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Physio-Chemical And Histological Studies On Some Navel Orange Cultivars Under Egyptian Condition

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ABSTRACT

This study was carried out during (2018/2019and 2019/2020) years in a private Orchard at Al Nubaria Region to study some physio-chemical and productivity of some navel orange cultivars named: Nave-late; Lane-late and Navelina (Citrus Sinensis L Osbek) budded on X 639 rootstock (Cleopatra mandarin X Poncirus trifoliate).The results revealed that Lane-late orange cultivar significantly has the highest values of shoot length, shoot diameter and leaf area. Moreover the highest significant number of leaves per shoot was obtained with Navelina orange cultivar. As for flowering and fruit set, the highest number of flowers per shoot was obtained for Nave-late orange cultivar, while Navelina orange cultivar significantly has the highest initial and final fruit set percentage. Leaves of Lane-late orange cultivar significantly has the highest nitrogen, phosphorus, potassium, iron and manganese, moreover leaves of Nave-late orange cultivar recorded the highest content of calcium and magnesium, while Nave-late orange cultivar significantly has the highest leaf content of zinc, copper and boron. Concerning the changes in endogenous total indoles and phenols for leaves and flowers through flowering and fruit set stages, obtained results showed that it's affected by type of navel orange cultivar and the physiological stage of organ for both seasons. As far leaf total indoles content, steadily increased in Navelina and Nave-late orange cultivars leaves and flowers by time till reached to the highest values in May, then gradually decreased by time till reached to the lowest values during June. Meanwhile, endogenous indoles of Lane-late orange cultivar take an adverse line, which steadily decreased during May, then gradually increased till June. With respect to flowers indoles content, all navel orange cultivars have gradually decreased till reached to a lower concentration during May. As for leaf phenols content, all navel orange cultivars steadily have increased by time till reached to a higher concentration, during June. Finally, as for flower phenols content, Navelina orange cultivar steadily increased by time till reached to a higher concentration. In contrary, Nave-late and Lane-late orange cultivars gradually decreased till reached to a lower concentration, during May. As for the results of the anatomy studies, which showed that, Navelina Navel orange cultivar, buds started to change from vegetative flowering and fruit setting earlier about from 2-3 weeks than the other Navel orange cultivars. Therefore, it can be conclude that, for increasing navel orange area and expanding marketing of fruits, it can be cultivate Nave-late, Lane-late or Navelina for to its distinct characteristics under Egyptian conditions.

Keywords: Navel orange, Nave-late, Lane-late, Navelina, vegetative growth, chemical studies, flower anatomy.

INTRODUCTION

Citrus (Citrus Sinensis L Osbek) is one of the leading fruit crops under tropical and sub-tropical conditions of the world with respect to its area and production, suitable soil and sufficient moisture available to sustain the trees. In Egypt, citrus occupies the first rank regarding cultivated area, production and exportation potentialities. The total citrus area in Egypt reached 456,082 feddans, of which fruiting area is 414,588 feddans with production of 4,245,684 tons according to the latest statistics of Ministry of Agriculture (2019).

Citrus orchards grown in the old lands face many problems that cause weakness and deterioration of trees, which was reflected in the returns of those orchards, including high level of ground water; the fragmentation of these areas; the progress of trees in age …. etc. This led farmers to head to the newly reclaimed desert land.

It is noticeable that some types of citrus fruit succeed under the prevailing conditions such as Valencia orange and Mandarins cultivars, while, seedless citrus cultivars, i.e. Navel orange cultivars fail under these conditions. In order to keep of the most important characteristic of the Egyptian orange (Navel orange), which has a good reputation in foreign markets, it was necessary to find appropriate application solutions to try to cultivate new cultivars of navel oranges under such conditions by introducing new cultivars that proved successful in the country of origin such as Nave-late, Lane-late and Navelina etc. Nevertheless, it was surprising that these cultivars varied in their degree of success under the conditions of new lands in Egypt.

