A Comparative Study of The Effectiveness of Three Rootstocks on The Quality and Storability of 'Desert Red' Peach Fruits

El-Helaly, Amira, A.E., [1]; Enas, A.E. Tayel[2] and El-Shobaky, M.A.[3]
1,2- Hort. Res. Station Alex., Hort. Res. Ins., A.R.C., Giza, Egypt.
3- Hort. Res. Ins. A.R.C., Giza, Egypt.

ABSTRACT

This experiment was performed during 2005 and 2006 seasons on c.v. 'Desert red' peaches. The fruits were taken from trees budded on three rootstocks, i.e. 'Balady' peach; apricot and 'Nemagard' peach rootstocks. The fruits were packed in polyethylene bags and stored at 0° and 5°C with 85-90% RH. To simulate retial marketing, the fruits were held at 20-30°C with 80-90% RH at the middle and the end of storage period (4 weeks). The results indicated that, in both experimental seasons, 'Desert red' peach fruits from trees on the three rootstocks, were almost the same concerning the weight; length; thickness; firmness; SSC and non-reducing sugars, as no significant differences were detected. Generally, the fruits from trees on 'Balady' peach rootstock had higher percentages of acidity and lower values of water soluble pectin; total sugars and anthocyanin, than those from trees on other two rootstocks, which almost had the same values. The 'desert red' peach fruits from trees on the three rootstocks, stored at 0°C remained 4 weeks in storage, while those stored at 5°C remained only 2 weeks. As the storage period advanced, there was a significant reduction in the values of firmness and acidity, besides a significant increment in weight loss and water soluble pectin percentages. Also at the end of storage period, the initial values of reducing sugars significantly increased, while total and non-reducing sugars significantly decreased. Concerning the effectiveness of storage temperature, almost no significant differences were found in the values of total sugars (except the fruits on 'Nemagard' peach); reducing sugars and SSC between fruits from trees on the three rootstocks, stored at 0°C and those stored at 5°C. Fruit acidity (except the fruits on apricot) and firmness, were lower at 5° than those at 0°C, while water soluble pectin (in the fruits on 'Balady' peach) and water loss%, were higher at 5°C. Regarding the efficient of roostocks, as an average of 4 weeks of storage, anthocyanin values were not affected by rootstocks. The fruits on 'Balady' peach rootstock had the highest values of firmness and acidity and the lowest percentages of SSC. Respecting shelf-life, fruits from trees on the three rootstocks, stored at 0°C maintained their firmness so their shelf-life period was 3 days at the middle of storage time (2 weeks), while those stored at 5°C lost their firmness rapidly, so their shelf-life remained only 2 days. At the end of storage period (4 weeks for fruits stored at 0°C) the shelf-life period remained 2 days. Fruits from trees on apricot rootstock had the highest values of SSC. It could be recommended that, the best rootstock for 'Desert red' peach fruits quality is 'Balady' peach rootstock followed by apricot rootstock.

Key words: Peach fruits; rootstocks; storage and quality.

INTRODUCTION

Peach (*Prunus persica*, L.) is one of the most important fruits of the world. It ranks the fourth among the Temperate Zone fruits (FAO, 1999). The total area of peach is 79199 feddans while the fruiting area is 75592 feddans with total production of 360937 tons (according to the Study for Estimate National Agricultural Income, 2006).

Much has been written about rootstocks for many horticultural crops; likewise, fruit quality has been a considerable commercial and research concern at all places in the food system from producer to consumer. However, they differ markedly in one respect in that rootstocks are often employed as a treatment in research and, as much, information about them and their effects readily lends itself to occasional compilation and interpretation (Rom and Carlson, 1987). The major purposes of rootstocks for most deciduous fruit crops are to control tree size, induce precocity, improve yield, provide soil adaptation, and combat various soil-borne pests and diseases (Elfving, 1987). Fruit quality is of relatively minor importance among the reasons for selecting rootstocks in deciduous crops whereas the opposite is true for citrus (Cummins and Aldwinckle, 1983 and Castle, 1987). Among the deciduous fruits, rootstocks affect fruit size, soluble solids concentration, firmness, and storability, but there are few studies in which rootstock and fruit quality were the central issues (Westwood *et al.* 1973; Autio, 1987; Barden, 1988; Lipe and Perry, 1988; Beckman *et al.*, 1992 and Brown and Wolfe, 1992). Williamn (1995) reported that rootstocks for species of climacteric fruits, appear to influence fruit quality in an indirect manner primarily through crop load and tree yield/ growth efficiencies.

As the relationship of rootstock to peach fruit quality has not been a subject of review except in few studies, so it is difficult, from the small number of studies, the small range of rootstocks used in each study, and the somewhat inconsistent results to compose a clear picture of the effects of rootstock on peach quality. Therefore, this study was undertaken for the purpose of comparing the effectiveness of three rootstocks on the quality and storability of 'Desert red' peach fruits during cold storage at 0° and 5°C.

MATERIALS AND METHODS

The present investigation was conducted during 2005 and 2006 seasons using 'Desert red' peaches. The fruits were obtained form a private orchard in EL-Noubaria, Behera Governorate. The trees were nine years old, grafted on three rootstocks, i.e. 'Balady' peach; apricot or 'Nemagard' peach. All trees were grown in a sandy soil at 5 x 5 meters under drip

irrigation and were received the normal horticultural practices usually done at El-Noubaria region.

In the third week of May in both first and second seasons, 225 mature 'Desert red' peach fruits from trees on each rootstock were hand picked. The fruits were free from obvious defects or mechanical damage. The fruits were surface cleaned with soft tissue. Fifteen fruits from trees of each rootstock were used as an initial sample for physical and chemical analyses. The remaining fruits (210) were divided into small groups (replicates) 5 fruits each, placed in foam plates (5 fruits/ one plate) in one layer and packed with polyethylene bags (20 microns in thickness). In other words, there were 42 plates. Half of them (21 ones) were stored at 0°C with relative humidity of 85-90%. The second half were stored at 5°C with the same percentage of humidity. Fruits were kept as long as they were suitable for human consumption and the firmness didn't reach nearly 3 (1b/inch^2). Fruits were examined weekly until the end of storage period, 4 weeks that means 4 dates. Besides, 3 dates for determining shelf-life, at the middle (2 dates) and the end of storage period (one date). Three plates (replicates) 5 fruits each, at the two storage temperature (0° and 5°C) were taken randomly at every evaluating date. On that base, 'Desert red' peach fruits from trees of each rootstock were represented by 3 replicates x 5 fruits each x 7 evaluating dates x 2 storage temperature = 210 fruits.

The effect of the 3 rootstocks ('Balady' peach, apricot or 'Nemagard' peach) on physical and chemical properties of 'Desert red' peach fruits, was determined at harvesting date; during cold storage at 0° and 5°C and during shelf-life at the middle and the end of storage period.

