



Evaluation Physical and Chemical Characteristics of Some Seedlings Date Palm Fruits (Maghal) in the North Delta Egypt

Khaled Abd-El Hamed, Darwesh Rasmia, S.S. and Eman M.M. Zayed

Abstract: Egypt ranked as the first production country of dates, dates trees cultivation is wide and important fruits in Egypt which provide a food source for population and animal, date palm trees described as very heterozygous led to non- true to type fruits by seeds production, many fruits seedlings trees cultivated in most areas that have good characteristics, it may be related to the nearest cultivar find in this area, thus the main object of this work to evaluate some physical and chemical attributes of these seedlings fruits cultivations. The present results proved that, the major tested fruit characteristics included fruit weight, length, diameter, length/diameter, volume and seed weight and length additionally fruit chemical contents of the evaluated seedling palm tree numbered 4,6,7 and 9 showed insignificant variance among comparing cultivar Amhat cv., on the other hand as evident from obtained results the evaluated seedling palm tree Masoud and Neil Omraa* clarified not statistical differs between Zaghloul cv as comparing cultivar for major physical and chemical measurements. Clustering dendrogram exhibited strongly relationship between evaluated seedling palm trees and comparisons according to their fruit physical and chemical characteristics. consequently, these seedling palms are considered as desired palm trees for producing soft dates cultivars as well as all of these seedling trees needs to importance enhancing of cultivation practice to increasing quality and production fruits for consumers.*

Keywords: Chemical, Date palm, Evaluate, Fruits, Physical, Seedlings

*Famous region name

Introduction:

Date palm (*Phoenix dactylifera* L.) one of the most fruits in Egypt as soft, semi dry and dry cultivars that were found in all cultivated areas, date palm as a dioecious species produced about 3000 cultivars popular of the different regions of the world, date palm produced by seeds led to many seedling trees cultivars have different characters between mother trees (**Zaid** and **Wet** 1999a), Some of these date palm cultivars exhibited a great growth and fruiting characteristics and can utilize for commercial applications (**Shaker et al.** 2000). Dates fruits one of oldest fruit trees in the Middle East Arab region (**El-Shibli** and **Korelainen** 2009) which is ranking marketing based on physical characteristics and fruit moisture and sugars contents (**Abdalla et al.** 1996), dates carbohydrates in the form of fructose and glucose, easily absorbed by the human body, dates contain high concentrations of protein 0.3%, moisture contents were at the highest levels (66.3 and 67.4%) in Haiani dates (**Hussein** and **El-desouki** 1992, **Al- Showiman** 1998), total sugars content ranged from 73.65% to 81.77% for dry cultivars and from 75.10% to 87.27% for semi-dry cultivars. Non reducing sugars (41.85%-46.52 %) of dry cultivars, while reducing sugars (71.83%-79.08%) were present in high amounts in the semi-dry cultivars when evaluate 8 dates cultivars in upper



Egypt (**Youssef** et al 1999), fruits of date palm fruit described as single, oblong, a fleshy pericarp and a membranous endocarp, one-seeded berry with a terminal stigma, fruit length about from 2.80 cm in Aglany to 5.92 in Zaghoul (**Mansour** 2005), dates fruits are main income source and staple food for local populations in many cultivated countries, and have played significant roles in the economy, society, also able to make changes in environment countries (**Chao** and **Krueger** 2007), Egypt have the first country of dates yields (**FAO** 2015), date palm fruit characters as weight, length, size, color and contents of TSS, total sugars, acidity, phenols and proteins contents, fruit chemical contents varied due to cultivar, region, climate, amount of fertilization and type of cultural practices (**El-Houmaizi** *et al.* 2007 and **Al-Rawahi** *et al.* 2005), total sugars about 60% of the dry matter weight of flesh of Deglet nour and Alig date palm fruit, , while reducing sugars content was higher in Alig from Tunisia (**Chaira** *et al.* 2007), dates contain carbohydrates (total sugars 44% - 88%), fats (0.2% - 0.4%), proteins (2.3% - 5.6 %), fibers (6.4% - 11.5%), unsaturated fatty acids as palmitoleic, oleic, linoleic and linolenic acids, vitamin A, C, B1, B2, folic acid and nicotinic acid of date flesh that most important in the arid and semi - arid region (**Al-Shahib** and **Marshall** 2003, **El-Sharabasy** 2009), physical and chemical as fruit weight, length, size, total sugars, SSC, tannins and fibers content depending on different cultivars and environmental conditions ((**Ismail** *et al.* 2008, **Rizk** *et al.* 2007, **Mohamed** *et al.* 2004), fruit flesh have the important source of sugar (~81-88%, mainly fructose, glucose and sucrose), small amounts of protein (**Al-Farsi** *et al.*, 2005), Fruits of date palm passing in three stages are khalal (biser), rutab and tamar (**Kassem** 2012), maximum units for flesh weight, fruit length, T.S.S, total sugars, total acidity and total fibers percentages were recorded in the date palm seedling in Kom-Ombo , in addition six semi-dry seedling date palms showed highest parameters compared to Sultany cv (**Abo-Rekab** 2013), dates fruits contains crude protein 1.21 , crude fat 1.73 , crude fibre 2.26 , ash 1.88, moisture contents 1.16, carbohydrate 91.76, moreover, Swei contain 0.48 % acidity, total sugars and T.S.S were (81.49%) and (91.20%), Cu, Na, Ca, Mg and K were 94.9, 81.7, 79.62, 66.33 & 55.11mg/100g respectively, Zn 0.86mg/100g and Fe 4.56mg/100g (**Shaba** *et al.* 2015 and **Ebtehal** 2014), dates fruits rich in carbohydrates (44-88%), mainly glucose and fructose, proteins 2.3-5.6%, and fats 0.2-0.5%, good source of vitamin B complex, dietary fiber, minerals, phenolics, carotenoids and antioxidants (**Nasir** *et al.* 2015). To sum-up, evaluate fruits physical and chemical characters of some selected seedlings soft date palm at some ways of the North Delta Egypt and possibility to increasing and enhancing these fruits quality by different cultivation practices in the future.

Materials and methods:

This work was done from 2015-2016 found at some ways in the North Delta Egypt to evaluate some of date palm seedlings soft cultivars and Amhat and Zaghoul cvs. as the comparison palm tree. Selected trees numbered 4,6,7 and 9 consumed at Rutab stage described as (about 10- 12 years, 6-11 (m) in height, 75-1.25 cm in diameter) while selected trees Masoud* and Neil Omraa* consumed at Khalal or Basr as Zaghoul cv. also in Rutab stages as Hayani cv. and described as (10-12 years, 3-4 m in height, 1-1.5 m for trunk diameter), grown in loam soils and have high yield and fruit quality, selected palm trees uniformed in all growth characters and subjected same practices cultivation, all these trees pollinated in March by pollen grains from mail grown at the same area, different maturity stages were (Hababok stage from April, Kemri stage from last May, Khalal stage from August and Rutab stage from September). fruit seedling tree number (4 and 9) have a golden brown color, fruit seedling tree number 6 have brown, seedling palm tree number 7 have dark brown fruit, fruit seedling trees Masoud* and Neil Omraa* have red fruit color in the Khalal stage and dark brown color in the Rutab stage.



Trees morphology estimations were recorded as

- 1- Pinnate number, pinnate apex, pinnate arrangement, pinnate area length (cm),
- 2- Spine arrangement, spine area length (cm), spine numbers,
- 3- Leaf length (cm), leaf numbers, leaf base width (cm),
- 4- Bunch length, bunch numbers, bunch weight (kg) and yield weight/year (kg)

$$\text{Fruit retention (\%)} = \frac{\text{Total number of retained fruits per bunch}}{\text{Total scores number per bunch}} \times 100$$

Fruits were picked at the Khalal and Rutab stages to estimate different characters as

- 1- Fruit weight and flesh weight (g)
- 2- Fruit length and fruit diameter (cm)
- 3- Fruit length / diameter (cm) and fruit volume (cm)
- 4- seed weight (g) and seed length (cm)

Fruit chemical characters as

Total soluble solids TSS % in fruit juice was determined by hand refractometer..

Total sugar, reducing sugars as described by **Shales and Schales** (1945)

non-reducing sugars by differentiate between total and reducing sugars

Titrateable acidity: as described by **A.O.A.C** (1995), percentage as percentage by titration against NaOH (0.1 N) using phenolphthaline as an indicator, results were converted to percent of malic acid (as the dominant organic acid in the fruit)

Total Soluble Protein: Total soluble protein levels were measured method of **Bradford** (1976).

Amino acids: were determined by using ninhydrin reagent according to **Moore and Stein** (1954).

N,P,K, Ca, Mg, Fe % and Mn, Zn, Cu and B mg/kg : according by (**Jackson** 1973).

Fruits were selected from each tree as randomized and three replicates were used (9 fruits per replicate).

