



SUMMARY

V- SUMMARY AND CONCLUSION

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.II. 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 (GA_3) and two mineral elements were investigated (GA_3 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 1st & 2nd 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 1st and 2nd, 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 1st experiment and different foliar spray treatments, geographical direction, fruit status and date of application in 2nd 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 1st and 2nd experiment during the two seasons of study.

V-2. Creasing %:

Creasing % of Tanarif fruits in response to specific and interaction effects of irrigation regime, water, measuring date and geographical direction for 1st experiment and different foliar spray treatments, geographical direction, measuring date and date of application for 2nd 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 (1st 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 2nd 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 (1st experiment) and/or foliar spray with GA₃ solely or combined with P, K, P + K (2nd 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

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.

V.I.1- 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.I.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 %

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.

V.I.2. Creasing incidence:

Specific effect:

1- In this respect creasing incidence in Tanarif fruits as influenced by irrigation regime, measuring date and geographical direction of fruit carrier limbs and their combinations were investigated. Hence, creasing incidence was significantly increased when Tanarif trees irrigated after depletion of 25 % A.W. The reverse was found with irrigated after depletion 75 % A.W.

2- As for the specific effect of measuring dates, it is quite evident that the creasing incidence was gradually increased with advancement of fruit development from last week of November till harvesting date in late February during both seasons.

3- Concerning the specific effect of geographical direction showed the highest creasing percentage was always in concomitant to the carrier fruits branches of northern side of tree canopy as compared to southern side.

Interaction effect:

It is quite clear that the specific effect of each investigated factor had been reflected directly on the interaction effect of their combinations. Hence, the highest value of creasing % was in closed relationship to fruits of the northern sides of Tanarif trees irrigated after depletion of 25 % A.W. in late February. The reverse was true with the southern half of Tanarif trees irrigated after depletion of 75 % A.W. in late November. In addition, other combinations were in between.

V.I.3. Nutritional status (leaf and fruit rind mineral composition):

It is quite clear that both leaf and fruit rind N; P; K; Ca; Mg; Fe; Mn; Zn and Cu contents of Tanarif trees in response to specific and interaction effects of irrigation regime, geographical direction (north and south), fruit status (sound and creased) and their combinations were investigated during both 2002/2003 and 2003/2004 experimental seasons.

Specific effect:

1- Concerning the specific effect of irrigation regime (25, 50 and 75% A.W.), data obtained during both seasons revealed that two plant organs (leaf and fruit rind) followed typically the same trend of response as the change in each element content was individually concerned. In addition, data obtained during both seasons showed that (P; K; Ca, Mg contents) from one hand and (N; Fe; Mn; Zn; Cu contents) from the other followed two conflicted trends. Whereas P; K; Ca, Mg contents were significantly higher in both plant organs (peel & leaf) subjected to irrigation after depletion of 25 % A.W. while N; Fe; Mn; Zn and Cu contents were in concomitant to the irrigated after depletion of 75 % A.W.

2- With respect to the specific effect of geographical direction (north & south) which fruit rind and adjacent leaves to it were analyzed, data obtained revealed that both plant organs were similar in their response. Hence, both peel and leaves bearer branches located the northern half of tree canopy characterized by their content of N; P; K; Fe and Zn, while lower contents of Ca; Mg; Mn and Cu as compared to southern side.

3- as for the specific effect of fruit status from which peel and adjacent leaves to it were analyzed, data obtained revealed that both plant organs were similar in their response.

Generally, peel of the sound fruits and leaves nearer to them characterized by their significant higher Ca; Fe and Zn over the creased fruits. The reverse was true with N; P; K; Mg; Mn and Cu whereas, rind of creased fruits and adjacent leaves exceeded statistically the analogous ones of sound fruits.

Interaction effect:

Regarding the interaction effect of various combinations between irrigation regime, geographical direction and fruit status on leaf and fruit rind mineral composition, data obtained displayed that two opposite trend were generally detected. Data obtained of interaction effect revealed that:

1- Response of N content, whereas peels creased fruits and leaves nearer to them situated on northern limbs of Tanarif trees irrigated after depletion of 75 % A.W. was the richest N content, while the contrary was found with sound fruits and approached leaves situated on southern limbs of Tanarif trees and irrigated after depletion of 25 % A.W.