Morphological characterization, nutrition status and hormonal level would be more rewarding in terms of accurate identification and characterization of most closely related cultivar at intra-specific level (Hegazi et al., 2014). Pervious trials dealt with the evaluation of some citrus cultivars (Khan et al., 2010; Abo-El-Ez et al., 2011; Hdider et al., 2013; Hegazi et al., 2014; Nasser et al., 2014; Khan et al., 2016; Nabil et al., 2016; Amorim et al., 2018; Herath et al., 2018 and Abd El-Rahman et al., 2020).

The goal of the present study was to evaluate vegetative growth traits and tree nutrition status as well as hormonal level of some newly introduced Navel orange cultivars namely: Nave-late, Lane-late and Navelina under Egyptian conditions.

MATERIAL AND METHODS

This study was carried out during 2018/2019and 2019/2020years in private Orchard at Al Nubaria Region to evaluate some morphological and chemical characteristics of some navel orange cultivars (Nave-late, Lane-late and Navelina) (Citrus Sinensis L Osbek) budded on X 639 rootstock (Cleopatra mandarin X Poncirus trifoliate). The selected trees were six year-old, spaced at 4*6 meter apart, grown in sandy soil and irrigated by the drip irrigation system.

The experiment comprised three cultivars arranged in a completely randomized design, each cultivar replicated three times and each replicate included five trees.

The following parameters were adopted to evaluate the tested cultivars:

1- Vegetative growth:

In early March for every experimental season four limbs (about 0.5 inch in diameter) well distributed around periphery of each devoted tree were carefully selected and tagged. Ten spring flushed shoots per each limb were labeled. Thereafter, at mid of September were recorded for ten shoots of piece previously labeled.

a- Shoot: length (cm), diameter (mm) and number of leaves per each spring flushed shoots were recorded.

b- Leaf area (cm^2): was determined for forty leaves, collected from those ranked 3rd or 4th from the top of the previously labeled shoots per each replicate and calculated according to Singh and Snyder (1984) by using the formula: Leaf area = 2/3 length X width.

c- Blooming and fruit set:

The previous four limbs which selected and tagged, total flowers were counted at full bloom for each cultivar. Then the total numbers of fruitlet at the first week of May and at the fourth week of June were recorded: whereas the initial fruit set and final fruit set for the experimental navel orange cultivars were calculated as follows:

- Initial fruit set (%) = (Number of fruitlet / Number of flowers) X 100.
- Final fruit set (%) = (Number of fruitlet / Number of flowers) X 100.

3- Leaf and flower content of total indoles and phenols

It's were determined in fresh leaves (the second and third leaves in labeled shoots) during April, May and June and in flower pedicels during April and May for each season. Total indoles was determined as mg/g dry weight according to Larsen et al. (1962) and as modified by Selim et al. (1978) and total phenols was determined mg/g dry weight as described by Daniel and George (1972).

4- Leaf mineral elements content

Leaves samples were carefully taken out from the treated plants fresh weight was recorded, then, washed several times with tap water followed by distilled water. Samples were dried in an oven at 70 ^oC for constant weight and ground in blender. Then, 0.5g. of dried samples was digested using the H_2SO_4 and H_2O_2 as described by Cottenie (1980). The extracted samples were used to determine the following minerals content of leaves: N, P, K, Ca and Mg as macro-elements and Fe, Zn, Mn, Cu and B as micro-elements as follows:

a- Macro- elements:

Total nitrogen (N %) was determined by modified micro-Kjeldahl procedure according to Chapman and Partt (1978).

Phosphorus (P%) was determined by using "specal" spectrophotometer at 882 U.V. (Model- Beckman Du 7400) according to the method described by Murphy and Riley (1962).

Potassium (K%) was determined using flame photometer (Model-JENWAY– pfp7 Flame Photometer) according to Piper, (1950).

Calcium (Ca%), Magnesium (Mg%) were determined in plant digest by titration with the verse Nate solution according to Richards (1954).

b- Micro-elements:

Iron (Fe), Zinc (Zn), Manganese (Mn), Cupper (Cu) and Boron (B) were determined as ppm by using Atomic Absorption Spectrophotometer according to Brandifeld and Spincer (1965).