Clustering dendrogram was performed on the fruit physical and chemical traits using Euclidean distance matrix (**Legrade** 1983 and **Everitt Brian** 1998)

Statistical Analysis

The selected trees was arranged in 3 replications as Randomized Complete Block Design (RCBD) (**Snedecor** and **Cochran** 1990)

*Famous region name

Results and Discussion:

Trees physical attributes:

Seedlings palm trees morphology estimations attributed to pinnate numbers, pinnate apex pinnate arrangement and pinnate area length, spine arrangement, spine area length (cm) spine numbers, leaf length, leaf numbers, leaf base width, bunch length, bunch numbers, yield weight/ year and bunch weight (kg) have different results as

Pinnate numbers, apex, arrangement and area length cm.: numbers of pinnate for evaluated seedling palm tree (Table 1) showed that, the selected seedling trees No. 6, 7 and 9 produced significant variance 225,215 and 225 in the 1st season and 233,220 and 235 in the 2nd season respectively comparing Amhat cv that have 185 and 189 successively for 1st and 2nd seasons, moreover the selected seedling trees No. 6 and 9 scored great numbers of pinnate 233 and 235 in the 2nd season than Zaghoul cv. 210 pinnate, evaluated seedling trees Masoud* and Neil Omraa* haven't differs between Zaghoul cv. In concerning to the pinnate



apex and arrangement (Table 1) the selected seedling palm trees exhibited insignificant differs with comparing trees Amhat and Zaghoul cvs. To shed light upon the pinnate area length (Table 1) the statistically variance was found between selected seedling trees in respective order 4,6,7, Masoud* and Neil Omraa* 350,400,400,415 and 350 and 355,420,420,420 and 355 cm. in order to the 1st and 2nd seasons with comparable tree Amhat cv 300 cm, meanwhile the selected seedling palm trees No 4 and Neil Omraa* reflected statistically differs 350 and 355cm. in order to 1st and 2nd seasons with comparing tree Zaghoul cv 420cm area length of pinnate.

Spine arrangement, area length (cm) and numbers: Data in (Table 1) proved spine arrangement had non-significant differs were detected between all tested seedling palm trees and comparing trees cultivars Amhat and Zaghoul cvs in the two successful seasons. According to perusal data in the (Table 1) on the spine area length cm, all selected seedling palm trees presented the highest area length upon comparable Zaghoul 25 and 25 consecutively for two tested seasons and statistical differs in between, all selected seedling palm trees recorded highest spine area length 82,90,85,87,50 and 80 in the same order for seedling trees and 1st season and 85,92,80,90,50 and 80 in order for 2nd season. but this area length recorded lowest value than Amhat cv. that have 133 and 135 for two seasons respectively. In relation to spine numbers obtained in (Table 1) the selected seedling palm tree Masoud* confirmed the lowest spine numbers 40 for two tested seasons without differs between Zaghoul cv 45 for two tested seasons meanwhile the other selected seedling palm trees produced highest spine numbers upon two comparing trees for two seasons. these previous results on the pinnate numbers, apex and arrangement, area length and spine arrangement, area length and numbers were in agreement with those found by **Elhoumaizi** 2002, **Hammadi** *et al.* 2009,

Leaf length (cm), numbers and base width cm : the obtained data in (Table 2) revealed that leaf length in different tested seedling palm trees 4,9 and Neil Omraa* showed non-significant variance between them and the comparing tree Amhat cv. 480 and 482 cm for 1st and 2nd seasons successively and significant shortest than Zaghoul cv 525 cm for two tested seasons, meanwhile seedling trees No. 6,7 and Masoud* exposed 510, 510, 510, 510 and 500 and 520 in order to 1st and 2nd seasons without statistical differs with Zaghoul cv. attributed selected seedling palm trees leaves numbers /tree (Table 2) proved the lowest significant numbers of leaves/tree was related to seedling trees No. 4,6,9 and Neil Omraa* in order 85, 83,87 and 80 leaves/tree for 1st season and 90, 87,93 and 87 leaves/tree for 2nd season comparable to Amhat and Zaghoul cvs in succession 95 and 98 and 97 and 97 leaves/tree for two tested seasons. The present data (Table 2) on leaf base width of all evaluated seedling palm trees possess higher leaf width than comparable trees Amhat cv and Zaghoul cv. (11 cm) for each one for two tested seasons

Bunch length cm, numbers and bunch weight Kg: Regarding to length of bunch trees (Table 2) illustrated the tallest bunch obtained by selected seedling palm trees No. 4,9, Masoud* and Neil Omraa* 225,215,230 and 228 for 1st season and 250,220,235,235 and 235 for 2nd season upon Amhat cv 175 and 183 cm. for two tested seasons with differs in between additionally these values were insignificant variance with Zaghoul cv 225 and 250 cm for two tested seasons. Concerning bunch numbers/tree it is clear that, the selected seedling palm tree No. 7 scored great numbers of bunch/tree 13 and 14 for two tested seasons respectively compared with Amhat and Zaghoul cvs 11 and 11 and 11 and 11 sequenced for two cultivars and seasons, in general results of bunch numbers haven't significant differs between comparable cultivars and selected seedling trees. The corresponding values of bunch weight (Table 2) showed the selected seedling tree No. 6 and 7 create great weight 21.7 and 22.5 kg and 20.2 and 22.5 Kg in succession for two seedling palm trees and tested seasons without significant differs between two comparable cultivars Amhat and Zaghoul, little



significant weight of bunch was obtained by seedling trees Masoud* and Neil Omraa* 15.5 and 16.7 and 17.0 and 17.5 respectively for two seedling trees and seasons, these results agreement by **Elsafy *et al.* 2015, El-Salhy *et al.* 2016** .

Yield weight/year and Fruit retention %: The maximum weight of yield/ year (Table 2) was occurred with selected seedlings palm trees No. 6 and 7 that gave 250 and 265 and 275 and 280 kg/year respectively without non-significant variance in between and Amhat cv 250 and 265 kg/year, selected seedling trees No. 4,9, Masoud* and Neil Omraa* haven't significant variance between Zaghoul cv 170 and 185 kg/year for two tested seasons and less than Amhat cv. Data in (Table 2) related to fruit retention showed that, the greatest percent of fruit retention take place under selected seedling palm trees No. 7 and Masoud* 75.0 and 76.2 and 72.7 and 72.7 % in the same order for two seedling trees and seasons without differs between Zaghoul cv, whereas selected seedling palm trees No. 4,6,9 and Neil Omraa* attain percent fruit retention upon Amhat cv 62.0 and 62.0 for two seasons with non-significant differs between them. These previous results in agreement with **El-Kosary 2009, Abo- Rekab *et al.* 2014, Bashir *et al.* 2014**.

Fruit physical attributes:

Date palm fruits were different from each cultivar dependent on external factor as temperature degree in the North, Middle and Upper Egypt and classified to soft, semi dry and dry cultivars which have a big differences in between in the fruit characteristics physical and chemical, postharvest, harvest, shelf life additionally the marketing, as well as the fruit physical and chemical contents can be done to distinguish between selected seedlings palm more than can be revealed the relationship between seedlings and comparable trees as Amhat and Zaghoul cvs

Fruit and Flesh weight (g): The values of fruit weight recorded in (Table 3 Fig 1) cleared that, selected seedling palm trees Masoud* and Neil Omraa* 34.8 and 36.1 and 22.0 and 26.4 g statistically heavier compared than comparable cultivars Amhat and Zaghoul 7.3 and 7.3 and 14.8 and 14.4 g sequenced for two cvs and seasons, moreover selected seedling palm trees No. 4,6, and 7 recorded great weight upon Amhat cv and less than Zaghoul cv. little weight for fruits was found under seedling tree No. 9. In concerning to flesh weight have same trend of fruit weight as the selected seedling trees Masoud* and Neil Omraa* produced highest flesh weight 32.2 and 33.1 and 20.3 and 24.6 g upon Zaghoul cv. 12.6 and 12.2 g in the same order for two seasons with statistically significant difference, sequenced by seedling palm No.4,6 and 9 which haven't statistically significant difference between Amhat cv, and less than Zaghoul cv for 1st and 2nd seasons, lowest flesh weight was related to seedling tree No 9 less than two comparable cultivars Amhat and Zaghoul for two tested seasons.

Fruit length, diameter, fruit length/diameter (cm) an volume (cm): obtained results from (Table 3 Fig 1 and 6) corresponding to fruit length (cm) showed the selected seedlings palm trees Masoud* and Neil Omraa* produced the significant longest fruits 7.5 and 7.8 and 5.6 and 6.0 cm in the same order for two cultivars and seasons greater than fruit length for two comparable cultivars Amhat and Zaghoul cvs 3.2 and 3.2 and 4.8 and 4.8 cm respectively, shortest fruits gained from seedling tree No. 9 that measured 2.9 and 3.2 cm respectively. In the second season seedling palm trees No. 4 and 7 showed non statistical variation between Zaghoul cv 4.8 and 4.8 cm which greater than Amhat cv.