Physical Properties

Fruit weight (gm).

Fruit length; fruit diameter and flesh thickness (cm).

Fruit firmness (lb/inch^2)

Flesh firmness was determined in any given sample by peeling the two opposite sides of the fruit and the firmness of each side was determined by using the Effegi pressure tester with an eight mm. plunger (Effegi, 48011 Alfonsine, Italy). Two types of the same Effegi pressure tester were used, the first one ranged from 1-30 lb/inch^2 as full scale while the second one ranged form 1-10 lb/inch^2. The former one was used for initial firmness determination and follow up, while the later one was used at

later stages of storage when the fruits became softer due to ripening. The average flesh firmness of each fruits sample was calculated from 10 readings was taken. Fruit firmness was expressed as pounds/inch^2.
Weight loss, as a percentage from the initial weight.

Chemical Properties:

Soluble solids contents (SSC%)

Two segments were taken longwise from two opposite sides of each fruit form the rose to the stem and as deep as to the stone of the fruit. Each segment was squeezed and the obtained juice was used to determine the percentage of SSC by the use of a hand refractometer according to Chen and Mellenthin (1981). Average percentage of SSC for each sample was then calculated.

Titratable acidity (TA)

Another two segments were taken as mentioned above and three samples of juice were obtained. Five ml. samples of the obtained juice were used to determine the tritratable acidity. For the titration, 0.1N sodium hydroxide was used in the presence of phenolphethalein as an indicator according to Chen and Mellenthin (1981). The titratable acidity was expressed as g malic acid / 100 ml of fruit juice.

Water soluble pectin (%)

Water soluble pectin content was estimated in the fruit pulp as calcium pectate pencentage according to Care and Hayres (1922). 50 gm of pulp segments were extracted by boiling in distilled water for one hour and the extraction filtered was and then completed to 250 ml as total volume. 100 ml of the obtained extraction was used to precipitate the calcium salt by acetic acid 1.0 N and calcium chloride 1.0 M. After one hour the extraction was boiled for 2 min. and then filtered. The precipitate was washed with boiled distilled water until becomes free from chloride ions. The precipitate was dried and then weighed as calcium pectate to calculate water soluble pectin percentage.

Sugars content (%)

Sugars were extracted from 10 gm of well chopped and mixed flesh of each fruit sample. The extraction was carried out by using distilled water (Loomis and Shull, 1937). Reducing sugars content was determined by the method of Shaffer and Hartman (1921). The non-reducing sugars were

determined by the hydrolysis with sulfuric acid and the total reducing sugars were then determined (Dubois *et al.* 1956). After that the non-reducing sugars were calculated by the difference between the total and the reducing sugars. Sugars content were expressed as gm/100 gm fresh weight of fruit flesh.

Anthocyanin (O.D/g fresh weight)

In the fresh fruit pulp sample of each replicate anthocyanin was determined by Geissman (1962) method. Anthocyanin was extracted from 1 gm of the fruit pulp tissues by acidified methanol (1%HCL), the extract was filtered and made up to final volume with methanol. The optical densities of the filtrates were measured by spectophotometer at 530 nm wave lengths. Anthocyanin was expressed as optical density per gm fresh weight (O.D. g fresh weight).

Shelf-life

The fruits were left at room temperature (20-30°C and 80-90% RH). They were examined at 2 and 3 days after the middle of storage period and at 2 days after the end of storage period. The termination of shelf-life period was done in both years of study, when fruit firmness reached around 3 ($lb/inch^2$).

All data were statistically analyzed according to Snedecor and Cochran (1971). The design was completely randomized with two factors experiment, treatments (3 rootstocks x 2 storage temperatures) and storage periods, (split in time). The L.S.D method at (0.05) was used to compare the average of treatments (T), storage periods (P) and their interaction (TxF).

RESULTS AND DISCUSSION

Effect of rootstocks on fruit quality at harvest

The data presented in Table (1) clearly indicated that, in both experimental seasons, no significant differences were detected among 'Desert red' peach fruits from trees on the three rootstocks, concerning fruit weight; length; flesh thickness; firmness; SSC and non-reducing sugars (in both seasons) and diameter and reducing sugars (in second season). Fruits from trees on "Balady" peach rootstock had higher values of acidity and lower values of water soluble pectin; total sugars and anthocyanin, than those from trees on other rootstocks, with significant differences. However, the differences were so slight to be significant between

anthocyanin values in fruits from trees on "Balady" peach and those on apricot rootstocks (in first season only). In addition, fruits from trees on apricot and 'Nemagard' peach rootstocks had almost the same values of acidity (in both seasons) and water soluble pectin; total sugars and anthocyanin (in first season).

The obtained results agree with Lord *et al.* (1985). They reported that rootstocks did not affect 'Empire' apple fruits size. Also, Yadava and Doud (1989) noticed that rootstock had little effect on peach fruit size. However, Autio (1991) and Embree *et al.* (1993) found that apple fruit size was altered by rootstock. Inaddition, Kochan (1972) and Westwood *et al.* (1973) on prunes and Fallahi *et al.* (1985); Drake *et al.* (1988) and Autio (1991) on apples found that rootstocks affected soluble solids. The results also were not in line with Kochan (1972) and Westwood *et al.* (1973). As they found flesh firmness of prunes varied considerably with rootstock. Concerning, fruit acidity the results were confirmed with those obtained by Drake *et al.* (1988). They noticed that rootstocks affected juice acidity of apple fruits. On the other side, Fallahi *et al.* (1985) found that fruit acidity was not influenced by rootstocks.

Effect of rootstocks on the storability of 'Desert red' peach fruits

The data clearly showed that 'Desert red' peach fruits from trees on all rootstocks stored at 0°C remained 4 weeks of storage, while those stored at 5°C remained only 2 weeks. It seemed quiet clear that, the period that fruits could retain firmly, was found to depend on storage temperature not on variety of rootstock, Table (2).

Effect of rootstocks on physical and chemical properties of fruits during cold storage at 0° and 5°C.

Physical Properties:

Firmness

The data presented in Table (2) indicated that the firmness of 'Desert red' peach fruits significantly decreased with the progress of storage time. The results were confirmed by those obtained by Vanoli *et al.* (1995) and Dundar (1997). They noticed that fruit firmness of peach decreased continuously, with length of storage period. El-Etreby (1996) reported that fruit firmness of 'Florda Sun'; 'Early Grand' and 'Desert Gold' peach showed a significant decrease with prolonged storage periods, either at room temperature or cold storage treatment.

