. These newly imported cultivars have much better quality than the locally grown ones, yet its colour and flavour are not of superior quality comparec to high chilling requirements ones.

Anna apple is the leading variety of all introduced cultivars, its origin is Dour Na Shamron, Israel, by Abbastein (Reid and Olmc, 1978). Their parents are Red Hadassiya (Local palastenian var.) x Golden Delicious. Trees required about 300 - 350 hr. below 7.2 ^{o}C for breaking their dormancy. Fruit is medium to large, skin red cheeked, flesh subacid to sweet, flavour mild, ripnening at the end of June to first of July and trees is annually productive. The cultivated area of "Anna" is increasing drasticelly due to high income return per feddan of these fruits compared to other deciduous fruits. Therefore, apple industry in Egypt is growing rapidly, this will necessate improving fruit quality to be acceptable to consumer.

Consequently, this investigation aimed to improve fruit quality i.e.; colour, total soluble solids and flavour. For

that purpose the ethylene relasing agent, CGA 15281 as a new research material produced by cibpa-Gaiggy Co., and ethephon were used.

REVIEW OF LITERATURE

It is evident from the literature that many workers are dealt with the effect of ethephon on fruit quality of apples. The review of literature will be discussed under the following two heaings:-

I. Effect of ethephon spray on fruit quality of apples:-

Several investigators have evaluated the effect of ethephon on fruit quality of apple. Green et al., (1974) reported that application of SADH (Succinic and 2, 2 dimethyl hydrazide), in mid-July, followed with ethephon at 150 - 250 ppm, improved red colour in McIntosh apples, but fruit were less firm within 7 days than fruit reciving only SADH.

Morecver James (1974)found that ethephon treatment on Me Intosn apples in late August significantly increased development of anthocyanine in fruit peel. Similarly, Green and Lord (1974) claimed that spraying ethephon at 150 ppm, on Niagra apple trees when the fruit had 46% colour, enhanced fruit colour by 23%, compared to only 3% on unsprayed ones, while spraying Alar on McIntosn apple trees at 1000 ppm in mid-July; followed by etnephon at 75 or 150 on September 11 th in combination with NAA at 20 ppm, reduced flesh firmness.

Blanpied et al., (1975) reported that applying ethephon to McIntosn trees at 75 or 150 ppm, in combination with daminozide and either 20 ppm NAA or 10 ppm fenoprop, ennanced red colour

and softened the fruit especially at 150 ppm ethephon. Similar results were obtained by Faragher and Brohier (1975) who found that spraying ethephon at 0, 125, 250, 500 or 1000 ppm, plus NAA on Jonathan apple trees 3 weeks before the expected date, enhanced red colour but the treated fruits were no softer than untreated one.

Green and Lord (1975 a) reported that application of ethephon at 150 ppm increased the red colour of shaded McIntosh apples, although colour development was slow. Since, they noticed that after eleven days of treatment 64% of the shaded fruit on 10-year old semi-dwarf trees met the colour standard for us Extera Fancy Grade, whereas only 37% met this standard 14 days after application on the large trees, on the other hand, no shaded fruit on control trees were US Extera Fancy. In addition, the same authers (1975 b) claimed that spraying a solution containing 2, 4, 5 TP at 10 ppm, either alone or with ethephon on McIntosh apple trees enhanced fruit colour 8 days later.

Miller (1975) found that spraying ethephon and fenoprop on McIntosh apple on September 7 th, stimulated colour development, fruit softening and disappearance of starch after 7-10 days of treatment . Moreover, the application of ethrel- A (ethephon) at 0.1 or 0.15%, on three-year-old Golden Delecious apple trees one month before normal harvest, over 60% of the fruits treated with the lower concentration were coloured yellow on the exposed side, compared to none on untreated trees (Peerbooms, 1975).