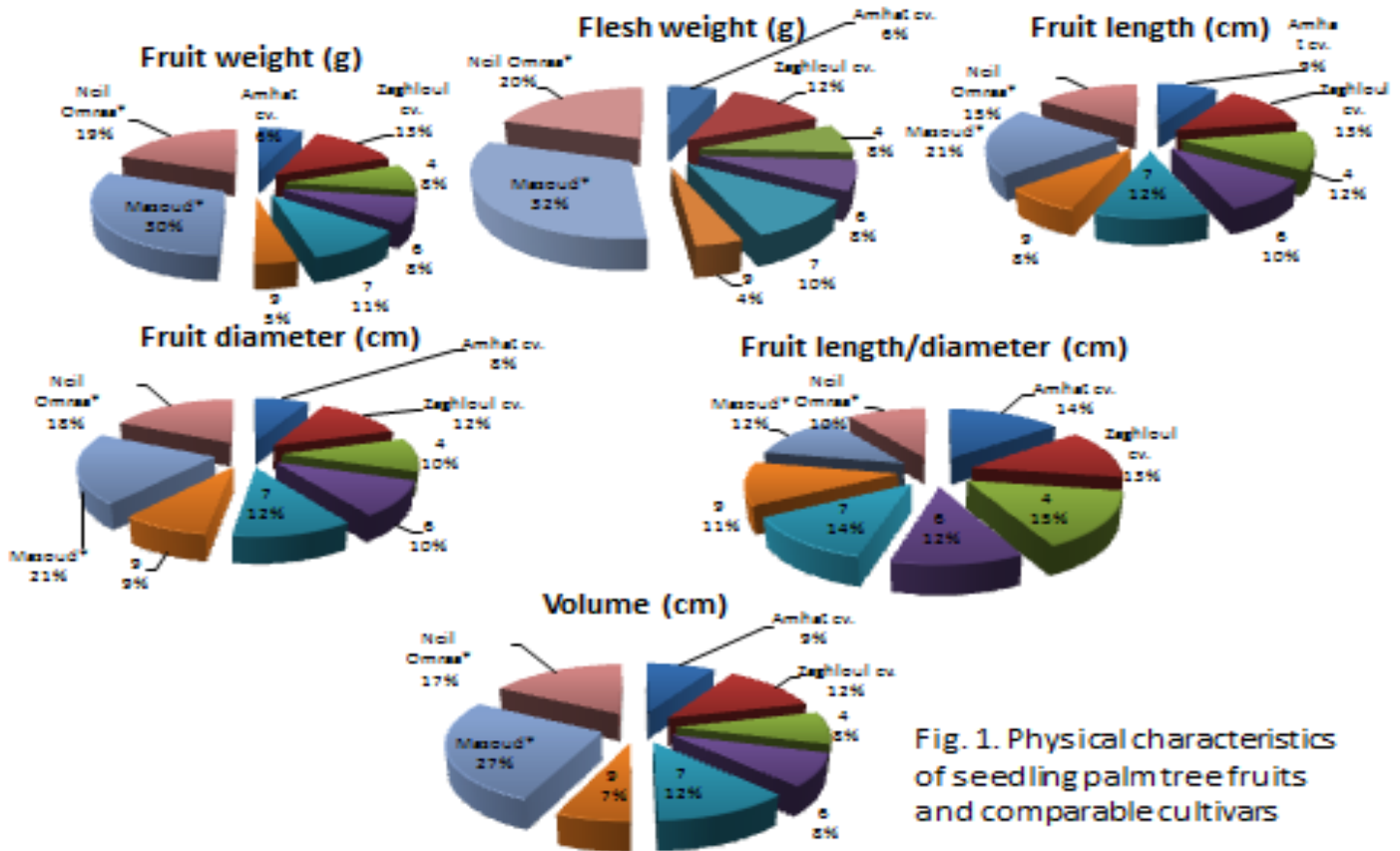


Fig. 1. Physical characteristics of seedling palm tree fruits and comparable cultivars

According to data in (Table 3 and Fig 1 and 6) relevance to fruit diameter cm, significant maximum measuring diameter outcome from seedling palm trees Masoud* and Neil Omraa* 3.8 and 4.1 and 3.3 and 3.5 cm in the order of two cvs and seasons compared to Amhat cv 1.4 and 1.4 cm for two tested seasons and Zaghloul cv 2.3 and 2.3 cm for two seasons, furthermore, the other seedling palm trees No. 4,6,7 and 9 have statistical wide fruits than Amhat cv in the two tested seasons and have narrow fruits than Zaghloul cv. Results of fruit length/diameter cm showed significant variation (Table 3 and Fig 1 and 6) between seedling palm trees No. 6,7,9, Masoud* and Neil Omraa* 1.9 and 1.9 and 2.0 and 2.2 and 1.8 and 1.9 and 1.9 and 1.9 and 1.6 and 1.7 with comparable two cultivars Amhat and Zaghloul 2.3 and 2.3 and 2.1 and 2.1 respectively for trees and 1st and 2nd seasons. With respect of fruit volume (Table 3 and Fig 1 and 6) greatest statistical fruit volume was found with seedling palm trees Masoud* and Neil Omraa* 16.1 and 18.6 and 10.3 and 12.6 cm in order of two trees and seasons compared to Amhat and Zaghloul cvs 5.2 and 5.2 and 7.5 and 7.5 cm in the same sequence for cultivars and seasons graduated by seedling tree No. 7 that recorded 7.3 and 7.5 cm without statistical differs with Zaghloul, whereas seedling No. 4 and 6 exhibited non-significant variance with Zaghloul cv.

Seed weight g and length cm: data in (Table 3 Fig 2 and 6) on the fruit weight indicated that, heaviest seeds were found related to seedling palm tree Masoud* 2.6 and 3.0 g for 1st and 2nd respectively upon two



comparable cvs Amhat and Zaghoul 1.1 and 1.1 and 2.2 and 2.2 g in order for cvs and seasons, seedling trees No. 4 and 7 weighted 1.7 and 1.8 and 1.6 and 1.7 g more than Amhat cv and lowest than Zaghoul cv.

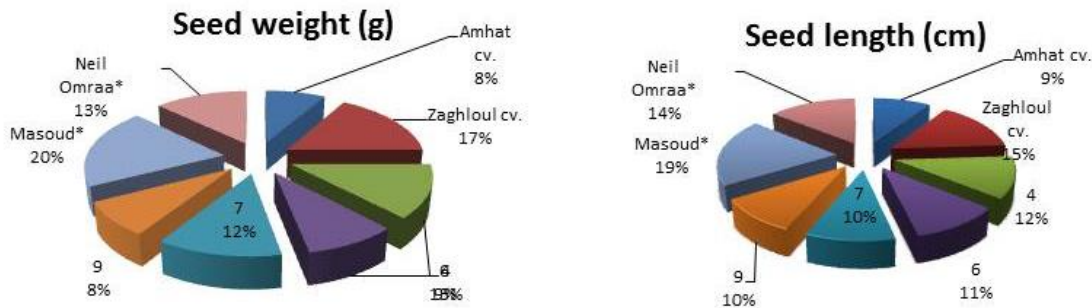


Fig. 2. Seed weight and length of seedling and comparable trees

To looking the results on seed length (Table 3, Fig 2 and 6) the statistical tallest fruits were gained by seedling palm trees Masoud* 4.8 and 5.0 cm compared to Amhat and Zaghoul cvs 2.3 and 2.3 and 3.6 and 3.6 in the same order for cultivars and two tested seasons, graduated by seedling palm tree Neil Omraa* 3.5 and 3.6 upon Amhat cv and without significant variation with Zaghoul cv. moreover selected seedling trees No. 6,7 and 9 measured length fruits 2.6 and 2.6 cm and 2.5 and 2.6 cm and 2.4 and 2.4 cm without differs with Amhat cv. Same results are found **Metwaly et al.** (2009), **Hasnaoui et al.** (2011), **Faissal et al.** 2013, **Osman** (2008), **Soliman** (2006), **El-Agamy et al.** (2003) , **Hussein et al.** (2001), **Rizk et al.**(2003), **Héla et al.**(2012), **Iqbal et al.**(2008), **Abdel Moneim et al.** (2012) **Haseeb et al.** (2014), **Idris et al.** (2014), **Omaima et al.** (2015) recently **Soliman et al.** (2016)

Fruit Chemical attributes: fruit chemical contents take place the main factor to identified fruit quality

TSS %: in concerning to percentage of Total Soluble Solids (TSS) % in (Table 4 and Fig 3) proved the highest contents of TSS % was found in the evaluated seedling palm tree number 4 tended to possess great TSS 31.5 and 33.2 % which without significant differs between Amaht cv. 30.8 and 30.8 % for 1st and 2nd seasons and lowest than Zaghoul , graduated by seedling trees No. Masoud* and Neil Omraa* which owned TSS% contents less than two comparable trees Amhat and Zaghoul, lowest statistical contents of TSS% produced with seedling tree No. 6 which gave 22.2 and 22.9 % for two seasons respectively.