5- Anatomical studies:

Bud samples were taken from lateral bud each two weeks from mid-January till first May to follow differentiation stages. Then, specimens were killed and fixed for at least 48 hrs. in F.A.A. (10 ml formalin, 5 ml glacial acetic acid, 35 ml distilled water and 50 ml ethyl alcohol 95%). The selected materials were washed in 50% ethyl alcohol, dehydrated in a normal butyl alcohol series, embedded in paraffin wax of melting point 560C, longitudinal sectioned to a thickness of 20 micron, double stained With Erythrosin and Crystal Violet, cleared in xylene and mounted in Canada balsam according to Nassar and El- sahhar, (1998). Slides were analyzed microscopically and Photo-Micro-Graphed.

6- Experimental design and statistical analysis

The experiment was conducted in a completely randomized design. The statistical analysis was carried out according to Snedecor and Cochran (1980). Averages were compared using the L.S.D. values at 5% level (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

1. Vegetative growth characteristics

As shown in Table (1), data reveal that all vegetative growth parameters expressed average shoot length and shoot diameter, average number of leaves per shoot and average leaf area were significantly affected by type of navel orange cultivar in both seasons. Longest significant shoot was obtained with Lane late orange cultivar followed by Nave late orange cultivar, while Navelina orange cultivar resulted in significantly the shortest one in both seasons. Lane late orange cultivar had significantly the highest values of shoot diameter followed by Navelinaorange cultivar.

On the other hand, the lowest value of this one was attained by Nave-late orange cultivarin both seasons. Highest significant number of leaves per shoot was obtained with Navelina orange cultivar followed by Nave-late orange cultivar, whereas Lane-late orange cultivar induced significantly the lowest values for both seasons. Lane late orange cultivar had significantly the highest values of leaf area followed by Navelina orange cultivar. On the other hand, the lowest value was attained by Nave-late orange cultivar in both seasons.

From the previous results ,it can be conclude that Nave-late, Lane-late & Navelina navel orange cultivars have with significant variations in vegetative growth parameters in this study , whereas, cultivar genotype has an important role in this variations . Moreover, the Eco-Histological factor as a result of the interaction between the cultivar genotype and climate under experimental orchard. These results are in agreement with those obtained by Soni and Randhawa (1975), Hittalmani (1977), Sayed and Abdel-Aziz (2011), Nasser et al (2014) and Mishra et al., (2018) whom found that, the magnitude of growth and productivity vary with the number of factors such as: environment, species, varieties and age of the trees.

2- Blooming and fruit set:

Flowering and fruit set measurements as average number of flowers/shoot and percentage of initial and final fruit set performance for cultivars under study will be affected by type of navel orange cultivar during the two studied seasons, whereas, data in Table (2) revealed that Nave-late cultivar gave the highest number of flowers per shoot with significant differences compared to the other cultivars, followed by

Lane-late orange, while Navelina cultivar significantly has the lowest values of this one for both seasons. In the contrary, Navelina orange cultivar significantly gave the highest initial fruit set % and final fruit set % values followed by Lane-late orange cultivar, whereas, Nave-late orange cultivar was the lowest percentage of this one for both seasons.

These results are in concordance with those obtained by Nasser et al. (2014) whom showed that with significant effect the highest values of flowering percentage were obtained by Lane-Late cultivar followed closely by Parent Spring and Fisher. Heren, Nave-late gave the highest with significant differences in fruit set percentage, followed closely by Lane-Late, New Hall, Navelina and Leng, respectively. Recently, Abd El-Rahman et al. (2020) in a study to evaluate three navel orange cultivars namely Washington, New hall and Nave-late, mentioned that Washington navel orange cultivar attained the highest values of fruit set percentage followed by both 'New hall' and Nave- late cultivars. Generally Davenport, (1990) mentioned to blooming and fruit- set percentage in citrus trees positively correlated with tree nutritional status and carbohydrate content in the previous season. Moreover, Erner et al., (1993) whom obtained that the direct effect of the auxin on abscission, which causes a delay of abscission and may result eventually in an increase in setting percentage.

3- Leaf elements content:

a. Macro- elements:

As shown in Table (3), data reveal that leaf macro-elements content namely Nitrogen, Phosphorus, Potassium, Calcium and Magnesium percentage significantly were affected by navel orange cultivar type in both seasons.