A reduction in fruit firmness with the increasing of storage temperature was greatly noticed, in both experimental seasons. As the fruit firmness from trees on each rootstock stored at 5°were significantly lower than those on that rootstock, stored at 0°C, as an average for 2 weeks of storage. The diminution in fruits firmness with the increasing of storage temperature and the progress of storage period, is due mainly to decomposition enzymatic degradation of insoluble protopectins to more simple soluble pectins, solubilization of cell and cell wall contents as a result of the increasing in pectin esterase activity, and subsequent development of juiciness and the loss in peel and pulp hardness (Deshpande and Salunkhe, 1964). The above mentioned results and related discussion were supported by those found by El-Seidy (2000). In addition, Shaltout (1987) found that fruit firmness of 'Florda prince' peach c.v., decreased as time of storage advanced and the temperature increased.

The efficient of rootstocks on fruit firmness was almost not clearly noticed at 5°C, while at 0°C the firmest fruits were from trees on 'Balady' peach then on apricot and at last on 'Nemagard' peach rootstock with significant differences; as an average of 2 or 4 weeks of storage. However, in second season, the differences were insignificant between fruit firmness from trees on 'Balady' peach and apricot rootstocks. The results were in agreement with those obtained by Kochan (1972) and Westwood *et al.* (1973). They found that flesh firmness of prune fruits varied considerably with rootstock.

Weight loss

The data introduced in Table (3) declared that, in both experimental seasons, there was a gradual increment in the percentages of weight loss with the progress of storage period, and the differences were significant among all storage periods, as an average of all rootstocks at both storage temperatures. Fruit weight loss occurred naturally mainly as a result of water loss from the fruits tissues during storage and partially during respiration process. The results of the present study and associated discussion are supported by the findings of Robertson *et al.* (1990) on 'Cresthaven' peach; Kuranze and Kaska (1993) on some peach varieties; Mohamed (1999) on 'Florda prince, 'Almoge' and ; 'Tropical snow' peach; El-Seidy (2000) on 'Florda prince', 'Desert red' and 'Swelling' peach and Tayel (2001) on 'Florda prince', 'Desert red' and 'Hermosa' peach. They all

reported that rate of weight loss increased with the prolongation of cold storage period.

The data also clearly showed that 'Desert red' peach fruits from trees on all rootstocks, stored at 0°C, had weight loss percentages significantly lower than those stored at 5°C, as an average of 2 weeks of storage. The increment in the weight loss percentages with the increase of storage temperature, was previously reported by Shaltout (1987). He found that 'Florda prince' peach fruits could be stored at 0°C for 5 weeks with about 17% weight loss, whereas, storage at 5°C resulted in about 22.8% weight loss.

Concerning the rootstock effect, the data incicated that no significant differences were detected among weight loss percentages of 'Desert red' peach fruits from trees on the three rootstocks stored at 0°C, in both years of study, as an average for 2 or 4 weeks of storage. Except in the first season, fruits from trees on apricot rootstock gave the least significant percentage of weight loss, while fruits from, trees on 'Nemagard' peach rootstock gave the highest ones, as an average of 4 weeks of storage. Regarding storage at 5°C, the data showed that fruit weight loss percentages from trees on apricot rootstock were higher than those of other rootstocks with significant differences, as an average of 2 weeks of storage. However, the differences were so slight to be significant in the first season.

Generally, it could be concluded that fruit weight loss values were not greatly influenced by the type of rootstocks.

Chemical Properties

Soluble solids content (SSC)

It is clear from Table (4) that the initial percentages of SSC increased at the end of storage period (2 weeks for fruits stored at 5°C and 4 weeks for ones stored at 0°C). However, in the second season, the differences were insignificant. The increment in the percentages of soluble solids content could be due to the degradation of complex insoluble compounds like starch to simple soluble ones, like sugars which are the major component of soluble solids content in the fruits (EL-Seidy, 1994). The above mentioned data and related discussion are confirmed with those obtained by Dundar (1997), Mohamed (1999) and El-Seidy (2000) on different varieties of peach fruits. On other hand, Tayel (2001) found no significant relation between storage period and soluble solids content of peach fruits of some postharvest treatments.

It has generally been found that SSC percentages were not greatly affected by storage temperature. However, Shaltout (1987) found that TSS of 'Florda prince' peach fruits were increased as storage temperature increased.

Regarding to rootstock effectiveness, the data showed that, in both years of study, as an average of 2 or 4 weeks of storage, SSC percentages of fruits from trees on 'Balady' peach rootstock at both storage temperatures were significantly lower than those on apricot or 'Nemagard' peach rootstocks, which almost had the same values (no significant differences were detected between them). The results were in line with those obtained by Kochan (1972) and Westwood *et al.* (1973) on prunes and Fallahi *et al.* (1985); Drake *et al.* (1988) and Autio (1991) on apples. They all noticed that rootstocks affected soluble solids.

Titratable acidity (TA)

The changes in the titratable acidity (TA) expressed as malic acid percentage, are presented in Table (5). The data indicated that, TA significantly decreased with the advancing of storage period. However, the rate of reduction was slowly at the first two weeks of storage. Malic acid is a respiratory substrate and its consumption in respiration increases with the progress of storage time, as the malic acid could be used as an organic substrate in the respiration process (El-Seidy, 2000). The above results and associated discussion were in agreement with the findings of Han Tao *et al.* (1996) on 'Beijing' china peach c.v. 'Luhu'; Kamal *et al.* (1996) on 'Florda sun', 'Early grand', 'Desert gold' and 'Mit ghamr' peaches and Mohamed (1999) on 'Florda prince', Almoge and 'Tropical snow' peaches. They all found a significant decrease in the percentage of malic acid during storage period.

The effectiveness of storage temperature were obvious on fruits from trees on 'Balady' and 'Nemagard' peach rootstocks. As their acidity percentages were significantly lower at 5°C than those stored at 0°C, in both years of study, as an average for two weeks of storage. The reduction in fruit acidity with the increment of storage temperature, was previously noticed by Shaltout (1987). He found that fruit acidity of 'Florida prince' peach c.v. was decreased as storage temperature increased.

The influence of rootstock on fruit acidity was clearly noticed after 4 weeks of storage (for fruits stored at 0°C). As the highest percentages of malic acid were existed in fruits from trees on 'Balady' peach then on apricot and at last on 'Nemagard' peach rootstocks, with significant differences, as an average for the whole storage period (4 weeks), in both

years of study. The data were in harmony with those found by Drake *et al.* (1988) on apples, they reported that fruit acidity was rootstock related. However, Fallahi *et al.* (1985) on apples indicated that rootstock did not affect juice acidity.

Water soluble pectin

The data recorded in Table (6) indicated that the initial water soluble pectin percentages significantly increased after 4 weeks of storage in both seasons. The increasing in water soluble pectin with the progress of storage period is due to the decomposition and the enzymatic degradation of protopectin to soluble pectin. α-D-galacturonase (polygalacturonase) and cellulase are involved only in softening fruits in the later stages of ripening. Furthermore, cell wall polymers containing long thin pectin aggregates were destroyed, whereas cell wall polymers containing short thick pectin aggregates remained. The above results and related discussion are confirmed with the results recorded by Kim *et al.* (1992); Fishman *et al.* (1993); El-Seidy (2000) and Tayel (2001) on peach cvs. All of them found that the percentage of water soluble pectin increased during storage period.