Total sugars, Reducing sugars and Non-reducing sugars %: Results on the percentage of total sugars (Table 4 Fig 3) revealed the highest rate of total sugars 73.2, 73.8 and 73.3 and 73.5 % come out by seedling palm trees No. 4 and 6 respectively with insignificant differs in between and above two comparable cultivars Amhat and Zaghoul cvs 67.3 and 67.3 % and 68.2 and 68.2 % in order to cultivars and two fruiting seasons, while seedling trees No. 7,9, Masoud* and Neil Omraa* has not possess statistically significant difference in between and two comparable cultivars. Belonging to fruit contents of reducing sugars percentage, superior contents of value of reducing sugars in the fruit seedling palm trees No. 4,6 and 9 that produced 49.5 and 49.8 % and 42.6 and 42.3 % and 50.4 and 50.1% respectively for trees and two fruiting seasons above two comparable cultivars Amhat cv 31.0 and 31.0 % for two fruiting seasons and Zaghoul cv 37.2 and 37.2 % , whereas the other seedling trees No. 7 and Masoud* and Neil Omraa* haven't a significant differences between Zaghoul cv.

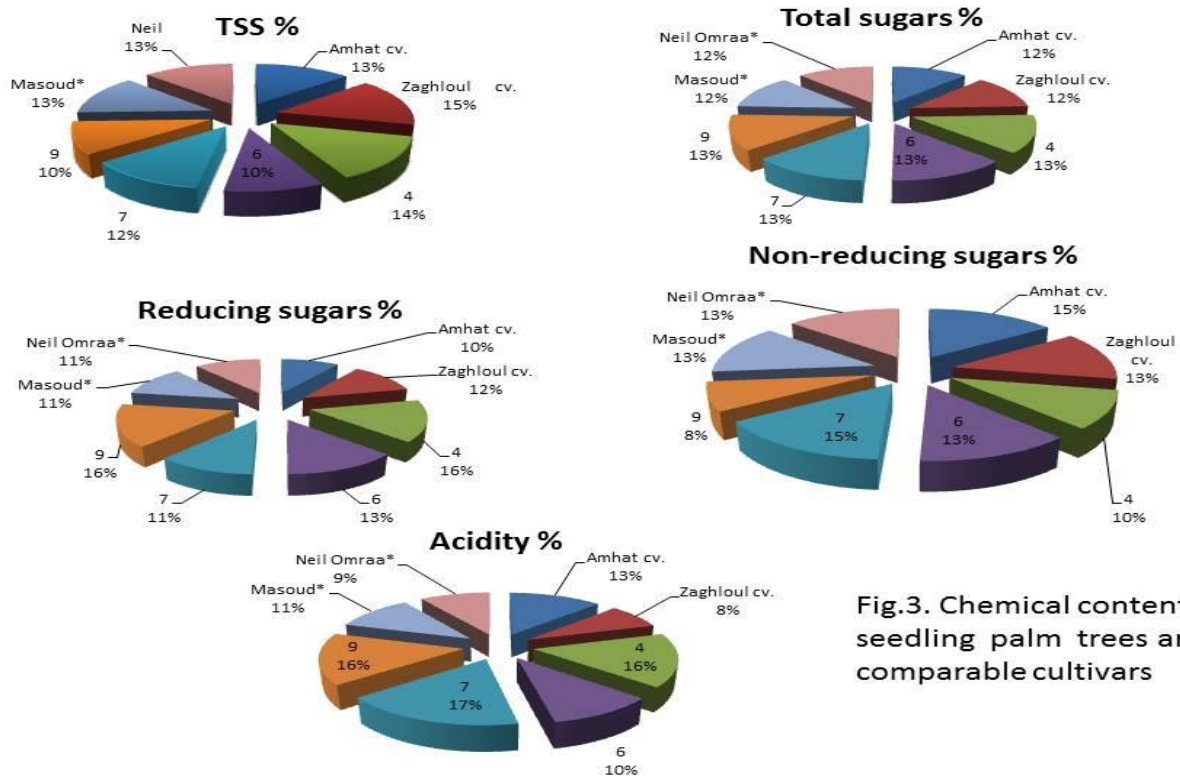


Fig.3. Chemical contents of seedling palm trees and comparable cultivars

In relation to non-reducing sugars declared statistical differences between selected seedling trees and comparable trees on the rates of non-reducing sugars, seedling palm tree No. 7 possess the highest value fruit contents of non-reducing sugars 35.8 and 37.3% without insignificant differs with Amhat cv 36.3 and 36.3% for two seasons respectively graduated by seedling trees Masoud* and Neil Omraa* 31.5 and 31.2% and 32.1 and 32.0% without significant variation with Zaghoul cv. 31.0 and 31.0% in order of trees and two fruiting seasons, meanwhile, significant reductions of non-reducing sugars fruit contents were observed from seedling tree No. 9 that have 18.2 and 19.5% compared to comparable cultivars.

Acidity %: Results on the fruit acidity (Table 4 Fig 3) revealed that great significant rate of acidity were measured by seedling palm trees No. 4,7 and 9 that have rate 0.53 and 0.50% and 0.57 and 0.53% and 0.51 and 0.49% above two comparable cultivars Amhat and Zaghoul cvs. 0.41 and 0.43% and 0.25 and 0.25% in order to trees and seasons, seedling trees No. 6, Masoud* and Neil Omraa* recorded insignificant differs in between and upon Zaghoul cv. in the same time have lowest percentage of fruit acidity than Amhat cv.

Fruit proteins contents mg/g f.w.: maximum fruit protein contents (Table 4 Fig 4) create by seedling palm trees No. 4,6,7 and 9 that have 1.9 and 2.0 mg/g f.w. and 1.7 and 1.8 mg/g f.w. and 1.8 and 1.9 mg/g f.w. and 1.9 and 2.0 mg/g f.w. successively for trees and seasons above Zaghoul cv 1.4 and 1.5 mg/g f.w. and lowest than Amhat cv. 2.4 and 2.7 mg/g f.w., lowest fruit proteins contents refer to seedling tree Neil Omraa* 1.1 and 1.2 mg/g f.w.

Amino acids mg/g f.w.: Fruit amino acids contents of evaluating seedling trees (Table 4 Fig 4) showed more amino acids contents referred to seedling trees No. 4,7 and 9 that gain 3.1 and 3.2 mg/g f.w. and 4.0



and 4.1 mg/g f.w. and 3.5 and 3.7 mg/g f.w. upon two comparable cultivars Amhat cv. 1.6 and 1.8 mg/g f.w. and Zaghoul cv. 2.3 and 2.3 mg/g f.w. meanwhile, seedling trees No 6, Masoud* and Neil Omraa* haven't significant differs in between and Zaghoul cv for two seasons.

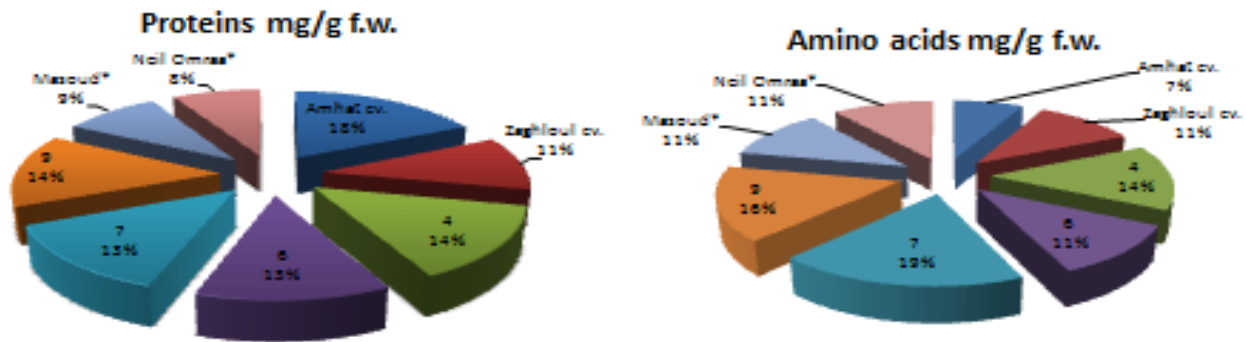


Fig. 4. Proteins and Amino acids of seedling and comparable palm trees

Minerals N,P,K, Ca, Mg and Fe % : analyzed of fruit extract showed that significant differs (Table 5) between seedling palm trees No. 7 and 9 contain the highest fruit nitrogen percent 2.01 and 2.03 and 2.37 and 2.39% above Amhat and Zaghoul cvs 1.98 and 1.99 and 1.50 and 1.52 % in succession for two cultivars and seasons, fewer statistical nitrogen contents achieved from seedling trees Masoud* and Neil Omraa* compare to Amhat and Zaghoul cvs. The values of phosphorus analyzed in the fruits extract of tested seedling trees are shown in (Table 5) illustrated the highest phosphorus accumulated was attain in the Masoud* and Neil Omraa* without significant differs with comparing trees Amhat and Zaghoul cvs. 0.09 % for each one and seasons graduated by tested seedling palm trees 4,6,7 and 9 that produced 0.05 and 0.06 and 0.04 and 0.05 and 0.04 and 0.04 and 0.04 and 0.05 % respectively without significant differs in between. Potassium accumulated fruits was highest as for seedling trees No. 4 and 6 that have 0.32 and 0.33% and 0.39 and 0.39% in order for two seasons comparable to Amhat and Zaghoul cvs 0.25 and 0.26% and 0.30 and 0.31% for two cultivars and seasons successively, while insignificant variance were exist between all other seedling trees with comparable cultivars.