2- Leaf and peel P content followed similarly the same and the firm trend, whereas peels of creased fruits and leaves approached them situated northern branches of Tanarif trees irrigated after depletion of 25% A.W. was significantly richer in their P content as compared to analogous ones of the sound fruits and adjacent leaves situated on southern side of Tanarif trees irrigated after depletion of 75 % A.W. during the two seasons of study.

3- Referring leaf and fruit rind K % related to the interaction effect of various combinations between irrigation regime, geographical direction & fruit status, it could be generally detected that rind of creased fruit and leaves adjacent to them born on northern side of tree canopy and irrigated trees after depletion of 25 % A.W. were richer. On the contrary, peels of sound fruits and the nearer leaves to

them of southern branches of Tanarif trees irrigated after depletion of 75 % A.W. were the poorest in this respect.

4- The highest leaf and fruit rind Ca content were closely coupled to sound fruits and adjacent leaves situated on the southern limbs of Tanarif trees irrigated after depletion 25 % A.W. Contrary, to that the lowest value were always in concomitant to creased fruits and nearer leaves from it situated on northern side of canopy of Tanarif trees irrigated after depletion of 75 % A.W.

5- Data obtained revealed that the highest values of Mg content of both plant organs (peel & leaves) was coupled with those creased fruits and adjacent leaves situated within the southern limbs of Tanarif trees irrigated after depletion of 25 % A.W. Contrary to that, fruits of Tanarif trees irrigated after depletion of 75 % A.W. and situated on the northern limbs statistically the lowest value of Mg content.

6- Fruit peel and adjacent leaves of sound fruits borne on northern limbs of Tanarif trees irrigated after depletion of 75 % A.W. were statistically the largest values of Fe & Zn contents. However, the opposite was found with creased fruits which carrier branches on southern side of tree canopy of Tanarif trees irrigated after depletion of 25 % A. W. during the study.

7- With regard to the interaction effects of irrigation regime, geographical direction & fruit status, on fruit peel and leaves Mn content. In this regard, it was quite evident to be noticed that the highest value of Mn content was statistically coupled with the sound fruits and adjacent leaves situated within southern limbs of Tanarif trees irrigated after depletion of 75 % A.W. Moreover, the lowest value was always in closed relationship to the creased fruits and approached leaves born on the northern limbs of Tanarif trees irrigated after depletion of 25 % A.W.

SUMMARY AND CONCLUSION

8- With regard to the interaction effects of irrigation regime, geographical direction & fruit status, on fruit peel and leaves Cu content. In this regard, it was quite evident to be noticed that the highest value of Cu content was statistically coupled with the creased fruits and adjacent leaves situated within southern limbs of Tanarif trees irrigated after depletion of 75 % A.W. Moreover, the lowest value was always in closed relationship to the sound fruits and approached leaves born on the northern limbs of Tanarif trees irrigated after depletion of 25 % A.W.

V.II- Second experiment II: Effect of (GA₃; P; K) foliar spray in combination with application date and geographical direction on Tanarif sweet orange cultivar:

In this regard, specific and interaction effects of four investigated factors i.e., different foliar spray treatments (GA₃ 40 ppm solely or combined with P or K or/and P + K); geographical direction (north & south); fruit status (sound & creased) and date of application (June & July) as well as their possible combinations were studied regarding the influence of some fruit physical and chemical properties, creasing incidence and chemical composition for peel fruits and adjacent leaves.

Data obtained during both experimental seasons of 2002/2003 and 2003/2004 could be summarized as follows:

V.II.1- Fruit quality:

V.II.1.a- Fruit physical characteristics:

Specific effect:

1- Regarding the specific effect of different foliar spray treatments on the average of fruit weight; size; dimension (polar & equatorial diameters); fruit peel (weight

& thickness) and fruit juice (weight & volume) to various foliar spray solutions (GA_3 solely or combined with P or K or/and P + K), data obtained revealed that foliar spray with GA_3 solely or in combination with P or K or/and P + K (during both seasons), all resulted in increasing all the abovementioned investigated physical characteristics. Such trend was true during both seasons.