Regarding the effect of storage temperature, data in Table (6) indicated that water soluble pectin percentages of fruits from trees on 'Balady' peach and apricot rootstocks, stored at 5 °C, were significantly higher than those stored at 0°C, in both seasons, as an average for 2 weeks of storage. However, the differences were insignificant concerning the fruits from trees on apricot rootstock in second season. The increasing in water soluble pectin with the increasing of storage temperature was previously recorded by Tsuji and Komiyama (1991) on 'Sordum' plum; Mahajan (1994) on 'Red Delicious' apples and El-Seidy (2000) on peaches.

Concerning the influence of rootstocks, generally it could be concluded that in first season fruits from trees on 'Balady peach rootstock, stored at 0 or 5°C, had the least values of water soluble pectin followed by those from trees on apricot and finally ones from trees on 'Nemagard' peach rootstocks. However, the differences were insignificant between fruits from trees on apricot and those from trees on other rootstocks, as an average of four weeks of storage. In second season, almost the same trend was found, despite the differences were insignificant between fruits from trees on apricot and those from trees on 'Nemagard' peach rootstock, stored at 0°C, as an average of 2 or 4 weeks of storage. Also between fruits from trees on 'Balady' and those from trees on 'Nemagard' peach rootstocks, stored at 5°C, as an average of 2 weeks of storage.

Anthocyanin

The results in Table (7) disclosed that the initial anthocyanin values significantly increased at the end of storage period (4 weeks). In second season, the initial values were almost the same after 4 weeks of storage. Generally, it could be concluded that, anthocyanin values were not greatly affected either by storage temperature or variety of rootstock. However, Kochan (1972) on prunes and Embree *et al.* (1993) on apples noticed that flesh color varied considerably with rootstock.

Sugars (total, non-reducing and reducing)

In both experimental seasons, the initial total and non reducing sugars percentages were significantly decreased at the end of storage period (Tables 8 and 9). The reduction in total and non-reducing sugars percentages at the end of storage period may be due to their consumption in respiration processes as respiratory substrates. The results of present study agree with those obtained by Mohamed (1999); El-Seidy (2000) and Tayel (2001) on peach fruits. They all noticed that total and non-reducing sugar percentages decreased at the end of storage period.

On the contrary, the percentages of reducing sugars significantly increased at the end of storage period, in both years of study (Table 10). The increasing in reducing sugars at the end of storage period may be due to the conversion of non-reducing sugars to reducing sugars. The results were confirmed with those obtained by Abd El-Migid (1986) on pears; Mohamed (1999); El-Seidy (2000) and Tayel (2001) on peches and El-Helaly *et al.* (2004) on apples.

Concerning the effect of storage temperature, as an average of two weeks of storage, no significant differences were detected in sugar contents between 'Desert red' fruits from trees on all rootstocks stored at 0°C and those stored at 5°C. Except fruits on 'Nemagard' rootstock, as total sugars (in both seasons) and non-reducing sugars (in second one) in the fruits stored at 5°C were significantly higher than those stored at 0°C. The results were not in line with those of Tayel (2001). She found that total sugars decreased with the increasing of storage temperature. However, it could be concluded that 'Desert red' fruits from trees on all rootstocks, were not greatly affected by storage temperature after two weeks of storage.

Regarding the influence of rootstocks, as an average of 4 weeks of storage, the data indicated that, in first experimental season, no significant differences were found among the sugar contents (total; non-reducing and

reducing) in the fruits from trees on all rootstocks. In second season, total and non-reducing sugars could be arranged in descending order as fruits from trees on 'Balady' peach then apricot and finally on 'Nemagard' peach rootstocks. However, the differences in total sugars were insignificant between the fruits from trees on 'Balady' peach and apricot rootstocks. As for reducing sugars, fruits from trees on 'Balady' peach rootstock had lower values than those from trees on other rootstocks which almost had the same values.

Generally, it could be concluded that, the influence of rootstocks on sugar contents, was not clearly obvious.

Effects of rootstocks on fruit quality during shelf life of fruits stored at 0° or 5°C.

The data from Table (11) indicated that, the firmness in fruits from trees on all rootstocks, stored at 5°C, reached around 3 (1b/inch^2) at 2 days of shelf-life after the middle of storage period (2 weeks), so their shelf-life remained only 2 days, while those stored at 0°C still firmer [4.950-6.733 in first season and 4.460-6.100 (1b/inch^2) in second], therefore, their shelf life period attained one more day (3 days). In addition, fruits stored at 0°C had higher percentages of malic acid than those stored at 5°C. Concerning weight loss and SSC their values didn't greatly affected by storage temperature.

Regarding rootstocks effectiveness, the data in Table (12) showed that at the end of storage period (4 weeks for fruits stored at 0°C) the shelf life period remained 2 days. Fruits from trees on apricot rootstock had the highest values of SSC, also those fruits (in second season) were the firmest ones followed by fruits on 'Balady' peach rootstock, which almost had the least percentages of weight loss. However, rootstocks had no obvious effects on fruit acidity during shelf-life period, after 4 weeks of storage.

CONCLUSION

'Desert red' peach fruits on the three rootstocks ('Balady' peach; apricot and 'Nemagard' peach) almost had the same values of weight; length; thickness; firmness; SSC and non-reducing sugars. Fruits on 'Balady' peach rootstock had the least percentages of water soluble pectin. Furthermore, during storage period, those fruits (on 'Balady' peach rootstock) were almost the firmest ones. So, it could be recommended that, 'Balady' peach rootstock is the best rootstock for 'Desert red' peach fruits quality followed by apricot rootstock.

Table (1): Initial quality of "Desert red" peach fruits from trees buded on three various rootstocks in 2005 and 2006.