The highest with significant variation in leaf magnitude of Nitrogen, Phosphorus and Potassium was obtained by Lane-late orange cultivar followed by Nave-late orange cultivar, while Navelina orange cultivar significantly was the lowest magnitude of these elements in both seasons.

Data showed that Navelina orange cultivar significantly has the highest leaf magnitude of Calcium and Magnesium followed by Nave-late orange cultivar. On the other hand, the lowest leaf magnitude of calcium was attained by Lane-late orange cultivar for both seasons. The obtained results are in harmony with those obtained by Nasser et al., (2014) found that the highest values of N, P, Ca, and Mg were obtained Nave-late and Lane-Late orange cultivars, while Cara Cara, Spring and Leng orange cultivars were the lowest. In additions, Abd El-Rahman et al. (2020) demonstrated that the highest values of leaf N% was obtained for Nave-late cultivar and Washington navel orange leaves attained the highest values of K%.

b- Leaf micro-elements content:

As shown in Table (4), data reveal that leaf content of iron, zinc, manganese, copper and Boron significantly affected by navel orange cultivar type in both seasons. The highest with significant effect in leaf magnitude of Iron, Zinc and Manganese was obtained with Lane-late orange cultivar, followed by Nave-late orange cultivar. On the other hand, the lowest leafmagnitude of Iron, Zinc and Manganese was recorded with Navelina orange cultivar during both seasons. Data showed that Nave-late orange cultivar leaves significantly has the highest leaf magnitude of copper and boron, followed by Lane-late orange cultivar. Meanwhile, the lowest leaf magnitude of copper and boron was attained by Navelina orange cultivar for both seasons.

The obtained results are in agreement with those obtained by Nasser et al., (2014) in a study to evaluate some newly introduced Navel orange cultivars namely, New Hall, Navelina, Nave-late, Lane Late, Cara Cara, Spring, Fisher, Parent, Fukumoto and Leng, found that the highest values of iron, zinc, manganese were obtained Lane-late orange cultivar, while Spring, Fisher and Fukumoto orange cultivars had the lowest values. In this respect, Abd El-Rahman et al. (2020) in a study to evaluate three navel orange cultivars namely Washington, New hall and Nave-late, demonstrated that the highest values of iron, zinc, manganese in the leaves was obtained from New hall cultivar compared with the other studied cultivars.

4- Indoles and phenols content:

a- Leaf indoles content:

Leaf indoles of Navelina and Nave-late orange cultivars steadily increased by timing till reach to the highest level during May then gradually decreased till reach to a lower level during June (Table, 5). Contrary, obtained results of endogenous leaves indoles in Lane-late orange cultivar take an adverse line, whereas, steadily decreased by timing till reach to the lowest level during May , then, gradually increased till reach to a higher level during June for both seasons.

b- Flower indoles content:

Data in Table (5) showed that Nave-late orange cultivar has the highest leaf magnitude of indoles, followed by Navelina orange cultivar. While the lowest leaf magnitude of this one was attained by Lane-late orange cultivar during April for both seasons. During May, all navel orange cultivars flowers indoles contents gradually decreased till reach to a lower level for both seasons.

c- Leaf phenols content:

Leaf endogenous phenols for all navel orange cultivars under study steadily increased by timing till reach to the highest levels during June (Table, 6). On the other hand, Lane-late orange cultivar has the highest leaf magnitude of phenols during June, followed by Nave-late orange cultivar. Whereas the lowest leaf magnitude of this one was attained by Navelina orange cultivar for both seasons.

d- Flower phenols content:

Data in Table (6) showed that Navelina orange cultivar has the highest flower magnitude of phenols, followed by Nave-late orange cultivar. While the lowest flower magnitude of this one was attained by Lane-late orange cultivar during April. During May, Navelina orange cultivar flower Phenols contents steadily increased by timing till reached to a higher level. Whereas, Nave-late and Lane-late orange cultivars flowers Phenols contents gradually decreased till reached to a lower levels in the same period for both seasons.

Nevertheless, endogenous hormones will be effect on cells performance which reflects on plant organs performance. Therefore, both indoles as assimilation product and Phenols as growth retardant play an important role in tree growth, blooming and fruit-set , whereas, the data presented showed a significant fluctuation in its levels for orange cultivars, understudy during this period.