2- As for the specific effect of geographical direction however, the trend varied from one physical characteristics to another from one hand, but it 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 diameter) as compared to those of the southern limbs.

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

3- Regarding the specific relationship between fruit status (creased or sound) and its all investigated physical characteristics under study, it was so clear that the sound Tanarif fruits exhibited the higher values for all investigated physical characteristics. Such trend was true during both seasons and differences were more pronounced.

4- Concerning the specific effect of date of application (June & July) on all investigated physical characteristics, data obtained revealed that July foliar spray characterized by their significant higher all investigated physical characteristics under study as compared to June date of application during the two seasons of study.

SUMMARY AND CONCLUSION

Interaction effect:

Data obtained during both 2002/2003 and 2003/2004 seasons proved that each investigated factor (4 factors) reflected its own specific effect on interaction effects of its combinations. 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 2 trends.

1- 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 sprayed with GA₃ at 40 ppm + P at 200 ppm + K₂SO₄ at 3 % solution in July date of application. The reverse was found with creased fruits situated across the southern side of Tanarif trees treated with GA₃ at 40 ppm + P at 200 ppm during the two seasons of study.

2- The fruit rind (weight & thickness) and fruit juice (weight & size), where sound fruits of the southern branches and sprayed Tanarif trees with the GA₃ at 40 ppm + P at 200 ppm + K₂SO₄ at 3 % treatment in July date of application characterized by their abundant juice and thicker as well as heavier rind as compared with creased fruits situated across the northern limbs of the Tanarif trees sprayed with water (control) during the study. In addition, other combinations were in between in this regard.

V.II.1.b- 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 different foliar spray treatments; geographical direction; fruit status; date of application and their possible combinations.

Specific effect:

1- As for the specific effect of different foliar spray treatments, data obtained during both seasons revealed that foliar application with either the T₄ (GA₃ at 40 ppm + K₂SO₄ at 3 %) on the T₅ (GA₃ at 40 ppm + P at 200 ppm + K₂SO₄ at 3 %) gave the highest value in their juice TSS%, acidity % and vitamin C content from one hand while both foliar spray with GA₃ at 40 ppm solely or combined with P at 200 ppm showed the highest value of TSS/acid ratio during the two seasons of study.

2- As for the specific effect of geographical direction towards which fruits bearer branches were directed, data obtained during both seasons revealed that both TSS %, TSS/acid ratio from one hand acidity% as well as vitamin C content from the other followed two opposite trends. Hence, fruits of southern limbs were the richest in their juice TSS % and TSS/acid ratio from one hand but the poorest regarding acidity % and vitamin C content from the other during the study.

3- Regarding the specific effect of fruit status, data obtained revealed that, sound fruits had significantly increased both TSS % and acidity % as well as vitamin C content as compared with creased fruits. Such trend was true during both seasons and differences were more pronounced.

4- As the specific effect of date of application (June & July), data obtained during both seasons revealed that TSS %; total acidity; TSS/acid ratio and vitamin C content followed the same trend. Hence, fruits of trees sprayed in July were the richest in their juice TSS %; acidity %, TSS/acid ratio and V.C content as compared with fruits from trees sprayed in June.

Interaction effect:

1- It was quite evident that the specific of each investigated factor (4 factors) reflected on the interaction

effect of their combinations. Hence, sound Tanarif fruits of southern limbs of trees treated with the (GA_3 at 40 ppm + P at 200 ppm + K_2SO_4 at 3 %) foliar spray treatment in July characterized by the highest level of TSS %. The reverse was found with creased fruits situated across the northern branches and spray Tanarif trees with water in July during the two seasons of study. In addition, other combination were in between.

