

Physiological studies on creasing of sweet orange

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The present investigation was carried out on fruitful trees of Tanarif cv. budded on sour orange rootstock grown in clay loamy soil at the Horticultural Research Station at El-Kanater El-Khairia, Qualiobia Governorate, Egypt during two consecutive 2002/2003 and 2003/2004 seasons. Two experiments were conducted in this work.

VI- Experiment I: Effect of irrigation regimes: In this regard, a factorial experiment was conducted for studying the influence of 3 levels of available water (25, 50 & 75 %) combined with both geographical direction (north & south) and the fruit status (sound & creased) on fruit qualities (physical and chemical properties); creasing incidence and nutritional status (leaves and fruit rind mineral composition) of sweet orange Tanarif trees. The complete randomized block design with 5 replication was employed for arranging the various treatments of three investigated factors in this experiment. Whereas, the specific and interaction effects of levels of available water, geographical direction, fruit status and their combinations were investigating regarding the response of fruit qualities, creasing incidence and nutritional status (fruits rind and approached leaves mineral composition).

V.H. Experiment II: Effect of (GA₃; P; K) foliar spray in combination with application date and geographical direction on Tanarif sweet orange cultivar: The response of Tanarif orange trees budded on sour orange to the differential spray treatments with various GA₃ solely or combined with P or K and/or (P + K) solution were investigated during both 2002/2003 and 2003/2004 experimental seasons. Hence, solution of the aforesaid substance (GA₃) and two mineral elements were investigated (GA₃ was applied solely or in combination with P or K). Whereas, the complete randomized block design with 5 replications was used in this experiment and each replicate was represented by one tree which comprised two main branches (limbs) detected towards two opposite directions (north and south) for each application dates (June & July). Since, Tween -20 at the rate of 0.1 % was added to all foliar spray solutions a surfactant even with control (water spray). Specific and interaction effects of the investigated factors and their combinations included in the aforesaid 18 & 2° experiment were studied through the response of the following measurements.

V-1. Fruit qualities:

V-a. Fruit physical properties: At harvest date in February 28th of 2003 and 2004 during both 18 and 2°1, respectively, average fruit weight; size; dimension (polar & equatorial diameter); fruit rind thickness and weight and fruit juice (weight & volume) were investigated regarding the response of levels of available water, geographical direction of fruit locality towards north and south directions and fruit status (sound & creased) for 18 experiment and different foliar spray treatments, geographical direction, fruit status and date of application in 2° experiment.

V-b. Fruit chemical properties: In this respect fruit juice total soluble solids TSS %, total acidity%, TSS/acid ratio and vitamin C contents were the fruit chemical properties investigated in this concern for 18 and 2° experiment during the two seasons of study.

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V-2. Creasing %: Creasing % of Tanarif fruits in response to specific and interaction effects of irrigation regime, water, measuring date and geographical direction for 18 experiment and different foliar spray treatments, geographical direction, measuring date and date of application for 2°1 experiment during the two seasons of study.

V-3. Nutritional status (leaf and fruit rind mineral composition): N, P, K, Ca, Mg, Fe, Mn, Zn and Cu contents in both leaves and fruits rind collected separately from northern and southern sides of tree periphery were investigated in response to specific and interaction effects of levels of available water, geographical direction and fruit status from which rinds and adjacent leaves were sampled for analysis (18 experiment) and different foliar spray treatments, geographical direction (north & south)

fruit status (sound & creased) from which rinds and adjacent leaves were sampled for analysis and date of application (June & July) for 2'1 experiment.

V-5- Anatomical studies: Rind anatomy of the studied both sound and creased fruits to determine rind structure of the studied Tanarif orange fruits in order to determine any anatomical variation between irrigation after depletion of 25, 50 & 75 % available water (18 experiment) and/or foliar spray with GA3 solely or combined with P, K, P + K (2'1 experiment) to determination of the first evidence of creasing phenomenon within peel layers and studied any anatomical differences in the rind connected with occurrence of creasing. The obtained results during both experimental seasons could be summarized as follows:

SUMMARY AND CONCLUSION-229-V.I. Experiment, 1: Effect of irrigation regimes: In this regard, fruit quality; creasing incidence and nutritional status (fruit rind & leaf mineral composition) of Tanarif cultivar were concerned.

VII- Fruit quality:

V.I.1.a- Fruit physical characteristics: Fruit average weight; size; dimensions (polar & equatorial diameters); fruit juice (weight & volume); peel thickness and weight were investigated regarding the specific and interaction effects of irrigation regime x geographical direction (north & south) and fruit status (sound or creased) for Tanarif trees irrigated after depletion of 25, 50 and 75% available water was investigated.

