COMPARATIVE STUDY ON SOME IMPORTED CITRUS VARIETIES

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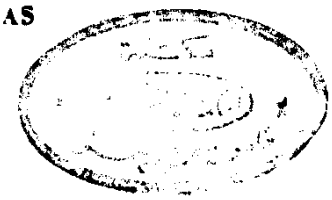

THESIS

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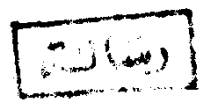

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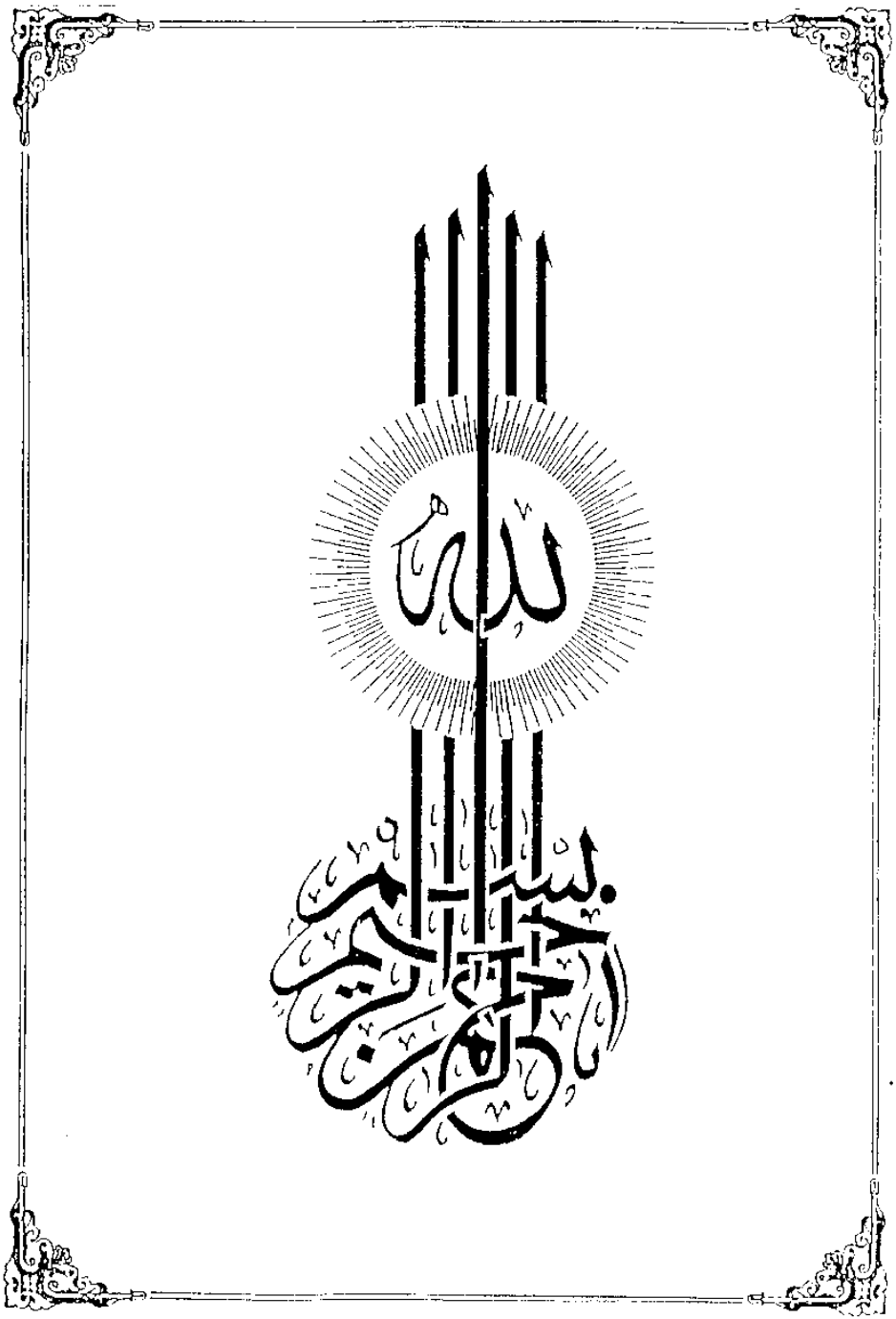

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INTRODUCTION

Citrus trees are the backbone of fruit culture in Egypt since it occupies about 56 % of the total fruit area. The main citrus species, planted in Egypt according to the census of 1973, are: oranges 122032 fed. mandarin 13708 fed., and lime 8685 fed.. Other citrus species such as lemon, sweet lime and grapefruit are planted in small areas.