Endogenous hormones and their balance play a modulating role in the mobilization of nutrients to the developing organs. Temperature, florigenic promoter, inhibitors, auxin, cytokinin, gibberellin, carbohydrates, amino acids, phenols, enzymes and genetic factors play important role in the floral induction of citrus. The elements and mechanisms whereby endogenous and environmental stimuli affect fruit growth are being interpreted and this knowledge may help to provide tools that allow optimizing production and fruit with enhanced nutritional value, the ultimate goal of the Citrus Industry. These results are in line with those obtained by Ma and Liu,(1998)whom mentioned to there is a positive relationship between IAA and GA and the growth of plant organs as well as the development of natural growth regulators in plants; especially in citrus fruits. Usenik et al., (2005), phenolic compounds are thought to be related to the growth vigor of trees, however, there were not a causal link between phenolic compound content and dwarfism Hatfield et al., (1999), obtained that phenolic compounds have been shown to have both stimulatory and inhibitory effects on plant development. They play a significant rolein cell wall development act in lignin biosynthesis. Kojima (1999) indicated that the endogenous hormones (IAA or Zeatin) enhanced fruit growth during fruit growth and development. The total phenolic content and some mineral nutrition were found to be different according to vigour capacity and there was a direct relationship between vigor and total phenol content (Moghadam et al. 2007). Finally, Abd El-Rahman et al. (2020) illustrated that Washington leaves had the significant highest values followed by 'New hall' leaves at the three dates of sampling, with slight exceptions, while 'Nave-late' cultivar had the lowest value in this concern.

Tables:

Table (1): Vegetative growth performance of some Navel orange cultivars during (2018/2019and 2019/2020)

Cultivar	Shoot length (cm)	Shoot diameter(cm)	No. of leaves/shoot	Leaf area(cm^2)
		First season		
Nave-late	12.83 b	2.05 c	9.02 b	12.97 c
Lane-late	13.02 a	2.21 a	8.73 c	18.52 a
Navelina	10.98 c	2.12 b	9.17 a	16.63 b
		Second season		
Nave-late	12.78 b	2.09 c	9.21 b	13.02 c
Lane-late	13.03 a	2.18 a	9.02 c	18.34 a
Navelina	11.37 c	2.13 b	9.33 a	16.86 b

Values followed by the same letter (s) are not significantly different at 0.05.

Table (2): Flowering and fruit set performance of some Navel orange cultivars during (2018/2019and 2019/2020) seasons.

Cultivar	Number of flowers/shoot	Initial fruit set (%)	Final fruit set (%)
		First season	
Nave- late	714.8 a	11.94 c	0.25 c
Lane- late	289.2 b	13.48 b	0.58 b
Navelina	255.3 c	24.17 a	2.04 a
		Second season	
Nave-late	553.5 a	12.23 c	0.17 c
Lane-late	291.7 b	15.27 b	0.43 b
Navelina	246.8 c	28.84 a	3.59 a

Values followed by the same letter (s) are not significantly different at 0.05.

Table (3): Leaf macro-elements performance of some Navel orange cultivars during (2018/2019and 2019/2020) seasons.

Cultivar	N (%)	P (%)	K (%)	Ca (%)	Mg (%)
	First season				
Nave-late	2.17 b	0.23 b	1.25 b	3.56 b	0.33 b
Lane-late	2.31 a	0.26 a	1.29 a	3.49 c	0.28 c
Navelina	2.11 c	0.18 c	1.17 c	3.67 a	0.37 a
	Second season				
Nave-late	2.21 b	0.26 b	1.28 b	3.61 b	0.34 b
Lane-late	2.39 a	0.31 a	1.33 a	3.53 c	0.31 c
Navelina	2.13 c	0.23 c	1.21 c	3.74 a	

Values followed by the same letter (s) are not significantly different at 0.05.

Table (4): leaf micro-elements performance of some Navel orange cultivars during (2018/2019and 2019/2020) seasons.