Fruit calcium contents showed the superior value 0.42 and 0.42 % respectively for two seasons in the seedling tree No. 4 above compare trees Amhat and Zaghoul cvs 0.12 and 0.14% and 0.23 and 0.24 % respectively, while the other seedling trees recorded the lowest calcium contents than comparable cultivars.

Mg fruit accumulated (Table 5) presented insignificant differs between all tested seedling trees and comparing trees Amhat and Zaghoul cultivars.

Higher Fe fruit contents was come out from the seedlings trees No. 6 and 7 produced 0.24 and 0.25% and 0.24 and 0.26% greater than Amhat and Zaghoul cvs 0.12 and 0.14% and 0.12 and 0.15% respectively for trees and two fruiting seasons without significant differs between them (Table 5) the other seedling trees under evaluated haven't differs with comparable cultivars.

Mn, Zn, Cu and B mg/kg: Seedling trees No. 4,6 and 7 under evaluated bring out the most Mn fruit contents (Table 6) 26.69 and 26.76 mg/kg and 26.39 and 26.46 mg/kg and 26.29 and 26.34 mg/kg above comparing trees Amhat and Zaghoul cvs. 21.49 and 21.49 mg/kg and 20.89 and 20.96 mg/kg consecutively for seedling trees and two fruiting seasons.



Zn fruit contents analyzed showed insignificant variance between selected seedling trees and comparing cultivars for two fruiting seasons.

Evaluated seedling trees 4 and 6 were confirmed the highest contents of Cu 26.60 and 26.68 mg/kg and 28.20 and 28.23 mg/kg (Table 6) respectively with highly significant differs between Amhat and Zaghoul cvs. 19.60 and 20.71 and 23.0 mg/kg and 23.40 mg/kg mg/kg, meanwhile seedling tree Masoud* and Neil Omraa* hasn't arise significant variance between them and Amhat and Zaghoul cultivars.

The greatest B fruit contents concerning to seedling tree 9 which accumulated 10.1 and 10.2 mg/kg (Table 6) compared to Amhat and Zaghoul cvs. that have 6.9 and 6.92 mg/kg and 6.90 and 6.94 mg/kg, minimum fruit contents of B obtained by seedling trees 4 and 6 compared to Amhat and Zaghoul cvs.

These results were agreement with **Al-Doss** *et al.* (2001), **El-Kosary** (2003), **Sakr** *et al.* 2010, **Al- Jasser** (2009), **Salama** *et al.*(2014), **Omar** *et al.* (2014), **El-Sohaimy** and **Hafez** (2010), **Nadeem** *et al.* (2011), **El - Merghany** and **Zaen El – Daen** (2013), **Kacem-Chaouche** *et al.* (2013), **Sadiq** *et al.* (2013), **Said** *et al.* (2014), **Mortazavi** *et al.* (2015), **Farag** *et al.* (2014), **Ismail** *et al.* (2015) and **Qadri** *et al.* (2016)

Identification of evaluated seedling trees by Dendrogram:

the selected evaluated and comparisons trees were also confirmed in a dendrogram based on two characteristics as fruit physical and chemical attributes, generally as to the physical attributed (Fig. 5), concerning the fruit and flesh weight, fruit length and diameter, in addition to seed weight and length, all cultivars come out for two main groups, the first one contain cultivars numbered as 1,2,3,4,5 and 6, the cultivars numbered 7 and 8 were gathered in the second main group. The first one could be grouped into more subclusters. While fruit length diameter have two main group cultivars, the first group contain numbered cultivars 1,2 and 3, the second group contain numbered cultivars 4,5,6,7 and 8, two groups possess more subcluster, the fruit volume forming at two group 1,2,3,4,5,6 and 8 in the first group, while the cultivar number 7 only in the second group. Regarding to the chemical attributes, fruit TSS % divided into two main groups, the first included the numbered cultivars 1,2 and 3, the numbered cultivars 4,6,5,7 and 8 in the second main group which divided into two subcluster, the numbered cultivar 4 and 6 in first subcluster, whereas the numbered cultivars 5,7 and 8 were clustered together in the second subcluster, the cultivars separated into for three main collection in the total sugars and acidity % , the first one involved cultivars No. 1 and 2, the second comprised the cultivars No. 3,4,5,6,7 and 8, moreover the second group divided into two subcluster, the first subcluster in the total sugars contain 3,4 and 5 cultivar number, while the second subcluster have 6,7 and 8 cultivar number, in the acidity the numbered cultivars divided into the subclusters, 3 and 4 under one subcluster, 5 and 6 under second subcluster, 7 and 8 in the last subcluster. The cultivars under reducing and non-reducing sugars were divided into two main groups, the first one own numbered cultivars 1,2,5,7,8 and 4, meanwhile the numbered cultivars 3 and 6 were collected in the second group, the first one group forming more subclusters. Fruit proteins mg/g f.w. aggregated in the two group, the first included one cultivar is numbered 1, the second included numbered cultivars 2,3,4,5,6,7 and 8, this group could be divided into two subcluster as the cultivars numbered 2,3,4,5 and 6 could be grouped together in the one subcluster, the second subcluster enclosed with 7 and 8 cultivars. The cultivars under amino acids have



two main groups, the first one involved numbered cultivars 1,2,3 and 4, the second group have 5,6,7 and 8, each group have two subcluster. Therefore from the previous fruit physical and chemical results of these evaluated seedling trees of date palm could be consider the promising cultivars to increasing high fruits yield and quality for Egypt consumers.

References

- [1] Abdalla M., Sabour A., EL-Makhtoun F. and Ahmed A. (1996): Effects of some environmental conditions on vegetative, yield and fruit properties of Sewy date cultivar. *Zagazig J. Agric. Res.* 23 (2).
- [2] Abdel Moneim E. S., Itimad A. Abd Elhafise and Abdelrahim A.M.(2012): Comparative Study on Five Sudanese Date (*Phoenix dactylifera* L.) Fruit Cultivars. *Food and Nutrition Sciences*,3: 1245-1251
- [3] Abo-Rekab Z.A., Ghada A. Ali, El-Kafrawy T. M. and Madboly E.A. (2014): Physico Chemical Characters and Molecular Genetic Evaluation of Selected Dry Date Palm Seedling Trees. *Middle East Journal of Applied Sciences*, 4(4): 931-941
- [4] Abo Rekab, Zeinab A. M. (2013): The genetic diversity analysis of some Egyptian Oasis seedling date palm fruits and its physical characteristics and chemical composition. *J. Biol. Chem. Environ. Sci.*, 2013, Vol. 8(3):433-450
- [5] A.O.A.C.(1995): Official Methods of Analysis. 13th Ed. Association of Official Analytical Chemists, Washington D.C., USA.
- [6] Al-Doss, A.A., Aly M.A. and Basha M.A. (2001): Morphological and Agronomical variations among some date palm cultivars grown in Saudi Arabia using principal component and cluster analysis. *ElMalik Saud J. Agric. Sci.*, 13(1): 3-18.
- [7] Al-Farsi, M., Alasalvar, C., Morris, A., Baron, M., and Shahidi, F. (2005): Comparison of antioxidant activity, anthocyanins, carotenoids, and phenolics of three native fresh and sun-dried date (*Phoenix dactylifera* L.) varieties grown in Oman. *Journal of Agricultural and Food Chemistry*, 53(19): 7592-7599
- [8] Al-Jasser M.S. (2009): Physicochemical composition of date fruit (*Phoenix dactylifera* L.) from a. offshoots and cultured cells at different stages. *J Food Technol*, 7:102-105.
- [9] Al-Rawahi, A.S., Kasapis S. and Al-Bulushi I.M. (2005): Development of a date confectionary: Part 1. Relating formulation to instrumental texture. *Intr. J. Food Prop.* 8:457-468.
- [10] Al-Showiman S. S. (1998): "Al Tamr, Ghetha wa Saha (Date, Food and Health)," Dar Al-Khareji Press, Saudi Arabia
- [11] Al-Shahib W. and Marshall R. J. (2003): "The Fruit of the Date Palm: Its Possible Use as the Best Food for the Future," *International Journal of Food Science & Nutrition*, 54 : 247-259.
- [12] Bashir M. A., Ahmad M., Altaf F. and Shabir K. (2014): Fruit quality and yield of date palm (*Phoenix dactylifera* L.) as affected by strand thinning. *The Journal of Animal & Plant Sciences*, 24(3): 951-954



