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WATER REQUIREMENTS OF SOME CITRUS VARIETIES  
AND THEIR EFFECT ON FRUIT QUALITY

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## INTRODUCTION

It is known that citrus varieties, are the most important fruit crop in the United Arab Republic. It occupy more than 50% of the total area covered with fruit trees.

The acreage of citrus trees in the United Arab Republic reached to about 120,000 Feddans (Table 1). Approximately 97% of this area is occupied with orange trees.

The Balady orange (a variety of sweet orange)-Citrus sinensis, Linn.- is one of the major fruits of economic importance in the U.A.R. It comprises a great percent of the orange area. The total area of this variety in 1966 was 26,285 Feddans and the highest acreage of which is concentrated at Calubiya province, where the present investigation was carried out.

A great attention has been given to Balady orange variety in foreign markets, for its high quality and juiciness.

Table (1)

Acreage of Citrus at the E.A.E.  
1965-1966 Season

| No.   | Provinces      | Citrus<br>acreage<br>(Fed.) | Orange<br>acreage<br>% | Balady<br>O. Acr.<br>(Fed.) | Balady<br>O. Acr.<br>% |
|-------|----------------|-----------------------------|------------------------|-----------------------------|------------------------|
| 1     | Beheira        | 25077                       | 20.93                  | 2254                        | 8.98                   |
| 2     | Calubiya       | 22223                       | 18.55                  | 5891                        | 26.50                  |
| 3     | Sharkia        | 13005                       | 10.85                  | 2511                        | 19.30                  |
| 4     | Monoufia       | 12010                       | 10.02                  | 2491                        | 20.74                  |
| 5     | Gharbia        | 8610                        | 7.18                   | 1121                        | 13.01                  |
| 6     | Dakahlia       | 5783                        | 4.82                   | 603                         | 10.42                  |
| 7     | Alexandria     | 1674                        | 1.39                   | 136                         | 8.12                   |
| 8     | Ismailia       | 2175                        | 1.81                   | 737                         | 33.88                  |
| 9     | Suez           | 146                         | 0.12                   | 106                         | 72.60                  |
| 10    | Kafr-el-Sheikh | 1550                        | 1.29                   | 224                         | 14.45                  |
| 11    | Damietta       | 617                         | 0.51                   | 48                          | 7.77                   |
| 12    | Cairo          | 984                         | 0.82                   | 252                         | 25.60                  |
| 13    | Giza           | 4071                        | 3.39                   | 1018                        | 25.00                  |
| 14    | Beni-Suef      | 2785                        | 2.32                   | 1048                        | 37.63                  |
| 15    | Mayoum         | 4885                        | 4.07                   | 885                         | 18.11                  |
| 16    | Minya          | 3452                        | 2.88                   | 1358                        | 39.33                  |
| 17    | Assiut         | 5148                        | 4.29                   | 4091                        | 79.46                  |
| 18    | Sohag          | 1328                        | 1.10                   | 936                         | 70.48                  |
| 19    | Kena           | 912                         | 0.76                   | 483                         | 52.90                  |
| 20    | Asswan         | 341                         | 0.28                   | 144                         | 42.22                  |
| Total |                | 119776                      | -                      | 26285                       | -                      |

According to the Horticulture Department report, Ministry  
of Agriculture, 1966.

Although several studies had been made to solve citrus fertilization, root-stocks, maturity and storage problems, yet investigations on water requirements and irrigation of citrus fruits are lacking in U.A.R., as they are more complicated subjects.

The present work was planned to evaluate the effect of irrigation on fruit quality of Balady oranges during development and storage. Such work may guide to solve the problem of Greasing (Tabheer), which is a serious problem confronting the fruit exporters and causes a big loss in fruits during marketting and exporting.

## REVIEW OF LITERATURE

The literature of the present investigation has been reviewed under five main headings :

- I- Water Requirements.
- II- Developmental Stages in the Fruit.
- III-Anatomy.
- IV- Creasing (Tabheer).
- V- Storage.

### I- Water Requirements

A large number of publications dealing with the water available to plant in the soil were published. As a result of extensive studies it can be concluded that as long as the soil in the root-zone was in the range between field capacity and wilting point, the percentage of moisture content in this range had no effect on the apparent growth of the fruit (14, 30, 50, 74 & 98).

Concerning this point Scofield (82) mentioned that the available soil moisture decreased as the moisture content decreased from the field capacity to the permanent wilting point. The plant requires more effort for obtaining available water from soil.

For obtaining higher yields, the soil moisture content must be kept at a high level and not allowing it to fall below one half the range between field capacity and wilting percentage (21, 29, 50, 77 & 88).

Floyd (26) showed that when a tree suffered from lack of water, its yield was decreased, even though it was recovered after an irrigation. On the other hand increasing number of irrigations or the water quantity resulted in injuring the crop and the soil, besides being a waste for both water and labour.

Nockrashy (73) found that ten irrigations with  $3000 \text{ m}^3/\text{feddan}/\text{year}$  as a most convenient regime for orange irrigation, in the U.A.R. orchards.

Israelsen and Frank (50) found that some available water content (about 3% of moisture over the wilting point) must be kept in the soil to obtain best results in the tree production.

## II- Developmental Stages in the Fruit

### a) Physical Changes :

#### Colour of Rind.

During ripening the chlorophyll content in the rind decreases, and the carotenoid pigments increases. The rind colour changes from green to orange (18 and 63).

Concerning the relation between water applications and the changes of the rind colour, El-Mahmoudi et al.(23) found that light water applications accelerated colour development in orange fruits.

The colour of the rind alone was not a standard index for ripening or palatability of citrus fruits (12, 13 and 99).

#### Fruit Diameter.

Most of the work done concerning the fruit development found that the fruit diameter increases during the seasonal changes and till maturity (35, 52, 73 and 89). Jacobs (52) stated that the greatest increase in diameter of oranges happens during the period of development prior to the attainment of prime eating quality, while a less rapid and irregular increase occurs during later stages of ripening.

### Fruit Weight and Volume.

As a normal change in the appearance of the fruit during developmental stages, is the increase in its weight and volume (9, 34, 44, 45, 52, 63, 73, 89, 94 and 95).

Azouni and Shiaty (3) found that the lime fruits increased at first, in early stages of fruit development, then decreased till the end of the season.

Erickson and Richards (24) found that the fruit size but not fruit number was less on the dry than on the moist soil. They also found that the percentage of rag in Valencia late oranges, was greater in fruits taken from trees in the dry soil than that taken from trees in the moist soil.

### Rind Thickness.

Many investigators found that the peel increases in its thickness during the fruit development, as the season advances (3, 89, 94 and 95), while Harding et al. (45) reported that the peel thickness remained unchanged through the various stages of growth and ripening.

Uria et al. (97) and Nasharty (72) found that increasing water quantity during the season caused splitting of fruits.