EVALUATION AND DESCRIPTION OF "EARLY SWELLING" PEACH CULTIVAR UNDER RECLAIMED SOIL CONDITIONS IN EGYPT

[1]WESAM A. NABIL, [1]MAGDA NASR, [2]NAHED A. AHMED and [3]ABD EL-RAOF, A.

[1]Deciduous fruit Res. Dept., Hort. Res. Instit., ARC, Giza, Egypt
[2]Fruit Handling Res. Dept., Hort. Res. Instit., ARC, Giza, Egypt
[3]Cliametic Labortray, ARC, Giza, Egypt

Abstract

This investigation was conducted for two successive seasons 2012/2013-2013/2014 in a private orchard at Regwa district, Giza governorate to describe and evaluate mature bearing trees of "Early Swelling" peach cultivar budded on "Nemagaurd" rootstock. The chosen trees were four years old, grown on sandy soil, spaced at 3 X 6 meters apart, irrigated by the drip system. The results revealed that "Early Swelling" peach is considered as one of early mature peach cultivars, it needs chill hours ranged between (89-112) at 7°C or (563-577) at 10°C and GDH ranged between (26014-15166) heat units and fruit maturity ranged between (74-83 days) from beginning of flowering till harvesting time during two studied seasons 2013-2014. It appeared that this cultivar was successful under Egyptian conditions. It was characterized by good vegetative growth and good fruit quality. Yield/tree, fruit weight and size were medium, fruit shape was spherical-oval and fruit colour was yellowish red. Histological studies showed that the time of bud differentiation is closely with phenological stages. However, bud differentiation occurs just after leaves defoliation time (the late of September) and continues almost until onset of flowering time (the beginning of February). With respect to genetic studies, the data obtained from ISSR-PCR showed sixteen bands as total bands with molecular weight ranging from 220-1050bp. On the other hand, RAPD-PCR analysis generated thirty three bands with molecular weight ranging from 160-870bp. While, Protein electrophoresis profile resulted in fourteen bands with molecular weight ranging from 22-160 KDa, Peroxidase isozyme profile was eleven peroxidase bands with different density and also Poly Phenyle Oxidase profile produced six bands with different density. As for the storability, "Early Swelling" peach fruits had kept good characteristics including the decrease of fruit weight loss and good fruits physical and chemical characteristics during cold storage period for six weeks. Thus, from the obtained results for this cultivar, it is recommended to widespread cultivation Early Swelling peach cultivar in Egypt for local market or export.

INTRODUCTION

Peach, (Prunus presica L.) fruit is one of the favorite fruits of temperate zone and considered one of the most important deciduous fruit trees growing rapidly in the world.

In Egypt, it is known that the most spread local peach clone is "Mit Ghamer". Fortunately, during the last three decades, several peach cultivars have been introduced to Egypt by the Agricultural Development System (Stino et al., 1982; Mansour and Stino 1986 and Shaltout 1987 and 1995). These cultivars were achieved by selecting a profitable cultivar at the right time, it is an important factor determining success in each production due to increase marketing period of peach fruits, such as Florida Princ, Desert Red, Tropic Snow, Tropic Sweet and Swelling.

Two Italian peach cultivars; Early Crest and May Crest were evaluated by El-Sherif et al., (2009) and four cultivars; Hermosillo, Desert Pearl, Bokkeveld and De Wet were evaluated by Yehia et al., (2010), These cultivars are early maturing ones and are exhibited in the local market with high prices. Therefore, the area of peach orchards increased and attained about 59374 Feddans with a production of about 281119 tons (Statistics of 2013, Ministry of Agriculture, Egypt).

Flower bud differentiation is quite important for peach production and it is well known that flowering is an evident important stage in plant life, because of yield is directly dependent upon its success (Abbas, 1995). "San Pedro", "Y9/106" and "Rubidoux" peach cultivars showed that twelve stages could be detected through the generative process from mid of June up to end Feb. or early March. The preliminary stages of floral bud occurred approximately at the same time in the three studied cultivars. The late stages (primordia of ovules) were formed during Jan 26th, Feb. 9th and March 9 for the three cultivars respectively (El-Agamy et al., 2002). However, before starting any programs for improving cultivars, occurred studies on flowering behaviour must be conducted.

Local peach strains of Dakahlia have attractive fruits with special taste and aroma. Production of superior quality of peaches is highly demanded for consumption and exportations (Mehanna et al., 1982; Mansour and Shaltout,1986 and EL-Said et al., 1997). Early peach of Sinai are vigorous, good shaped, resistant to drought, when high fruit quality and big adaptability for handling and storage ability (Mansour et al., 1998). So, there was a recommendation to peach growers to establish some superior Dakahlia and Sinai peach strains (Mansour et al., 1999 and Eliwa,2005).

Molecular markers are interest to plant geneticists and breeders as a source of new genetic information on plant genomes and for use in trait selection. Randomly Amplified Polymorphic DNA analysis (RAPD) can be used to identify many useful polymorphisms quickly and efficiently, and as such, it has tremendous potential for use in cultivar identification. RAPD analysis has been used to study genetic relationships in a number of fruit trees including almond (Bartolozzi et al., 1998), plum varieties (Ortize et al., 1997), peach varieties (Chaparro et al., 1994; Warburton and

Bliss, 1996), peach rootstocks (Lu et al., 1996) and RAPD markers have been used in peach genetics and breeding programs (Rajapakse et al., 1995).

Preconditioning of stone fruits involve exposing the fruit to warm conditions for 1 or 2 day(s) after harvest before placing them in ^{0}C storage; this treatment can extend peach and nectarine storage life (Lurie & Crisosto, 2005). It has been reported that two days of delayed storage at 20 ^{0}C prior to storage at ^{0}C for 42 days prevented chilling injury in 'Flavortop' nectarines (Zhou et al., 2000 and Crisosto et al., 2004).