Rootstocks / Parameter	Balady peach	Apricot	Nemagard peach	L.S.D. 0.05	Balady peach	Apricot	Nemagard peach	L.S.D. 0.05
	2005				2006			
Fruit weight (gm)	97.467	91.033	87.500	N.S	87.267	85.200	84.700	N.S
Flesh thickness (cm)	1.466	1.466	1.300	N.S	1.433	1.233	1.333	N.S
Fruit length (cm)	5.200	4.866	4.866	N.S	5.166	4.800	4.966	N.S
Fruit diameter (cm)	4.933	4.666	4.466	0.199	4.766	4.500	4.400	N.S
Firmness (lb/inch^2)	9.803	10.110	9.340	N.S	9.840	9.256	9.423	N.S
SSC %	10.230	10.326	9.933	N.S	10.783	10.620	10.620	N.S
Acidity %	0.750	0.643	0.629	0.031	0.736	0.596	0.609	0.048
Water soluble pectin %	0.676	0.900	1.050	0.216	0.713	0.850	0.990	0.124
Total sugars%	5.913	6.913	7.160	0.828	7.220	7.330	7.450	0.104
Reducing sugars%	0.609	0.976	0.628	0.266	0.981	1.004	0.971	N.S
Non-reducing sugars %	5.304	5.937	6.532	N.S	6.236	6.326	6.479	N.S
Anthocyanin (O.D/g fresh weight)	0.526	0.833	1.292	0.460	1.124	1.720	2.030	0.171

Table (2): Effect of various rootstocks on fruit firmness (1b/inch^2) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
				2005				
0	9.803	10.110	9.340	9.803	10.110	9.340	9.751	9.751
1	9.113	9.000	6.850	7.873	7.130	5.766	7.622	8.321
2	8.923	7.316	6.283	5.633	5.400	4.090	6.274	7.507
Average	9.280	8.808	7.491	7.770	7.546	6.398		
L.S.D		Treatments			Storage period			Interaction
0.05		0.429			0.364			0.893
3	6.566	4.960	4.600	-	-	-		5.375
4	4.760	4.300	3.513	-	-	-		4.191
Average*	7.833	7.137	6.117	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.333			0.391			0.678
				2006				
0	9.840	9.256	9.423	9.840	9.256	9.423	9.506	9.506
1	9.493	9.160	7.116	6.613	6.493	6.823	7.616	8.590
2	8.546	8.636	6.620	5.103	5.183	4.403	6.415	7.934
Average	9.293	9.017	7.720	7.185	6.977	6.883		
L.S.D		Treatments			Storage period			Interaction
0.05		0.474			0.247			0.606
3	6.656	5.513	4.250	-	-	-		5.473
4	5.000	5.056	4.380	-	-	-		4.812
Average*	7.907	7.524	6.358	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.653			0.287			0.497

*Average of all storage periods.

Table (3): Effect of various rootstocks on the percentage of weight loss of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0 °C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
2005								
0	-	-	-	-	-	-	-	-
1	0.000	0.000	0.010	0.106	0.116	0.138	0.061	0.003
2	0.040	0.020	0.030	0.224	0.255	0.274	0.140	0.030
Average	0.020	0.010	0.020	0.165	0.185	0.206		
L.S.D		Treatments			Storage period			Interaction
0.05		0.031			0.006			0.015
3	0.072	0.040	0.084	-	-	-		0.065
4	0.093	0.071	0.126	-	-	-		0.097
Average*	0.051	0.032	0.062	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.010			0.004			0.008
2006								
0	-	-	-	-	-	-	-	-
1	0.000	0.000	0.000	0.131	0.147	0.137	0.138	0.000
2	0.040	0.032	0.013	0.266	0.400	0.290	0.173	0.028
Average	0.020	0.016	0.006	0.198	0.273	0.213		
L.S.D		Treatments			Storage period			Interaction
0.05		0.032			0.011			0.027
3	0.071	0.066	0.062	-	-	-		0.066
4	0.089	0.095	0.095	-	-	-		0.093
Average*	0.050	0.048	0.042	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.008			N.S

*Average of all storage periods.

Table (4): Effect of various rootstocks on soluble solids content (SSC) percentages of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
2005								
0	10.230	10.326	9.933	10.230	10.326	9.933	10.163	10.163
1	10.616	11.103	10.513	10.493	11.043	10.943	10.785	10.744
2	9.720	10.340	11.850	10.036	10.960	11.180	10.681	10.636
Average	10.188	10.590	10.765	10.253	10.776	10.685		
L.S.D		Treatments			Storage period			Interaction
0.05		0.227			0.177			0.435
3	10.200	10.550	10.900	-	-	-		10.550
4	10.620	10.900	9.970	-	-	-		10.496
Average*	10.277	10.644	10.633	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.148			0.188			0.325
2006								
0	10.783	10.620	10.620	10.783	10.620	10.620	10.675	10.675
1	10.620	11.760	10.553	10.463	10.990	10.540	10.821	10.977
2	9.890	11.150	11.550	10.056	11.030	11.083	10.793	10.863
Average	10.432	11.176	10.907	10.434	10.880	10.747		
L.S.D		Treatments			Storage period			Interaction
0.05		0.275			0.130			0.319
3	10.830	10.310	11.100	-	-	-		10.746
4	10.250	11.060	10.263	-	-	-		10.524
Average*	10.475	10.980	10.817	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.183			0.226			0.392

*Average of all storage periods.

Table (5): *Effect of various rootstocks on titratable acidity (malic acid %) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.*

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
				2005				
0	0.750	0.643	0.629	0.750	0.643	0.629	0.674	0.674
1	0.575	0.582	0.609	0.529	0.595	0.462	0.558	0.589
2	0.670	0.549	0.542	0.508	0.562	0.484	0.552	0.587
Average	0.665	0.591	0.593	0.595	0.600	0.525		
L.S.D		Treatments			Storage period			Interaction
0.05		0.015			0.010			0.026
3	0.589	0.589	0.555	-	-	-		0.577
4	0.556	0.502	0.435	-	-	-		0.497
Average*	0.628	0.573	0.554	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.015			0.009			0.017
				2006				
0	0.736	0.596	0.609	0.736	0.596	0.609	0.647	0.647
1	0.643	0.522	0.603	0.531	0.549	0.475	0.553	0.589
2	0.676	0.596	0.549	0.468	0.549	0.509	0.557	0.607
Average	0.685	0.571	0.587	0.578	0.564	0.531		
L.S.D		Treatments			Storage period			Interaction
0.05		0.019			0.011			0.028
3	0.589	0.549	0.509	-	-	-		0.549
4	0.549	0.535	0.421	-	-	-		0.501
Average*	0.638	0.559	0.538	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.011			0.017			0.031

*Average of all storage periods.

Table (6): Effect of various rootstocks on water soluble pectin (%) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
2005								
0	0.676	0.900	1.050	0.676	0.900	1.050	0.875	0.875
2	0.690	0.883	1.030	1.010	1.030	1.083	0.954	0.867
Average	0.683	0.891	1.040	0.843	0.965	1.066		
L.S.D		Treatments			Storage period			Interaction
0.05		0.061			N.S			N.S
4	1.600	1.620	1.473	-	-	-		1.564
Average*	0.988	1.134	1.184	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.155			0.099			0.172
2006								
0	0.713	0.850	0.990	0.713	0.850	0.990	0.851	0.851
2	1.080	1.743	1.643	1.570	1.890	1.230	1.526	1.488
Average	0.896	1.296	1.316	1.141	1.370	1.110		
L.S.D		Treatments			Storage period			Interaction
0.05		0.135			0.121			0.298
4	1.643	1.853	2.033	-	-	-		1.843
Average*	1.145	1.482	1.555	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.095			0.060			0.104

*Average of all storage periods.