- [13] Bradford, M.M. (1976): A Rapid and Sensitive Method for the Quantitation of microgram quantities of protein utilizing the principal of protein – Dye Binding. *Analytical Biochemistry* 72, 248-254.
- [14] Chaira, N., Ferchichi A., Mrabet A. and Sghairoun M. (2007): Chemical composition of the flesh and pit of date palm fruit and radical scavenging activity of their extracts. *Pakistan Journal of Biological Sciences*, 10 (13): 2202-2207
- [15] Chao, C.C.T., and Krueger, R.R. (2007): The Date Palm (*Phoenix dactylifera* L.): Overview of Biology, Uses, and Cultivation. *Hort Science*, 42 (5): 1077-1082.
- [16] Ebtehal A. A. AlTamim (2014): Comparative study on the chemical composition of Saudi Sukkari and Egyptian Swei date palm fruits. *Journal of American Science* 2014;10(6):149- 153
- [17] El-Agamy, S.Z., Mahdy T.K. and Khalil O.A. (2003): Behavior studies of Dajana and Sakkoti date palm cultivars under Aswan environment. *Proceedings of the International Conference on Date Palm in kingdom of Saudi Arabia. Qasseem branch; King Saud Univ*, 115-136 (English Section).
- [18] El-Houmaizi, M.A., Saaidi M., Oihabi A. and Cilas C. (2002): Phenotypic diversity of date palm cultivars (*Phoenix dactylifera* L.) from Morocco. *Genet. Resour. Crop. Ev.*, 49: 483-490.
- [19] El-Houmaizi, M.A., Lecoustre R. and Dauzat J. (2007): Using architectural traits for characterizing and identifying date cultivars. *The fourth Symposium on Date Palm in King Faisal Univ. AlHassa, Saudi Arabia, 5-8 May*, pp: 226.
- [20] El-Kosary, S. (2009): Comparison study on Barhee cultivar and two strains of Barhee palm seeding trees. *Egypt. J. Appl. Sci.*, 24: 768-783.
- [21] El-Kosary, S., (2003): Effect of pollination time and pollen source on yield and fruit characteristics of Samani and Zaghoul date palm cultivars. *Egypt. J. Appl. Sci.*, 18(8B): 635-656
- [22] Elsayfy M.; Garkava-Gustavsson, L. and Mujaju, C. (2015): Phenotypic diversity of date palm cultivars (*Phoenix dactylifera* L.) from Sudan estimated by vegetative and fruit characteristics. *International Journal of Biodiversity*, 2015:1-7
- [23] El-Salhy, A.M.; Ibrahim R.A.; Gadalla E.G. and Khalil H.K.H. (2016): Evaluation of some seeded dry date palm grown under Aswan climatic condition. *Assiut J. Agric. Sci.*, 47 (4): 136-155
- [24] El-Sharabasy, S. F. (2009): *The economic and importance strategy of date palm in Egypt (in Arabic)*. El Balagh for Printing Publishing & Distribution, Egypt
- [25] El-Shibli S. and Korelainen H. (2009): Biodiversity of date palm (*Phoenix dactylifera* L.) in Sudan: Chemical, morphological and DNA polymorphism of selected cultivars. *Plant Genet. Resour.* (7), 194-203.
- [26] El-Sohaimy, S. and Hafez E. (2010): Biochemical and maturational characterizations of date palm fruits (*Phoenix dactylifera* L.). *Journal of applied sciences research*, 6,(8):1060-1067.
- [27] El - Merghany S. and Zaen El – Daen E.M.A. (2013): Evaluation of some date palm cultivars grown under toshky conditions. *Proceedings of the Fifth International Date Palm Conference* , 33-42
- [28] Everitt, Brian (1998): *Dictionary of Statistics*. Cambridge, UK: Cambridge University Press. p. 96



- [30] Faissal, F. A., Mohamed M.A., Gobara A.A. and Abd El- Kafy A.A. (2013): Evaluation of Some Dry Date Palm Varieties Propagated Through Seed and Tissue Culture Technique under Aswan Region Climatic Conditions. *Stem Cell* 2013;4(3): 14-24
- [31] Farag, M.A., Mohsen, M., Heinke, R. and Wessjohann, L.A. (2014): Metabolomic fingerprints of 21 date palm fruit varieties from Egypt using UPLC/PDA/ESI-qTOF-MS and GC-MS analyzed by chemometrics. *Food Res. Int.* 2014, 64, 218–226
- [32] FAO (2015): Food and agricultural commodities production. [http:// faostat. Fao. Org / site / 339 / default. Aspx](http://faostat.fao.org/site/339/default.aspx)
- [33] Hammadi H., Mokhtar R., Mokhtar E. and Ferchichiali (2009): New approach for the morphological identification of Date Palm (*Phoenix dactylifera* L.) cultivars from Tunisia. *Pak. J. Bot.*, 41(6) : 2671-2681
- [34] Haseeb G.M.M., EL-Kosary S. and Omar M.A. (2014): Evaluation of Some Date Palm Seeded Trees Grown under El-Frafra Oasis Conditions. *Journal of Horticultural Science & Ornamental Plants* 6 (3): 161-169,
- [35] Hasnaoui, A., Elboumaizi, M. A., Hakkou, A., Wathelet, B. and Sindic, M. (2011): Physico-chemical characterization classification and quality evaluation of date palm fruits of some Moroccan cultivars. *J. Sci. Res.* 3 (1): 139 – 149
- [36] H ela E. O., Walker D.J. and Khouja M. L. (2012): Phenotypic and nuclear DNA variation in Tunisian cultivars of date palm (*Phoenix dactylifera* L.). *African Journal of Biotechnology* Vol. 11(22), pp. 6034-6042, 15
- [37] Hussein, A.A.M.; Nawal, Attia M.I; and Osman S. M. (2001): Survey and evaluation of fruit cultivars for some species grown under Siwa Oasis. II- Date palm. *Annals of Agric. Sc. Moshtohor*, 39 (2): 1265-1278
- [38] Hussein F. and El-Desouki M. (1992): Fertility period of date palm female spathes in relation to crop characteristics of Haiani cultivar under North Sinai condition. *J. Agric. Sci. Mansoura Univ.* 17(11), 3636-3641.
- [39] Idris T. I.M.; Hussein F.A., Said A. E. and Elsadig E.H. (2014): Evaluation of some dry seedling date selections from the Northern State, Sudan. *Sudanese Journal of Agricultural Sciences* (2014) 1, 30–35
- [40] Iqbal M., Ghaffar A., Din H.U. and Munir M. (2008): Effect of different date palm male pollinizers on fruit characteristics and yield index of date palm (*Phoenix dactylifera* L.) cultivars Zahidi and Dhakki. *Pakistan J. Agric. Res.*, 21: 1-4
- [41] Ismail H., AbdElgawad H., Al Jaouni S., Zinta G., Asard H., Hassan S., Hegab M., Hagagy N. and Selim S. (2015) Metabolic Analysis of Various Date Palm Fruit (*Phoenix dactylifera* L.) Cultivars from Saudi Arabia to Assess Their Nutritional Quality. *Molecules* 2015, 20, 13620-13641
- [42] Ismail, B., Haffar I., Baalbaki R. and Henry J. (2008): Physico-chemical characteristics and sensory quality of two date cultivars under commercial and industrial storage conditions. *Science Direct*, 41: 896-904.
- [43] Jackson, M.L. (1973): *Soil Chemical Analysis*. Prentice-Hall, Inc. India.
- [44] Kacem-Chaouche N., Dehimat L., Meraihi Z., Destain J., Kahlat K. and Thonart P. (2013): Decommissioned dates: chemical composition and fermentation substrate for the production of extracellular catalase by an *Aspergillus phoenicis* mutant. *Agric Biol J N Am* 2013;4:41-7.