Citrus acreage increases annually to meet the continuous demand of both local and foreign markets. Neverthless, many problems encounter citrus trees to reach the maximum productivity. Such problems could be grouped under: a) Cultural and physiological problems such as spacing, fertilizers and fruit set etc. b) The deterioration of old clones due to the infection of some viruses or virus like substances. In this respect Childs et al. (1956) surveyed some producing citrus orchards in Egypt and concluded that psorosis virus disease is spreading in about 95 % in "Baladi" mandarins, while the percentages of infected trees ranged between 62 - 97 % for orange varieties. They further stated that seedling trees of several varieties were available in Assuite area as sources of psorosis-free bud wood. Chandler (1958) and Nour El-Din (1969) stated also that most virus diseases in citrus are not transmitted

by seeds. Accordingly, they preferred citrus propagation by seeds taken from apparently healthy trees from regions where virus diseases are not widely spreading. Moreover, Chandler (1958) mentioned that most citrus varieties come true to type when propagated by seeds, as such seeds are polyembryonic containing many nucellar embryos in addition to one zygotic embryo.

The first problem has been a field of extensive research in Egypt and many recommendations are in hand. On the contrary the second problem, received scant attention but recently it arøses up as a serious problem encounters citrus production in Egypt.

Consequently, selecting new citrus strains characterized by vigorous growth, high yield and fancy fruit quality may be helpful in this respect. The study was designed to evaluate some imported citrus seedling trees grown in Tahrir Province. Trees under investigation were two tangerine lines: mainly Ponkan and Dancy, and one grapefruit line "Marsh seedless". To secure precised evaluation the former two tangerine types were compared with the local Balady mandarin cultivar, while the later type was compared against Marsh grapefruit variety.

REVIEW OF LITERATURE

I- Improvement Citrus Varieties Through Seed Propagation :

Many fruits such as citrus, mangoes, and mangosteen produce plants true to type when propagated by seeds, as such seeds are polyembryonic and contain many nucellar embryos in addition to one zygotic embryo. Furthermore, young trees developed from nucellar embryos of citrus differ from those trees of the same clone when propagated by budding. The nucellar trees are usually more vigorous, more thorny, and slower to start bearing although the fruit seems identical (Chandler, 1958). On the other hand, Frost et al. (1957), and Nishiura (1964) with "Satsuma" nucellar seedlings, and Childs and Long (1960) on "Persian" lime seedlings found that the variations in vegetative and fruit characteristics which may be due to some kind of mutation or genetical variations resulted from zygotic embryos or to the effect of juvenility as well as environmental effects.

Regarding the superiority of nucellar seedlings, Batchelor and Cameron (1950), Cameron and Soost (1952), Norman (1964), Minessy (1965) and Maxwell et al. (1973) stated that nucellar lines weremore productive and promising in citrus improvement because they werefree of virus diseases.

The selection of parent trees as sources of budwood for propagation should be based on individual tree selection and nucellar seedlings. The selection must be performed for: total fruit yield, fruit quality, tree vigour, and longevity (Shamel, 1917, Burns et al. (1969, and El-Wakeel et al., 1969)

II- The Variation Between Nucellar Lines and Old Lines :

Concerning tree growth, many investigators (Frost, 1938, Batchelor and Cameron, 1950, Frost, 1952, Reuther, 1958 and Hensz, 1970) reported that the nucellar citrus seedling trees werecharacterized by more vigour, upright growth habit and greater trunk diameter than that of the old-line at the same age.

Thorniness in citrus seedlings ~~is related~~ trees was ascribed to juvenility which occurs in citrus after seed reproduction (Swingle, 1932, Frost, 1938 and Cameron and Soost, 1961).

Variations in blooming between old line and young nucellar selections were early emphasized by various workers. Frost (1938) concluded that blooming in nucellar strains increased with progress in age. Frost (1943) stated that young seedling lines showed the biennial

[illegible] that at three years of age, the young line trees were [illegible] less productive of flowers and fruits than the old line trees. Reuther (1958) mentioned that nucellar seedling trees go through a juvenile stage before they begin flowering and fruiting at about seven or eight years.

In regard to tree yield, Cameron and Soost (1952) stated that except for the "Lisbon" lemon, tree yields were from 33 to 102 per cent greater in the nucellar seedling lines than in the respective old lines. Frost et al. (1957) reported that the greater yield of the nucellar lines had been due mainly to their greater tree size. Cameron et al. (1959) found that young Valencia lines (24 years) propagated by seed, showed extreme alternation in yield due to juvenility. Norman (1964) stated that nucellar seedlings were characterized by slowness to fruit and alternate bearing as a result of juvenility.

III- Vegetative Characters :

Concerning the growth habit of the trees, Webber (1943) stated that Dancy and Fonkan tangerine trees were upright in shape. Minessy, et al. (1965) reported that

Duncan grapefruit, Marsh grapefruit, and Clementine tangerine were all spreading in shape but Balady-blood orange was upright. Hamouda (1971) reported that Balady mandarin trees were small to medium in size with a spreading nature of branching.