Table (7): Effect of various rootstocks on anthocyanin (O.D/g fresh weight) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
				2005				
0	0.526	0.833	1.292	0.526	0.833	1.292	0.883	0.883
2	1.255	1.055	1.107	1.541	1.140	1.455	1.258	1.139
Average	0.890	0.944	1.199	1.033	0.986	1.373		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.072			0.176
4	1.185	1.363	1.594	-	-	-		1.380
Average*	0.988	1.083	1.331	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.159			0.276
				2006				
0	1.124	1.720	2.030	1.124	1.720	2.030	1.624	1.624
2	1.523	1.062	1.023	0.980	1.012	1.908	1.251	1.202
Average	1.323	1.391	1.526	1.052	1.366	1.969		
L.S.D		Treatments			Storage period			Interaction
0.05		0.059			0.084			0.206
4	1.880	0.567	1.309	-	-	-		1.585
Average*	1.509	1.449	1.454	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.144			0.250

*Average of all storage periods.

Table (8): Effect of various rootstocks on total sugars (%) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
		0°C			5°C			
				2005				
0	5.913	6.913	7.160	5.913	6.913	7.160	6.662	6.662
2	5.283	4.800	4.003	4.473	4.173	5.613	4.724	4.695
Average	5.598	5.856	5.581	5.193	5.543	6.388		
L.S.D		Treatments			Storage period			Interaction
0.05		0.602			0.383			0.938
4	6.520	6.473	5.783	-	-	-		6.285
Average*	5.905	6.062	5.648	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.346			0.599
				2006				
0	7.220	7.330	7.450	7.220	7.330	7.450	7.333	7.333
2	4.970	4.736	3.723	4.283	4.416	5.590	4.620	4.476
Average	6.095	6.033	5.586	5.751	5.873	6.520		
L.S.D		Treatments			Storage period			Interaction
0.05		0.517			0.277			0.679
4	6.610	6.323	5.879	-	-	-		6.268
Average*	6.266	6.130	5.682	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.263			0.530			N.S

*Average of all storage periods.

Table (9): Effect of various rootstocks on non-reducing sugars (%) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
2005								
0	5.304	5.937	6.532	5.304	5.937	6.532	5.924	5.924
2	4.433	4.060	3.113	3.678	3.190	4.610	3.847	3.868
Average	4.868	4.998	4.822	4.491	4.563	5.571		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.310			0.759
4	4.446	4.400	3.630	-	-	-		4.158
Average*	4.728	4.799	4.425	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.314			0.543
2006								
0	6.238	6.326	6.479	6.238	6.326	6.479	6.347	6.347
2	4.080	3.616	2.773	3.270	3.556	4.660	3.659	3.490
Average	5.159	4.971	4.626	4.754	4.941	5.569		
L.S.D		Treatments			Storage period			Interaction
0.05		0.565			0.250			0.613
4	4.566	3.993	2.900	-	-	-		3.820
Average*	4.961	4.645	4.050	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.301			0.562			N.S

*Average of all storage periods.

Table (10): Effect of various rootstocks on reducing sugars (%) of "Desert red" peach fruits during cold storage at 0°C or 5°C in 2005 and 2006.

Weeks in storage	Rootstocks						Average	Average of storage at 0°C
	Balady peach	Apricot	Nemagard peach	Balady peach	Apricot	Nemagard peach		
	0°C			5°C				
				2005				
0	0.609	0.976	0.628	0.609	0.976	0.628	0.737	0.737
2	0.850	0.740	0.890	0.795	0.983	1.003	0.876	0.826
Average	0.729	0.858	0.759	0.702	0.979	0.815		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.056			0.138
4	2.073	2.073	2.153	-	-	-		2.100
Average*	1.177	1.263	1.223	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			0.115			0.200
				2006				
0	0.981	1.004	0.971	0.981	1.004	0.971	0.985	0.985
2	0.890	1.120	0.950	1.013	0.860	0.931	0.960	0.986
Average	0.935	1.062	0.960	0.997	0.932	0.950		
L.S.D		Treatments			Storage period			Interaction
0.05		N.S			N.S			N.S
4	2.043	2.330	2.973	-	-	-		2.448
Average*	1.305	1.484	1.631	-	-	-		
L.S.D		Treatments			Storage period			Interaction
0.05		0.146			0.217			0.376

*Average of all storage periods.

Table (11): Effect of various rootstocks on "Desert red" peach fruits quality at the middle of storage period after 2 and 3 days of shelf-life at ambient temperature (20-30°C).

Rootstocks	Storage temperature	Weight loss %		Firmness (lb/inch²)		SSC %		Acidity %	
		Shelf-life (days)							
		2	3	2	3	2	3	2	3
2005									
Balady peach	0°C	0.416	0.490	6.733	4.723	9.920	9.573	0.506	0.415
Apricot	0°C	0.596	0.630	6.040	5.673	10.100	9.870	0.510	0.482
Nemagard peach	0°C	0.520	0.750	4.950	4.233	10.723	10.440	0.496	0.455
Balady peach	5°C	0.430	-	3.090	-	10.120	-	0.428	-
Apricot	5°C	0.433	-	2.600	-	10.440	-	0.435	-
Nemagard peach	5°C	0.545	-	2.350	-	10.380	-	0.435	-
L.S.D. 0.05		0.063	0.057	0.357	N.S	0.246	0.471	0.033	0.051
2006									
Balady peach	0°C	0.400	0.450	6.100	4.250	9.700	8.990	0.570	0.442
Apricot	0°C	0.600	0.690	6.000	5.453	11.023	9.743	0.548	0.502
Nemagard peach	0°C	0.483	0.753	4.460	3.250	10.800	10.190	0.520	0.455
Balady peach	5°C	0.545	-	3.440	-	9.883	-	0.482	-
Apricot	5°C	0.473	-	3.140	-	9.910	-	0.462	-
Nemagard peach	5°C	0.496	-	2.500	-	10.340	-	0.428	-
L.S.D. 0.05		0.076	0.017	0.472	0.954	0.244	0.328	0.051	0.017

Table (12): Effect of various rootstocks on "Desert red" peach fruits quality at the end of storage period after 2 days of shelf-life at ambient temperature (20-30°C).

Rootstocks	Storage temperature	Weight loss %	Firmness (lb/inch^2)	SSC %	Acidity %
		2005			
Balady peach	0°C	0.310	3.273	9.633	0.553
Apricot	0°C	0.319	3.250	10.700	0.504
Nemagard peach	0°C	0.319	3.173	9.740	0.489
L.S.D. 0.05		N.S	N.S	0.408	0.020
		2006			
Balady peach	0°C	0.303	3.250	9.930	0.475
Apricot	0°C	0.356	3.790	10.673	0.504
Nemagard peach	0°C	0.381	2.813	10.340	0.475
L.S.D. 0.05		0.053	0.361	0.127	N.S

REFERENCES

Abd El-Migid, M.B. (1986). Post-harvest physiological studies on Le- conte and Kiefer pear fruits stored at different temperatures. Ph.D. Thesis, Alex. Univ., Alex. Egypt.