- [45] Legrade, J. (1983): *Initiation à l'Analyse des Données*, Dunod Press, Paris, France, 1983
- [46] Kassem, H.A (2012): The response of date palm to calcareous soil fertilization. *Journal of Soil Science and Plant Nutrition*, 12 (1), 45-58.
- [47] Mansour H.M. (2005): *Morphological and Genetic Characterization of Some Common Phoenix dactylifera L. Cultivars in Ismailia Region*. M. Sc. Thesis Botany Department, Faculty of Science, Suez Canal University
- [48] Metwaly H. A. A., Abou-Rekab Z. A. M., Abd El-Baky A. A. and El-Bana A. A (2009): Evaluation of some seeded date palm trees grown in Fayoum Governorate A- Physical characteristics. 4th Conference on Recent Technologies in Agriculture, 2009 :684-700
- [49] Mohamed S.G., Abd-Allah B.M. and Mostafa F.M.A. (2004): Comparative study on some Iraqi date palm grown under middle and upper Egypt climatic conditions. *Egypt. J. Appl. Sci.*, 19:339-354.
- [50] Mortazavi S.M.H., Azizollahi F. and Moalemi N. (2015) Some Quality Attributes and Biochemical Properties of Nine Iranian Date (*Phoenix dactylifera L.*) Cultivars at Different Stages of Fruit Development. *International Journal of Horticultural Science and Technology* Vol. 2, No. 2; December 2015, pp 161-171
- [51] Moore, S. and Stein, W. H. (1954): A modified ninhydrin reagent for the photometric determination of amino acids and related compounds. *J. Biol. Chem.*, 211: 907-913.
- [52] Nadeem M., Ur-Rehman S., Anjum F.M. and Bhatti I.A. (2011): Quality evaluation of some Pakistani date palm varieties. *Pak. J. Agri. Sci.*, Vol. 48(4), 305-313
- [53] Nasir M.U., Hussain S., Jabbar S., Rashid F., Khalid N. and Mehmood A. (2015): A review on the nutritional content, functional properties and medicinal potential of dates. *Science Letters*, 3 (1): 17-22
- [54] Omaima, M. Hafez, Malaka Saleh A., Ashour N.E., Mostafa E.A.M. and Naguib M.M. (2015): Evaluation of Some Pollen Grain Sources on Yield and Fruit Quality of Samany Date Palm cv. (*Phoenix dactylifera L.*). *Middle East Journal of Agriculture*, 4 (1): 27-30
- [55] Omar, A.K., Rashed S.A., Said S. and Adel M.A. (2014): Effect of pollen source and area distribution on yield and fruit quality of 'Khalas' date palm under Saudi Arabia conditions. *Agricultural Sciences*, 2(3): 7-13.
- [56] Osman S.M. (2008): Fruit Quality and General Evaluation of Zaghloul and Samany Date Palms Cultivars Grown under Conditions of Aswan. *American-Eurasian J. Agric. & Environ. Sci.*, 4 (2): 230-236
- [57] Qadri R. W. K.; Waheed S.; Haider, M. S., Khan, I., Naqvi, S. A., Bashir, M. and Khan, M. M. (2016): Physiochemical characterization of fruits of different date palm (*Phoenix dactylifera L.*) varieties grown in Pakistan. *The Journal of Animal & Plant Sciences*, 26(5): 1268-1277.
- [58] Rizk, R.M., El- Shrabasy and Soliman KH. A. (2007): Characterization and evaluation of six males date palm (*Phoenix dactylifera L.*) genotypes in Egypt. The fourth Symposium on date palm in King Faisal Univ. AlHassa, Saudi Arabia, 5-8 May, pp:238.
- [59] Rizk, S.A., Omima M. and Abou Rawash M. (2003): Evaluation of some date palm cultivars grown at El-Baharia Oasis, Giza, Egypt. *Proceedings of the international conference on date palm in Kingdom of Saudi Arabia*. Qasseem Branch, King Saud Univ, 521-532.



- [60] Sadiq I. S., Izuagie T., Shuaibu M., Dogoyaro A. I., Garba A. and Abubakar S. (2013): The Nutritional Evaluation and Medicinal Value of Date Palm (*Phoenix dactylifera*). International Journal of Modern Chemistry, 2013, 4(3): 147-154
- [61] Said A., Kaouther D., Ahmed B., Mohammed T. and Brahim T. (2014): Dates Quality Assessment of the Main Date Palm Cultivars Grown in Algeria. Annual Research & Review in Biology 4(3): 487-499.
- [62] Salama, A.S.M., Omima M.E. and Abdel- Hameed A.A. (2014): Effect of magnesium fertilizer sources and rates on yield and fruit quality of date palm cv. Hayany under Ras-Sudr conditions. Journal of Agriculture and Biological Sciences, 10(2): 118-126.
- [63] Sakr M.M., Abu Zeid I.M., Hassan A.E., Baz A.G.I.O. and Hassan W.M. (2010): Identification of some Date palm (*Phoenix dactylifera*) cultivars by fruit characters. Indian Journal of Science and Technology, 3 (3):338- 343.
- [64] Shaba E. Y. , M. M. Ndamitso, J. T. Mathew, M. B. Etsunyakpa, A. N. Tsado and Muhammad S. S (2015): Nutritional and anti-nutritional composition of date palm (*Phoenix dactylifera* L.) fruits sold in major markets of Minna Niger State, Nigeria. African Journal of Pure and Applied Chemistry, 9 (8): 167-174
- [65] Shales, O. and Schales, S.S. (1945): A simple method for the determination of glucose in blood. Arch. Biochem., 8: 285-289
- [66] Shaker M., Bekheat S. A., Taha H. S., Fahmy A. S. and Moursy H. A. (2000): Detection of somaclonal variations in tissue culture- derived date palm plants using isozyme analysis RAPD finger prints. Biol. Plant 43: 347 – 351.
- [67] Snedecor, G.W. and Cochran W.G. (1990): Statistical Methods. 11th Ed. Iowa State Univ., Press. Ames, Iowa, USA
- [68] Soliman, S.S., Al- Saif, A.M. and Al-Obeed, R.S. (2016): Evaluation of pollen germination of some palm males and pollination impact on bunch weight and fruit quality in Kadary date palm cultivar (*Phoenix dactylifera* L). Jpurnal of Environmental Biology, 37: 141-147
- [69] Soliman S.S. (2006): Behaviour Studies of Zaghoul Date Palm Cultivar under Aswan environment. Journal of Applied Sciences Research 2(3): 184-191
- [70] Youssef, M.K., El-Rify M.N., El-Geddawy M.A. and Ramadan B.R. (1999): Nutrient elements and vitamins content of some new valley dates and certain date products. The International Conference on Date Palm 9-11 November, Assuit University for Environmental Studies, Egypt.
- [71] Zaid, A. and P.F. De Wet. (1999a): Botanical and systematic description of the date palm. pp. 1-28. In: Zaid, A. (Ed.). Date palm cultivation. FAO, Rome.



Table 1. Physical characteristics of pinnate and spine for evaluated seedling trees

No	Cvs.	Pinnate number		Pinnate apex		Pinnate arrangement		Pinnate area length		Spine arrangement		Spine area length (cm)		Spine numbers	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	185	189	2	2	1	1	300	300	2	2	133	135	95	95
2	Zaghloul cv.	210	210	1	1	2	2	420	420	2	2	25	25	45	45
3	4	195	200	1	1	1	1	350	355	1	1	82	85	85	90
4	6	225	233	1	1	1	1	400	420	1	1	90	92	110	107
5	7	215	220	2	2	1	1	400	420	1	1	85	80	120	123
6	9	225	235	1	1	1	1	325	329	1	1	87	90	110	110
7	Masoud*	200	200	1	1	1	1	415	420	2	2	50	50	40	40
8	Neil Omraa*	195	200	1	1	1	1	350	355	1	1	80	80	85	88
	L.s.d.	16.1	16.6	NS	NS	NS	NS	35.1	35.3	NS	NS	8.2	8.3	19.6	19.6

*Famous region name

Table 2. Physical characteristics of leaf, bunch and yield weight/year and fruit retention % for evaluated seedling trees

No	Cvs.	Leaf length (cm)		Leaf numbers		Leaf base width		Bunch length (cm)		Bunch numbers		Bunch weight (kg)		Yield weight/Year		Fruit retention %	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	480	482	95	98	11	11	175	183	11	11	20.3	21.5	250	265	62.0	62.0
2	Zaghloul cv.	525	525	97	97	11	11	225	250	11	11	19.0	20.5	175	185	72.7	73.1
3	4	460	465	85	90	15	16	225	250	11	12	17.3	19.5	200	220	69.8	71.4
4	6	510	510	83	87	19	19	175	185	11	12	21.7	22.5	250	265	68.7	70.4
5	7	510	510	95	100	20	21	175	186	13	14	20.2	22.5	275	280	75.0	76.2
6	9	450	450	87	93	15	16	215	220	9	11	18.0	20.5	175	200	66.7	66.7
7	Masoud*	500	520	93	95	13	18	230	235	10	11	15.5	16.7	160	170	72.7	72.7
8	Neil Omraa*	465	465	80	87	15	18	228	235	11	11	17.0	17.5	180	200	69.8	69.8
	L.s.d.	56.7	56.9	3.1	3.1	4.0	4.0	32.5	32.7	1.8	1.8	2.1	2.3	35.9	36.1	4.5	4.5

*Famous region name



No	Cvs.	Fruit weight (g)		Flesh weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit length/diameter (cm)		Volume (cm)		Seed weight (g)		Seed length (cm)	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	7.3	7.3	6.2	6.2	3.2	3.2	1.4	1.4	2.3	2.3	5.2	5.2	1.1	1.1	2.3	2.3
2	Zaghloul cv.	14.8	14.4	12.6	12.2	4.8	4.8	2.3	2.3	2.1	2.1	7.5	7.5	2.2	2.2	3.6	3.6
3	4	9.3	10.2	7.6	8.4	4.3	4.8	1.8	1.9	2.4	2.5	5.1	5.3	1.7	1.8	2.9	3.0
4	6	8.8	9.6	7.6	8.4	3.6	3.8	1.9	2.0	1.9	1.9	5.1	5.3	1.2	1.2	2.6	2.6
5	7	12.1	13.3	10.5	11.6	4.3	4.8	2.2	2.2	2.0	2.2	7.3	7.5	1.6	1.7	2.5	2.6
6	9	5.3	6.9	4.2	5.6	2.9	3.2	1.6	1.7	1.8	1.9	4.0	4.2	1.1	1.3	2.4	2.4
7	Masoud*	34.8	36.1	32.2	33.1	7.5	7.8	3.8	4.1	1.9	1.9	16.1	18.6	2.6	3.0	4.8	5.0
8	Neil Omraa*	22.0	26.4	20.3	24.6	5.6	6.0	3.3	3.5	1.6	1.7	10.3	12.6	1.7	1.8	3.5	3.6
	L.s.d.	2.9	2.8	2.4	2.4	0.5	0.5	0.2	0.2	0.2	0.2	1.0	1.1	0.3	0.4	0.3	0.4