Specific effect:

1-Data obtained during both experimental seasons, revealed that the specific effect of irrigation regime was obviously observed, whereas, irrigation after depletion of 25 % A.W. exhibited statistically the greatest values of the aforesaid physical parameter (fruit weight & size; dimensions and juice weight and volume) descendingly followed by irrigation after depletion of 50 % and 75 % ranked last during the two seasons of study. In addition, the reverse was true for rind thickness and weight.

2-As for the specific effect of geographical direction (north & south), however the trend varied from one physical characteristic to another from one hand but in general all investigated physical characteristics followed one of the following two trends.

a. Northern half of tree canopy induced fruits significantly higher in their average fresh weight; size and dimensions (polar & equatorial diameters) as compared to those of the southern branches.

b. The trend took the other way around with the fruit rind (weight & thickness) as well as fruit juice (weight & volume), whereas fruits of the southern limbs characterized by their abundant juice and thicker rind as compared to those of the opposite side of tree and differences were significant.

3- As the specific relationship between fruit status (sound or creased) and its investigated physical characteristics, it was so clear that the sound Tanarif fruits had significantly higher in their average fresh weight, size and dimensions (polar & equatorial diameters) fruit juice (weight & volume) and fruit peel (weight & thickness) as compared to those of the creasing fruits.

Interaction effect: Data obtained during both 2002/2003 and 2003/2004 seasons proved that each investigated factor reflected its own specific effect on interaction effects of its combinations as follows:

a. The heaviest fruits with greatest size and dimensions (polar & equatorial diameters) were in closed relationship to sound fruits situated across the northern side of Tanarif trees irrigated after depletion of 25 % A.W. The reverse was found with creased fruits situated across the southern branches of Tanarif trees irrigated after depletion of 75 %. Moreover, other combinations were in between in this respect.

b. On the other hand, sound fruits situated across the southern side of Tanarif trees which irrigated after depletion of 75 % characterized by their higher in both peel thickness and weight. The reverse was true with creasing fruits situated across the northern side of Tanarif trees irrigated after depletion of 25 A.W. In addition, other combinations were in between in this regard.

c. Obtained results revealed that sound fruits located across the southern half of tree canopy for Tanarif trees irrigated after depletion of 25 % A.W. characterized by high value of juice weight and volume, while the reverse was true with creased fruits situated across the northern limbs for Tanarif trees irrigated after depletion of 75% A.W. during the two seasons of study. Moreover, other combination were in between in this concern.

V.1.2- Fruit chemical properties: The fruit juice TSS %, total acidity %, TSS/acid ratio and vitamin C content were the investigated chemical properties regarding their response to specific and interaction effects of irrigation regime, geographical direction, fruit status and their combinations.

Specific effect:

1-As for the specific effect of irrigation regime; data obtained revealed that irrigated Tanarif trees after depletion of 75 % A.W. had statistically the highest values in TSS %; total acidity %; TSS/acid ratio and vitamin C while the reverse was true with those irrigated after depletion of 25 % A.W. Moreover, other irrigation regime (after depletion of 50 %

A.W.) were in between. Differences, were significant as three irrigation regime were compared each other during 2002/2003 and 2003/2004 seasons.2-Referring the specific effect of geographical direction towards which fruits bearer branches were directed, data obtained during both seasons revealed that both TSS %SUMMARY AND CONCLUSION-232-and acidity % as well as TSS/acid ratio followed typically the same trend. Hence, fruits of the southern branches were the richest in their juice TSS %, acidity % and TSS/acid ratio as compared with the fruits situated limbs on the north. Moreover, vitamin C content was richer in fruits situated in northern side as compared with the southern side during the two seasons of study.3-With respect to the specific effect of fruit status obtained results indicated that sound fruit juice TSS %, total acidity %; TSS/acid ratio and vitamin C content exhibited statistically the highest values from its as compared to creased fruits during the study.Interaction effect:1-It was quite evident that specific effect of each investigated factor (irrigation regime, geographical direction and fruit status) reflected on interaction effect of their combination. Since, sound fruits of the southern branches of Tanarif trees irrigated after depletion of 75 % A.W. characterized the highest level of TSS % and acidity %, the reverse was found with creased fruits situated on northern and southern limbs of Tanarif trees irrigated after depletion of 25 % A.W. respectively, during the study. In addition, other combinations were in between.2-Data obtained regarding fruit juice vitamin C content indicated that sound fruits situated on the northern branches of Tanarif trees irrigated after depletion of 75 % A.W. had the highest value acidity and vitamin C content, whereas, creased fruits situated on the southern side of Tanarif trees irrigated after depletion of 25 % A.W. had the lowest value in this respect. Moreover, other combinations were in between the abovementioned two extremes.