Autio, W.R. (1987). Effects of rootstock on apple ripening, size and quality. Compact fruit tree, 20: 98-102.

Autio, W.R. (1991). Rootstocks affect ripening and other qualities of 'Delicious' apples. J. Amer. Soc. Hort. Sci., 116: 378-382.

Barden, J.A. (1988). Rootstock effects on maturity, quality, storage life, and physiological disorders of Delicious apples. Compact fruit tree, 21: 82-85.

Beckman, T.G., W.R. Okie and S.C. Meyers (1992). Rootstocks affect bloom date and fruit maturation of 'Red haven' peach. J. Amer. Soc. Hort. Sci., 117: 377-379.

Brown, G.R., D. Wolfe (1992). Rootstock affects maturity of 'Startspur Supreme Delicious' apples. Hort. Sci., 27: 76.

Care, M.H. and S.Haynes (1922). Estimation of pectic substances. Cited form Ranganna S. (1979). Mannual of Analysis of Fruit and Vegetables Products, New Delhi, Tate Mc Graw-Hill Publishing, Company, Chapter, 2: 29-33.

Castle, W.S. (1987). Citrus rootstocks. pp.361-399 in: Rootstocks for fruit crops. Rom, R.C.; R.F. Carlson, (ed.) NY, Wiley and Sons.

Chen, P.M. and W.M.Mellenthin (1981). Effect of harvest date on ripening capacity and post-harvest life of d'Anjou Pears. J. Amer. Soc. Hort. Sci., 106 (1): 38-42.

Cummins, J.N, H.S. Aldwinckle (1983). Breeding apple rootstocks. Pp294-394 in Plant breeding reviews. Janick, J. ed. Westport, CT., AVI Publishing Co.

Deshpande, P.B. and D.K. Salunkhe (1964). Effects of maturity and storage on certain biochemical changes in apricots and peaches. Food Tech., 18 (18): 85-88.

Drake, S.R., F.E. larson, J.K.Fellman and S.S. Higgins (1988). Maturity, storage quality, carbohydrate, and mineral contents of 'Goldspur' apples as influenced by rootstock. J Amer. Soc. Hort. Soc., 113: 949-952.

Dubois, M., K.A. Gilles, J.K. Haniltion, P.A. Robers and F. Smith (1956). Anal. Chem., 28(3): 350-358.

Dundar, O. (1997). Investigation on cold storage and postharvest physiology of J.H. Hale peach. Acta Hort., 441: 411-414.

El-Etreby, S.M. (1996). Physiological studies on fruits of some old and new peach varieties. M. Sc. Fac. Agric. Cairo. Univ.

Elfving, D.C. (1987). Choosing an apple rootstock. Compact fruit tree, 20: 112-115.

El-Helaly, A.A.E., M.A.E. El-Shemy and M.E. Sobieh (2004). Additive effects of paclobutrazol preharvest spray and some posthavest dip treatments on keeping quality and storability of 'Anna' apple fruits. J. Agric. Sci. Mansoura Univ., 29 (12): 7385-7408.

El-Seidy, R.M.A. (1994). Physiological studies on cooling and refrigerated storage of fresh Le Conte pears. M.Sc. Thesis, Alex. Univ., Alex. Egypt.

El-Seidy, R.M.A. (2000). Postharvest-prestorage-calcium treatments in relation to quality changes and storagability of peaches. Ph.D. Thesis, Alex. Univ., Alex. Egypt.

Embree, C.G., B.H.Lesser and A.D. Crowe (1993). Characterization of the kentville Stock Clone apple rootstocks. III. Quality and overall performance. J. Amer. Soc. Hort. Sci., 118: 177-180.

Fallahi, E., D.G. Richardson and M.N. Westwood (1985). Quality of apple fruit from a high density orchard as influenced by rootstocks, fertilizers, maturity and storage. J. Amer. Soc. Hort. Sci., 110: 71-74.

FAO production year book 1999: FAO statistics series vol. 52, No. 148.

Fishman, M.I., B. Levaj, D. Gillespie and R. Scorza (1993). Changes in the physico-chemical properties of peach fruit pectin during on-tree ripening and storage. J. Amer. Soc. Hort. Sci., 118 (3): 343-349.

Geissman, T.A. (1962). The chemistry of flavonoid compounds. New York, Pergame press.

Han Tao, Li Liping and Gexing (1996). Physiological effect of heat shock treatment on peach fruit stored at low temperature. Plant physiology Communications, 32(3): 184-186. (Hort. Abst. 67(7): 5686).

Kamal, H.M., M.T.Kabeel and S.M. El-Etreby (1996). Physiological studies on fruits of some old and new peach varieties. Bull. Fac. Agric., Univ. Cairo, 47: 611-628.

Kim, M.H., S.R.Shin, M.A. Son and K.S. Kim (1992). Changes in the cell components of peach during maturation and storage. J. Korean Soc. Food and Nutrition, 21 (4): 372-376.

Kochan, W. (1972). What casuses prune shrivel? Proc. Idaho Hort. Soc. 78: 75.

Kuranze, S. and N. Kaska (1993). Investigation on the postharvest physiology of some peach vrieties grown in Adana. Doga Turk Tarm ve Ormancilik Dergisi, 17(1): 39-51. (Hort. Abst. 65: 1885).

Lipe, W.N., R.L. Perry (1988). Effects of rootstocks on wine grape vigor, yield and juice quality. Hort. Sci, 23: 317-321.

Loomis, W.E. and C.A. Shull (1937). Methods in plant physiology. McGraw-Hill Book Co., Inc. New York.

Lord, W.J., D.W. Greene, R.A. Jr. Damon and J.H. Baker (1985). Effects of stempiece and rootstock combinations on growth, leaf mineral concentrations, yield and fruit quality of 'Empire' apple trees. J. Amer. Soc. Hort. Sci., 110: 422-425.

Mahajan, B. V.C. (1994). Biological and enzymatic changes in apple during cold storage. J. Food Sci. Tech., 31(2): 142-144.

Mohamed, K.S. (1999). Postharvest studies on newly introduced peach varieties in the north west region of Egypt. M.Sc. Thesis, Alex. Univ., Alex., Egypt.

Robertson, J.A., F.I. Meredith, R.J. Horbert, J. Horvet and S.D.Senter (1990). Effect of cold storage and maturity on physical and chemical characteristics and volatile constituents of peach (c.v. Cresthaven). J. Agric. Food Chem., 38 (3): 620-624.