In addition, Buban and Gonda (1976) found that treating a high density Jonathan apple plantation (5 x 2.5 m) in early of September with 3 ethrel compounds, improved fruit colour. The same results was obtained by Grauslund (1976 a) who found that using ethrel, 2 weeks before the expected harvest date on Close, James Grieve Lired and Summerred apple cvs., improved colour development. Also, the same auther (1976 b) found that applying ethephon at 120, 240 or 480 ppm to James Grieve Lired apple cv. 2-4 weeks before normal harvest, greatly increased the red colouration and the soluble solids contents, reduced starch and acid contents. Greene et al., (1976) claimed that using ethephon on fruits of Cortland cv., at 1000 ppm reduced fruit firmness. Similarly, Hammett (1976) mentioned that summer application of daminozide followed by ethephon application one month before normal harvest to Starkimson Delicious trees resulted in highly -coloured, firm fruits which stored well for 28 weeks if harvested 20 days after ethephon application. On contrary, when treated the Golden Delicious fruits with same treatment resulted soft over-ripe fruits when harvested 10, 20 and 30 days after treatment.

Greene et al., (1977) reported that applying ethrel on Delicious apple trees at 500 - 1000 ppm, shortly after June drop increased flesh firmness. In addition, the same auther (1977) mentioned that applying ethephon in early August at 150 - 500 ppm, on McIntosh apple trees increased soluble solids, red colour but reduced flesh firmness.

Jones (1977) stated that using of ethephon at 100, 200 or 300 ppm, on Tydman's Early (Worcester) apple trees on February, one week before harvest, enhanced fruit colour in terms of the number of apples over 60% red, comparedwith water-sprayed (Controls). Kishore and Dhuria (1977) mentioned that applying ethephon at 1000-4000 ppm, on Red Delicious either alone or with daminozide at 1000-3000 ppm, 12 weeks after full bloom, enhanced fruit colour greatly especially at the highest concentration of ethrel alone or with daminozide at 2000 ppm.

Kvale (1977) found that there was an increasing of soluble solids content by using 400 ppm ethephon on the Prins, Roud prins, James Grive and Red Melba apple cvs., when 10 - 15; of their flower were fully opened. Ahmed and Shaladan (1978) mentioned that spraying ethrel on Ajami apple trees at 0, 250, 500 and 1000 ppm, 2 weeks before harvest, significantly promoted the development of red colour, while firmness of fruits were not affected by the treatments. In addition, Kustermans and Westerlaken (1978) found that applied ethrel at 0.2%, on Winston apple trees on M.9.; after 10 or 20 days from full bloom, enhanced fruit colour.

Fraysse et al., (1979) claimed that the best colour were obtained by applying Alar at 150 g/hl., 70 days before harvest followed by 200 ml/hl. ethephon plus 20 ml/hl., 2, 4, 5 TP, 20 days before harvest, these treatments had no significant adverse effects on fruit firmness and sugar/acid ratio. Moreover,

Hertz (1979) reported that applying ethrel to 20-year old trees apple cvs. Beacon, McIntosh, Haralson and Fireside, before maturity enhanced red colouration in all cvs., and fruit firmness was reduced by ethrel in McIntosh and Haralson.

Jones (1979) found that spraying ethephon 2, 1 or 0 weeks before the normal date of first picking on Tydman Early, at the first harvest the percentage of fruit in economically important colour category (61 - 100%) were 6.5, 39.9, 53.4 and 60.4, in the 0, 100, 200 and 300 ppm ethephon treatment, respectively. In addition, Comai and Widdman (1980) stated that spraying ethephon at 250 ppm, before harvest on cvs., Vista Bella, Jerseymac, Summerred and Early Tydman, enhanced red colouration but fruits were softer than control fruits.

DoZier et al., (1980) mentioned that ethephon at 300 ppm plus fenoprop at 20 ppm with or without other growth regulator such as GA_{4-1} and BA, improved red colour. Moreover, Fargher et al., (1980) claimed that using ethephon on Jonathan and Delicious with 250 and 500 ppm, 3 weeks before expected normal harvest improved ground colour, red colour, sugar level 1-2 weeks early and there were no effect on fruit firmness. In addition, Garf (1980) mentioned that spraying ethrel at 0.05%, on Jamba apple trees on August 15, 20 and 27 th, and fruit were harvested on August 30 th, produce good colour.