Regarding the morphology nature of leaves, Ryder (1954) stated that the leaf shape may be changed by environment or by heredity. Chandler (1958) mentioned that there were wide variations in leaf shape and leaf area among the different types of mandarins. Hamouda (1971) studied leaf length, width and area in six mandarin varieties. He found that Clementine leaf length was the longest followed by Satsuma, Molokey, Balady seedling, Balady budded, Selected-Mallowy, then came Balady-Nawa which had the shorter leaf length. His data proved significant differences in leaf length between Balady budded and balady seedling trees. Moreover, he found that the width and leaf area varied among the varieties.

IV- Flowering and Fruit Set :

In respect to blooming duration, Webber (1943) stated that the principle blooming period for all commercial species of citrus is early spring, and usually lasts

approximately six weeks. He also added that the different species and different varieties of the same species may normally have different blooming periods and the range is as small as two weeks. Hass (1948) revealed that blossoming and fruit setting of orange trees in southern California continues for a period of at least five weeks. He added that it was possible to make large collections of fully-open Washington Navel orange blossoms from March 19 to April 22. El-Shiaty (1952) reported that the flowering duration for citrus trees in Egypt usually begins in March and lasts approximately for three weeks. He added that Shamouti orange blooms nearly a week later than the Khalily-White orange. Minessy et al. (1965) found that the beginning of blooming in Egypt for Shaddock, Duncan grapefruit, Marsh grapefruit, Balady-blood orange, and Clementine tangerine were April 6, March 23, March 19, March 20, and March 15, while blooming ended at May 8, April 20, April 20, May 8, and April 24, respectively. They also mentioned that Shaddok and Balady-blood orange bloom late, however Clementine tangerine, Duncan grapefruit and Marsh grapefruit were early blooming varieties.

Viability of pollen grains in citrus varieties were studied by various workers. Moreira and Gurgel (1941)

found that the pollen stainability in the oranges varied from 0 to 90 per cent, while it varied from 50 to 80 per cent in limes and lemons. In tangerine the pollen fertility was generally above 60 per cent, while in oranges and grapefruit- except in Marsh seedless, was over 80 per cent. The variation in pollen fertility within the plant and even within the variety and species, was generally small, but soil conditions and rootstocks had a notable effect. Frost (1943) stated that in some kinds of plants, certain genes or combinations of genes are lethal for the development of the particular pollen grains or embryo - sacs, or both, which receive them after the reduction - division, so that these pollen grains or embryo-sacs do not produce viable gametes. Also, possession of a particular genetic constitution, may prevent the development of stamens, or pistils, or their reproductive tissues, throughout the plant. The sterility of the Washington navel orange is of this sort, since its pollen mother cells degenerate before the reduction division. El-Shiaty (1952) reported that pollen stainability in Shamouti and Khalily-White oranges were about 36 and 42 %, respectively. Dhuria and Randhawa (1963) found that the percentage of pollen grain germination in Marsh seeded grapefruit and sweet lime was 55.1

and 56.4, respectively, when germination was determined in 20 % sucrose solution. Soost (1963) reported that Marsh grapefruit, and other seedless varieties of grapefruit had only approximately 15 % functional pollen. While the seedy varieties such as Duncan and Foster had high percentages of functional pollen. He added that Dancy tangerine had ample functional pollen and produced adequate yields of seedy fruits with its own pollen. Ebrahim (1969) noted that pollen stainability ranged between 10 - 16 % for Marsh grapefruit, and 87 - 89 % for Clementine tangerine.

In regard to types of inflorescences and fruit set, Reece (1945) working on Pine-apple, Hamlin, and Valencia orange varieties, Sauer (1951) and Nasr (1953) on Navel and Valencia oranges found that the flowers on a leafy inflorescence had a better chance to develop to maturity than on a leafless one. Moreover, they reported that the percentage of fruit set on leafy inflorescence was higher than that on the leafless type in all varieties. Minessy et al. (1965) noted that Duncan and Marsh grapefruit, and Balady-blood orange have more leafless inflorescences but Clementine tangerine and Shaddok have more leafy inflorescences. El-Hagah (1966) in his studies concerning the bearing habits of some citrus varieties, found that in

most cases, the woody type of inflorescences was superior in number.

V- Fruit Drop and Fruiting :

With respect to the fruit drop, Iwasaki (1956) found that late maturing varieties of oranges showed two periods of fruit dropping, one from May to August, and the second from October to January or February. Fruit dropping in early maturing varieties usually occurred during the first period (i.e. from May to August). He added that there was no relationship between the number of seeds in fruits and the time of fruit dropping. Zidan (1959) reported that fruit drop of different citrus varieties was the highest in the first two months (approximately, mid March to mid May) then it decreased thereafter. Randhawa and Singh (1963) found two definite waves of fruit drop in mandarins during April - May and September - October. Dhuria and Randhawa (1965) observed three definite periods of fruit drop in Marsh seedless grapefruit and sweet lime. The first drop was immediately following fruit set in April, the second during the warmer months of May - June, and the third during September - October in sweet lime and October-November in grapefruit.