2- As for the total acidity content, data obtained indicated that sound Tanarif fruits situated across the northern half of canopy trees sprayed with the T_5 (GA_3 at 40 ppm + P at 200 ppm + K_2SO_4 at 3 %) significantly higher in their total acidity. The reverse was true of creased fruits situated across the southern side of tree sprayed with GA_3 at 40 ppm + P at 200 ppm in June during the two seasons of study. In addition, other combination were in between.

3- Concerning the interaction effect of TSS/acid ratio, in this concern, the highest value of TSS/acid ratio was found by creased fruits situated across the southern limbs of Tanarif trees sprayed with GA_3 at 40 ppm + P at 200 ppm foliar spray treatments in June. Contrary, was found with sound fruits situated across the northern branches in Tanarif trees sprayed with GA_3 at 40 ppm + K_2SO_4 at 3 % during the study. Moreover, other combination were in between.

4- Data obtained that the highest value of V.C. content were in closed relationship to sound fruits situated across the northern side of Tanarif trees sprayed with GA_3 at 40 ppm + P at 200 ppm + K_2SO_4 at 3 % foliar spray treatment in July while the reverse was true with creased fruits situated across southern side of Tanarif trees sprayed with water (control) in June. Other combination were in between.

V.II.2. Creasing incidence:

Specific effect:

In this respect creasing incidence in Tanarif fruits as influenced by different foliar spray treatments, date of application, geographical direction and measuring dates of fruits carrier branches and their combinations were investigated periodically from last week of November till harvesting in late February during both seasons. Data obtained revealed that as follows:

1- As for the specific of different foliar spray treatments, Tanarif trees sprayed with all different foliar spray treatments (GA_3 at 40 ppm solely or combined with P at 200 ppm or K_2SO_4 at 3 % or/and P + K treatments) decreased creasing percentage during the study as compared with control during the two seasons of study.

2- Data of application (June & July) didn't influence on creasing percentage of Tanarif fruits.

3- As for the specific effect of geographical direction, data showed that the highest creasing % was always in concomitant to the carrier fruits branches of the tree canopy.

4- Data revealed that the creasing incidence was gradually increase with advancement of fruit development from last week of November till harvesting in late February.

Interaction effect:

It was quite evident that the specific of each investigated factor (different foliar spray treatments, geographical direction; fruit status and measuring dates) reflected on interaction effect of their combinations. Hence, the highest creasing % was in closed relationship to fruits of the northern side of Tanarif trees sprayed with water (control)

in last week of February. The reverse was true with the southern half of Tanarif tree canopy sprayed with GA₃ at 40 ppm on the last week of November. However, other combinations were in between.

V.II.3- Nutritional status (Leaf and fruit mineral composition):

Leaf and fruit rind N; P; K; Ca; Mg; Fe; Mn; Zn and Cu contents of Tanarif cultivar in response to specific and interaction effects of different foliar spray treatments; geographical direction (north & south); fruit status (sound & creased); date of application (June or July) and their compositions were investigated during both 2002/2003 and 2003/2004 experimental seasons.

Specific effect:

1- Data obtained during both seasons revealed that two plant organs (leaf and fruit peel) followed typically the same trend of the response as the change of each element content was individually concerned.

2- Concerning the specific effect of different foliar spray treatments on leaf and fruit peel, data obtained that foliar spray with GA solely or combined with P or K or P + K increased all nutrient elements, in this concern foliar spray with the T₃ (GA₃ at 40 ppm + P at 200 ppm) significantly increased N, P and Mg while the T₄ (GA₃ at 40 ppm + K₂SO₄ at 3 %) foliar spray treatment the superior in leaf and fruit rind K content. In addition, Ca, Fe, Mn, Zn and Cu reached their peak in leaf and fruit rind of trees sprayed with the T₅ (GA₃ at 40 ppm + P at 200 ppm + K₂SO₄ at 3 %) during the two seasons of study.

3- As for the specific effect of geographical direction, however the trend varied from one element to another from

one hand. Hence, fruit rind and adjacent leaves of the northern direction were the richest N, P, K, Fe and Zn from one hand but the poorest regarding the southern side from the other. Moreover, fruit peel and leaf situated across the southern side of the tree canopy were the richest in their Ca, Mg, Mn and Cu contents whereas, the reverse was true with the northern side.