Cultivar	Fe (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)	B (ppm)
	First season				
Nave-late	122.7 b	67.3 a	78.9 b	16.7 a	29.7 a
Lane-late	126.3 a	64.7 b	81.3 a	13.2 b	24.9 b
Navelina	116.2 c	62.8 c	75.4 c	12.9 c	18.3 c
	Second season				
Nave-late	125.4 b	74.1 a	82.1 b	17.3 a	33.4 a
Lane-late	129.8 a	71.2 b	84.9 a	13.9 b	27.1 b
Navelina	118.3 c	69.4 c	78.2 c	12.4 c	22.7 c

Values followed by the same letter (s) are not significantly different at 0.05.

Table (5) Changes in leaf and flowers indoles mg/g dry weight content of some Navel orange cultivars during blooming and setting stages for (2018/2019and 2019/2020) seasons.

Cultivar	Leaf indoles content (mg/g)				Flower indoles content (mg/g)		
	Sample date						
	April	May	June	Mean (A)	April	May	Mean (A)
	First season						
Nave-late	0.46 c	0.62 b	0.33 d	0.47 B	0.53 a	0.21 b	0.37 A
Lane-late	0.63 b	0.31 d	0.52 bc	0.49 B	0.21 b	0.15 c	0.18 C
Navelina	0.57 bc	0.78 a	0.47 c	0.61 A	0.27 b	0.22 b	0.25 B
Mean (B)	0.55 A	0.57 A	0.44 B		0.34 A	0.19 B	
	Second season						

Nave-late	0.56 ef	0.79 bc	0.49 fg	0.61 b	0.62 a	0.31c	0.47 A
Lane-late	0.84 ab	0.43 g	0.69 d	0.65 b	0.31c	0.25 d	0.28 C
Navelina	0.74 cd	0.90 a	0.58 e	0.74 a	0.36 b	0.35 bc	0.35 B
Mean (B)	0.71 A	0.71 A	0.59 B		0.43 A	0.30 B	

Values followed by the same letter (s) are not significantly different at 0.05.

Table (6) Changes in leaf and flowers indoles content of some Navel orange cultivars during bloomingand setting stages for (2018/2019and 2019/2020) seasons.

Cultivar	Leaf phenols content mg/g				Flower phenols content mg/g		
	Sample date						
	April	May	June	Mean (A)	April	May	Mean (A)
	First season						
Nave-late	0.95 e	1.12 cd	1.24 bc	1.10 B	1.10 e	1.38 d	1.50 C
Lane-late	0.91 e	1.34 b	1.51 a	1.26 A	1.38 d	1.68 b	1.91 A
Navelina	0.87 e	1.03 de	1.14 cd	1.01 B	0.89 f	0.98 f	1.13 C
Mean (B)	0.91 C	1.16 B	1.30 A		1.12 c	1.35 b	
	Second season						
Nave-late	0.56 ef	0.79 bc	0.49 fg	0.61 B	0.62 a	0.31c	0.47 A
Lane-late	0.84 ab	0.43 g	0.69 d	0.65 B	0.31c	0.25 d	0.28 C
Navelina	0.74 cd	0.90 a	0.58 e	0.74 A	0.36 b	0.35 bc	0.35 B
Mean (B)	0.71 A	0.71 A	0.59 B		0.43 A	0.30 B	

Values followed by the same letter (s) are not significantly different at 0.05.

5- Anatomical study:

Regard to the transformation of vegetable buds for Navel orange cultivars into flower buds during three timing of blooming for Navel orange in this study :(i" Initiation, ii" Induction & iii" Differentiation) through 8 samples at: - mid of January; - mid of February; - the 1st & mid of March; - the 1st week of April and - the 1st week of May (Figs. a, b, c, d and e).

As for mid of January sample , data presented in (Fig .a) revealed that Navelina navel orange buds have been reached to bud initiation stage and the primary and secondary organs of flowers are now clearly defined when compared to other navel orange cultivars. Whereas, Nave-late cv., buds tend to swell, this means that Nave-late buds at bud induction stage. While, no change appeared in the lane-late buds.

Nave-late navel orange

Lane late navel orange

Navelina navel orange

Fig (a): Longitudinal section (500nm) in Nave-late, lane-late and Navelina navel orange cultivars buds at mid of January.