Table 3. Physical characteristics of fruits and seeds for evaluated seedling trees

*Famous region name

Table 4. Fruits chemical characteristics of evaluated seedling trees

No	Cvs.	TSS %		Total sugars %		Reducing sugars %		Non-reducing sugars %		Acidity %		Proteins mg/g f.w.		Amino acids mg/g f.w.	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	35.4	35.4	67.3	67.3	31.0	31.0	36.3	36.3	0.41	0.43	2.4	2.7	1.6	1.8
2	Zaghloul cv.	30.8	30.8	68.2	68.2	37.2	37.2	31.0	31.0	0.25	0.25	1.4	1.5	2.3	2.3
3	4	31.5	33.2	73.2	73.8	49.5	49.8	23.7	24.0	0.53	0.50	1.9	2.0	3.1	3.2
4	6	22.2	22.9	73.3	73.5	42.6	42.3	30.7	31.2	0.34	0.31	1.7	1.8	2.4	2.6
5	7	26.9	27.8	72.2	73.5	36.4	36.2	35.8	37.3	0.57	0.53	1.8	1.9	4.0	4.1
6	9	23.1	24.0	68.6	69.6	50.4	50.1	18.2	19.5	0.51	0.49	1.9	2.0	3.5	3.7
7	Masoud*	29.5	30.0	68.0	68.2	36.5	37.0	31.5	31.2	0.35	0.36	1.2	1.3	2.4	2.5
8	Neil Omraa*	28.9	29.9	67.5	68.0	35.4	36.0	32.1	32.0	0.31	0.32	1.1	1.2	2.3	2.4
	L.s.d.	4.5	4.5	5.2	5.4	2.3	2.3	2.7	2.8	0.07	0.07	0.3	0.3	0.5	0.6

*Famous region name



Table 5. Fruit contents of minerals % for evaluated seedling trees

No	Cvs.	(%)											
		N		P		K		Ca		Mg		Fe	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	1.98	1.99	0.09	0.09	0.25	0.26	0.12	0.14	0.18	0.18	0.12	0.14
2	Zaghloul cv.	1.50	1.52	0.09	0.09	0.30	0.31	0.23	0.24	0.17	0.18	0.12	0.15
3	4	1.64	1.65	0.05	0.06	0.32	0.33	0.42	0.42	0.18	0.19	0.16	0.16
4	6	1.79	1.81	0.04	0.05	0.39	0.39	0.15	0.17	0.14	0.16	0.24	0.25
5	7	2.01	2.03	0.04	0.04	0.29	0.30	0.20	0.22	0.14	0.15	0.24	0.26
6	9	2.37	2.39	0.04	0.05	0.27	0.28	0.18	0.20	0.18	0.19	0.12	0.14
7	Masoud*	1.48	1.49	0.07	0.09	0.29	0.29	0.22	0.23	0.14	0.17	0.12	0.14
8	Neil Omraa*	1.47	1.49	0.07	0.09	0.28	0.29	0.20	0.21	0.12	0.15	0.12	0.13
	L.s.d.	0.04	0.04	0.19	0.18	0.5	0.5	0.06	0.07	0.05	0.06	0.03	0.03

*Famous region name

Table 6. Fruit contents of elements mg/kg for evaluated seedling trees

No	Cvs.	(mg/kg)							
		Mn		Zn		Cu		B	
		1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
1	Amhat cv.	21.49	21.49	11.80	11.82	19.60	20.71	6.90	6.92
2	Zaghloul cv.	20.89	20.96	12.50	12.57	23.0	23.4	6.90	6.94
3	4	26.69	26.76	8.70	8.73	26.60	26.68	3.90	3.91
4	6	26.39	26.46	5.30	5.43	28.20	28.23	3.80	3.85
5	7	26.29	26.34	6.50	6.59	13.20	13.54	6.00	6.10
6	9	19.59	19.85	9.40	9.54	5.50	5.58	10.1	10.2
7	Masoud*	19.33	19.45	9.48	10.50	22.1	22.4	6.76	6.79
8	Neil Omraa*	18.9	19.10	8.25	8.79	20.3	20.42	6.51	6.52
	L.s.d.	4.7	4.8	2.2	2.2	3.3	3.2	1.1	1.1

*Famous region name

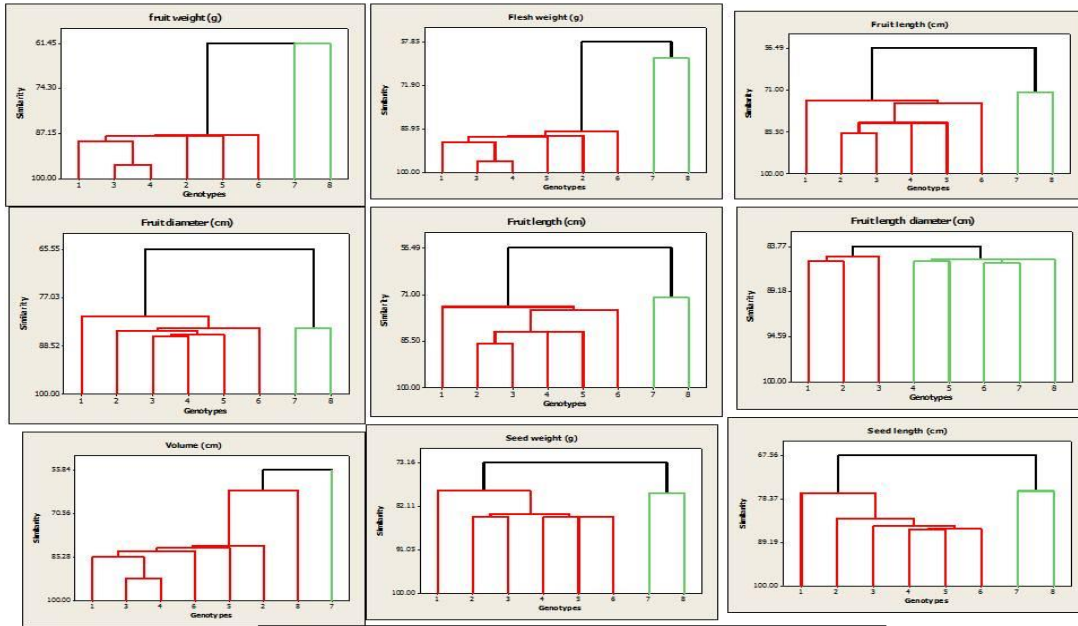


Fig. 5. Cluster dendrogram based on fruit physical and chemical attributes using distance metric is Euclidean distance average linkage

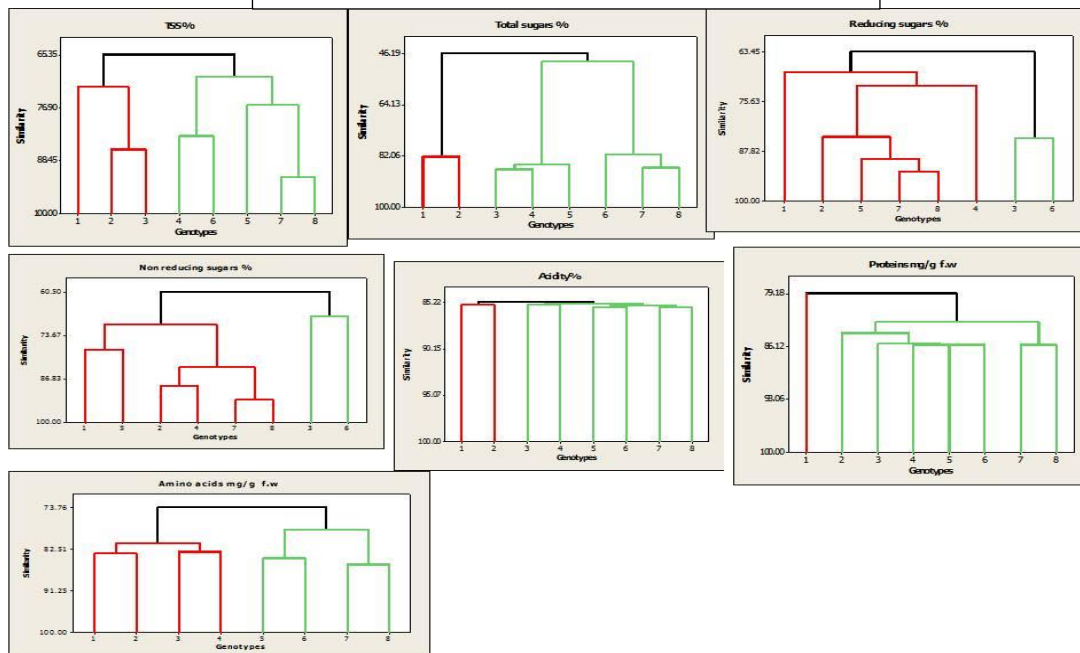




Fig. 6. Physical characteristics of evaluated seedling palm trees