4- As for the specific relationship between fruit status (creased or sound) and its fruit rind and leaf mineral content, it was so clear that the sound fruit and adjacent leaves had significantly higher peel and leaf Ca, Fe, Mn and Zn as compared with creased fruit rind and adjacent leaf. Moreover, creased fruits showed the highest value of peel and leaf N, P, K, Mg and Cu contents as compared with sound fruits. Such trend was true during two seasons of study.

5- Concerning the specific effect of date of application on peel and leaf nutrient contents, data obtained revealed that July foliar spray date of application treatments significantly increased all nutrients as compared to June date of application during the two seasons of study.

Interaction effect:

Referring the interaction effect of various combinations between different foliar spray treatments, geographical direction on fruit rind and adjacent leaf mineral composition, data obtained displayed that 7 opposite trend were generally detected.

1- Creased fruits and leaves situated across the northern side of Tanarif tree sprayed with the T_3 in July significantly the richest leaf and peel N content. The reverse was true with sound fruit situated on southern side of the tree sprayed in June with the T_4 .

2- Creased fruits and leaves nearer to them situated across the northern side of tree sprayed with the T_3 in July

SUMMARY AND CONCLUSION

significantly higher leaf and rind P content while the reverse was true with sound fruits situated across southern side of tree sprayed with the T_2 in June.

3- Creased fruits and leaves adjacent to them situated across the northern side of the tree sprayed with the T_4 in July significantly higher value leaf and peel K content. Contrary, sound fruits and leaves situated across the southern side of the tree and sprayed with water in both June and July dates of applications.

4- Sound fruits and leaves approached to them situated across the southern branches of tree sprayed with the T_5 in July significantly the richest leaf and rind Ca and Mn contents. The reverse was true with creased fruits situated on northern side of tree and sprayed with water in June.

5- Creased fruits and leaves nearer to them situated across the southern side of Tanarif tree sprayed with the T_3 in July significantly higher fruit rind and leaf Mg content. Contrary, with sound fruits situated across the northern side of the tree and sprayed with water in June.

6- Sound fruits and leaves situated across the northern side of Tanarif tree sprayed with the T_5 in July significantly the richest leaf and peel Fe and Zn contents the reverse was true with creased fruits situated on southern side of tree and sprayed with water in June.

7- Creased fruits and leaves adjacent to them situated across the southern side of the tree sprayed with the T_5 in July significantly the higher value of peel and leaf Cu content. Contrary, sound fruits and adjacent leaves situated across the northern side of the tree and sprayed with water in June date of application.

V.II.5- Anatomical studies

The obtained results could be summarized as follows:

1-The examination of transverse section of "Tanarif" orange cv., indicated that pericarp was composed of well known six layers namely: the outer epidermis, the outer hypoderm, the outer mesocarp, the inner mesocarp, the inner hypoderm and the inner epidermis.

2- The anatomical initial symptoms of creasing phenomenon were observed, 36 days after fruit set, within the inner mesocarp layer cells.

3- Concerning the different stages of creasing phenomenon the obtained results indicated that the fruits which had taken from untreated trees (control) the anatomical symptoms of creasing were very clearly as compared with other treatments.

4- As for the developmental symptoms of creasing phenomenon, the fruits which had taken from the trees were irrigated after depletion of 75 % A.W. or foliar spray with GA_3 40 ppm + P at 200 ppm + K_2SO_4 3 %, the obtained results indicated that these symptoms were least clearly as compared with other treatments through five different stages of creasing phenomenon. Other treatments were in between.

Recommendation:

On the light of the obtained results it may be recommended that using foliar spray treatment with GA_3 at 40 ppm solely or combined with P at 200 ppm or K_2SO_4 at 3 % or (P + K) treatments 1st June may be recommended to improve Tanarif fruit physical & chemical, decreased creasing % and increasing fruit rind and adjacent leaf mineral contents.