Regard to mid of February data presented in (Fig. 2.b) noticed that flower organs (sepals, petals, oil grand, initial of pollen green and initial of ovule) of Navelina buds appeared. While Nave-late buds appeared to be at the begin of initial stage .On the other hand, Lane-late bud begun to swell (bud induction stage).

Fig. (b): Longitudinal section (500nm) in Nave-late, lane-late and Navelina Navel orange cultivars budsat the mid of February.

Concerning of the 1st of March samples , obtained slides at (Fig.c) showed that Navelina buds reached to full bloom, whereas, the stigma, ovary and pollen grains appeared in the carpel and the presence of oil glands. As well as the presence of ovule inside the ovary than the others.

Fig (c) : Longitudinal section (500nm) in Nave-late, lane-late and Navelina navel orange cultivars budsat the 1st of March.

Slides in (Fig.d) showed that Navelina Navel orange cv., buds appeared at the begin of differentiation stage, whereas, petals and pollen grains are full and ovarian swelling and formation of ovule and ovarian chambers. While, Nave-late and lane-late Navel orange cultivars buds seem to be at full-bloom stage, whereas, Stigma, Ovary and Pollen grains appeared in the carpel. Also, the presence of oil glands, the appearance of the flower ovarian cavity, beside, it was noticed that Stigma of lane-late becomes deformed.

Fig (d): Longitudinal section (500nm) in Nave-late, lane-late and Navelina navel orange cultivars budsat mid of March.

Concern of slides for the three Navel orange cultivars under study i.e. Nave-late , Lane-late and Navelina, (Fig. e) cleared that, Navelina Navel orange cv., become at the begin of fruit setting stage While , Nave-late & Lane-late Navel orange cultivars at full-bloom stage ,whereas, petals and pollen grains are full and ovarian swelling and formation of ovule and ovarian chambers.

Fig. (e): Longitudinal section (500nm) in Nave-late, lane-late and Navelina navel orange cultivars buds at the 1st of April.

Regard to the anatomy slide for these Navel orange cultivars under this study,(Fig.f) indicated that flowers of Navelina orange loss of the secondary organs and style and stigma ,while, small fruitlets have been appearance, which led to the use of cross section. On the other side, Nave-late & Lane-late flowers reached to the beginning of fruit- set stage.

Fig. (f): Longitudinal section (500nm) in Nave-late, lane-late and horizontal section (500nm) Navelina navel orange cultivars buds at the 1st of May.

As for the results of the previous slides, it can be conclude that, Navelina Navel orange cv., buds started to change from vegetative flowering and fruit setting earlier about from 2-3 weeks than the other Navel orange cultivars, under study, which help the procedures under reclaimed soil regions to avoid some bad climatic influences that affect the navel orange during blooming and fruit set stages and the under such conditions.

In-addition, anatomical studies and the tree nutrient status cleared that, bud initiation of Navelina was earlier two weeks when compared to lane-late or nave-late which confirms that due to the genetic trait for Navelina cultivar, and other physiological factors as: nutrient status and endogenous Indoles / Phenols balance .

These results are in line with those obtained by, Acosta-Durán et al. (2007); León, A. R. (1992); Jacobs and Rubery (1988); Hikal et al. (2017) and Hussein and Sahar (2018) whom indicated that Calcium (Ca), essential for the cell walls and the structure of the plant, maintains the structure of the plant tissue and acts as a factor that maintains cohesion cells together. Without calcium, the development of new root and shoot tissue stops (cell division and extension).Also, some phenolic compounds have a role as natural auxin transport regulators in plants. Endogenous indoles and reduced in contents of total phenols, this will be led to increasing in the percentages of the bud differentiation and fruit set, as well as the reduction in the period of flowering, and finally the increasing in the yield. As for the results of the previous slides, it can be conclude that, Navelina Navel orange cultivar buds started to change from vegetative flowering and fruit setting earlier about from 2-3 weeks than the other Navel orange cultivars.

Conclusion: From these findings, it can be recommended to expand the cultivation of Navel new orange cvs., under new reclaimed soil conditions , it will must be import new cultivars as Nave-late, Lane-late and Navelina and evaluated before it is allowed to spread.

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