Rom, R.C., R.F. Carlson (ed.), (1987). Rootstocks for fruit crops. New York, Wiley and Sons. 494p.

Shaffer, P.A. and A.F. Hartman (1921). The iodometric determination of copper and its use in sugar analysis. J. Bio. Chem. 45: 390.

Shaltout, A.D. (1987). Florda prince, a promising peach cultivar recently introduced to Egypt. Bull. Fac. Agric. Univ. Cairo, 38(2): 381-391.

Snedecor, G.W. and W.G. Cochran (1971). Statistical methods, 6th ed. Iowa State Unive., Press, Ames., Iowa USA.

Study for Estimate National Agricultural Income (2006). Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, A.R.E., (2003/2004).

Tayel, E.A.A. (2001). Non-chemical postharvest treatments to maintain fruit quality and improve storagability of three peach cultivars grown in west coast region of Egypt. Ph.D. Thesis, Alex. Univ., Alex. Egypt.

Tsuji, M. and Komiyama (1991). Changes in pectic substances and pectin-degrading enzyme activities of plum fruits during storage at 30°C. J. Japanese Soc. Food Sci. Tech., 38 (11): 1013-1035.

Vanoli, M., C. Visai and A. Rizzole (1995). Peach quality: influence of ripening and cold storage Acta Hort. 379: 445-450.

Westwood, M.N., M.H. Chaplin, A.N. Roberts (1973). Effects of rootstock on growth, bloom, yield, maturity, and fruit quality of prune (*Prunus domestica* L.). J. Amer. Soc. Hort. Sci., 98(4): 352-357.

William; S.C. (1995). Rootstock as a fruit quality factor in citrus and deciduous tree crops. New Zealand J. Crop and Hort. Sci., 23: 393-394.

Yadava, U.L. and S.L. Doud (1989). Rootstock and scion influence growth, productivity, survival, and short life-related performance of peach trees. J. Amer. Soc. Hort. Sci., 114(6): 875-880.

الملخص العربى

دراسة مقارنة على تأثير ٣ أصول على صفات الجودة والقدرة التخزينية لثمار خوخ صنف" ديزرت رید"

أميرة عبد الحميد الهلالي[١] ، إيناس عبد العزيز طايل[٢]، محمد عاطف الشوبكي[٣]

١، ٢- محطة بحوث البساتين – الإسكندرية – معهد بحوث البساتين – الجيزة – جمهورية مصر العربية

٣- معهد بحوث البساتين – الجيزة – جمهورية مصر العربية

أجريت هذه الدراسة خلال عامي ٢٠٠٥ ، ٢٠٠٦ بهدف مقارنة تأثيرات ٣ أصول هي الخوخ البلدي ، المشمش وخوخ نيماجارد على صفات الجودة والقدرة التخزينيه لثمار الخوخ صنف ديزرت رید النامية في الأرض الرملية تحت نظام الري بالتنقيط. وقد تم تخزين الثمار بعد تغليفها بأكياس بولي إيثيلين عند درجتى حرارة صفر،٥°م ورطوبة نسبيه ٨٥-٩٠٪. وقد فحصت صفات الجودة بمجرد جمع الثمار وبعد كل أسبوع أثناء فترة التخزين التي استمرت لمدة أربعة أسابيع وأيضاً أثناء فترة عرض الثمار عند منتصف ونهاية فترة التخزين حيث تركت الثمار على درجة حرارة الغرفة ٢٠-٣٠°م، رطوبة نسبيه ٨٠-٩٠٪. لتماثل ظروف السوق.

ولقد أظهرت النتائج المتشابهه فى الموسمين الآتى:

- عند وقت الجمع تماثلت ثمار الخوخ صنف (ديزرت رید) المطعومة على الأصول المختلفة من حيث الوزن، الطول ، السمك، الصلابة، المواد الصلبة الذائبة والسكريات الغير مختزلة، حيث لم يكن هناك فروق معنوية، و بصفة عامة أعطت ثمار الخوخ ديزرت رید من الأشجار المطعومة على

أصل الخوخ البلدى أعلى قيم للحموضة وأقل قيم للبكتين الذائب والسكريات الكلية والانثوسيانين بينما تماثلت تقريباً هذه الصفات في الثمار على الأصلين الأخريين .

- لم يكن هناك تأثير للأصول على القدرة التخزينية للثمار حيث استمرت الثمار المطعومة على الأصول المختلفة والمخزنة على صفر°م مدة ٤ أسابيع بحالة جيدة بينما لم تستمر تلك المخزنة على ٥°م سوى أسبوعين مما يثبت أن القدرة التخزينية للثمار اعتمدت بصفة أساسية على درجة حرارة التخزين .
- بتقدم فترة التخزين حدث انخفاض معنوي في الصلابة والحموضة وزيادة معنوية في فقد الوزن ، البكتين الذائب في الماء وعند نهاية فترة التخزين حدثت زيادة معنوية في السكريات المختزلة بينما انخفضت السكريات الكلية والغير مختزلة وكان الانخفاض معنوي .
- لم تختلف معنوياً قيم السكريات الكلية (بإستثناء الثمار على أصل الخوخ نيماجارد) والسكريات المختزلة والمواد الصلبة الذائبة باختلاف درجة حرارة التخزين فى ثمار الأشجار المطعومة على الأصول المختلفة. بينما كانت قيم الحموضة (بإستثناء الثمار على أصل المشمش) و الصلابة أقل عند ٥°م عنها عند صفر°م على العكس من قيم البكتين الذائب (فى الثمار التى على أصل الخوخ البلدى) و فقد الوزن التى كانت أعلى عند ٥°م.
- بصفة عامة قيم الأنثوسيانين لم تتأثر بالأصول المستخدمة. بينما الثمار على أصل الخوخ البلدى أحتوت على أعلى قيم من الصلابة والحموضة. أيضاً الثمار على هذا الأصل (الخوخ البلدى) أحتوت أقل قيم من المواد الصلبة الذائبة و ذلك كمتوسط لطول فترة التخزين (٤ أسابيع).
- أوضحت النتائج أن الثمار من الأشجار على الأصول المختلفة، التي خزنت عند صفر°م احتفظت بصلابتها فاستمرت فترة العرض ٣ أيام بينما تلك التي خزنت عند ٥°م فقدت صلابتها سريعاً لذا لم تستمر سوى ٢ يوم فقط. و عند نهاية فترة التخزين (٤ أسابيع للثمار المخزنة عند صفر°م) استمرت فترة العرض يومين. و أظهرت النتائج أن الثمار على أصل المشمش أحتوت أعلى قيم من المواد الصلبة الذائبة.

من النتائج السابقة نستنتج أن أفضل الأصول تأثيرا على جودة ثمار خوخ ديزرت رید هو أصل الخوخ البلدى يليه أصل المشمش.