Hence, the aim of this work was to study the performance of "Early Swelling" peach cultivar under new reclaimed soil conditions by studying required chill units (CU) and growing degree hours (GDH), vegetative growth, the yield, fruit physical and chemical characteristics, storability, bud differentiation and finger print.

MATERIALS AND METHODS

The present investigation was conducted at a private orchard in Regwa district at Giza governorate, Egypt. The experiment extended for two successive seasons 2012/2013-2013/2014 on mature bearing trees of "Early Swelling" peach cultivar.

Nine trees-4 years old, spaced 3x6m and grown in sandy soil were randomly selected, approximately vigorously uniform in their vegetative growth, budded on "Nemagaurd" rootstock and trained as Vase form. Regular horticultural practices were applied to all experimental trees.

Chilling requirements (Meteorological data)

Chill units from leaves defoliation till beginning of flowering were recorded as follows:-

a) Number of hours at <7.2 ^{o}C

b) Number of hours at <10 ^{o}C

Heat units

Growing degree hours were also estimated for fruit growth from beginning of flowering till harvest date according to Shallenberger et al., (1959) as

$$GDH = \sum 2\,(T_m - 7.5)12$$

When T_m = temperature at a given hour in the day, and 7.5^{o}C = base temperature.

Phenological studies:

Four shoots of the current season in four directions were tagged on three trees to record:

a) Time of phenological dates (onset of flowering, full bloom, onset of fruit set, pit hardening and fruit maturity) was estimated periodically.

b) Number of days for phenological dates was calculated periodically by calendar year (Julian day).

Descriptive measurements

The morphological studies were carried out according to the International Amelographic Registered Schedule as follows: Tree size, leaf shape, leaf teeth, fruit size, fruit shape, fruit color, flesh color and pit adherence.

Morphological studies:

Increment length and diameter (cm) of shoot, leaf area (cm^2) and number of vegetative and floral buds were recorded.

Percentage of fruit set:

The total number of flowers on each tagged limb was counted at full bloom. The number of set fruit was counted on the same limbs after one month from full bloom. Fruit set percentage was calculated according to (Westwood, 1988) as follows:

$$\text{Fruit set\%} = \frac{\text{Number of developing fruitlets}}{\text{Total number of flowers}} \times 100$$

Yield and fruit physical and chemical characteristics:

Yield/tree (kg) was determined as number of fruits/tree X average fruit weight (g). Also, five fruits per tree samples were examined at picking date to determine fruit characteristics including: fruit weight (g), fruit size (cm^3), fruit firmness (g/cm^2) and fruit skin color were measured. Total soluble solids (%) were estimated using hand refractometer and total acidity was estimated according to (A.O.A.C., 2000).

Histological studies:

Sampling period: Five buds were taken at random from the fourth node from the base of the current cultivar shoots. The buds were taken at weekly intervals beginning on the first of June till early February or March (at pink bud stage).

Buds were excised and fixed in F.A.A. solution (Formalin, acetic acid and alcohol (95%) as 5:5:90, respectively). The buds were transferred from F.A.A. and were dehydrated in a graded series of alcohol (Tertiary butyle alcohol (TBA) and Ethanol) according to the method of (Sass, 1940). Then buds were embedded in paraffin wax at 60°C for three days. Series paraffin blocks were cut into sections of 7-10µM in thickness were prepared using hand microtome. Sections were stained with (Safranine) according to the method (El-Agamy et al., 2002).

Genetic studies:

Protein extraction:

Samples of "Early Swelling" peach cultivar leaves were taken and total soluble protein was extracted by grinding 0.25g of each sample in 0.9 ml extraction buffer (10ml 0.5MTris pH6.8, 16ml 10% SDS, 30ml D.W) with shaking thoroughly. The extracts were transferred to Eppendorf tubes and centrifuged for 10 min. at 10000

rpm under cooling. Supernatant were transferred by fresh tubes and used for SDS-PAGE analysis and extraction of isozymes was used as described by Jonathan and Weeden, (1990).

Protein related index:

Fractionation electrophoresis was performed under identical conditions on sodium dedocyl sulphate polyacrylamide gel (SDS-PAGE) (12%W/V) vertical slab using BIORAD Techware 1.5 mm according to the method of Laemmli (1970) as modified by Studier (1973). The molecular weights of proteins were estimated relative to marker, a wide range molecular weight protein (Fermentas com.).

Isozymes electrophoresis:

Native–polacrylamide gel electrophoresis (Native-PAGE) was performed in 12% (W/V) slab gel (Davis, 1964). The gel was stained after run according to Tankseley and Rick (1980) for Poly Phenyl Oxidase (PPO) isozymes as Graham et al., (1964) for peroxidase isozymes. The staining gel was incubated at 37 °C in dark for complete staining after adding the appropriate substrates and staining solutions.

RAPD-PCR Analysis

DNA Extraction

Yong and freshly excised leaves were collected from Early Swelling peach cultivar. Then DNA extraction was performed as described by Dellaporta et al. (1983). About 0.1 gm (fresh weight) of plant tissues was ground to fine powder in liquid N2 in a mortar. Before the tissue thawed, 1 ml extraction buffer (100 mM Tris-HCl pH 8.0, 50 mM EDTA and 0.5 M NaCl) and 0.2 ml 20% SDS were added. The mixture was incubated at 65°C in water bath for 20 minutes. Then 1 ml of phenol, chloroform and isoamyl alcohol (25: 24: 1) was added. Centrifugation was performed at 10,000 rpm for 10 minutes. The supernatants of sample were transferred separately to new tubes, and then 1 ml of chloroform and isoamyl (24: 1) was added. Centrifugation was performed at 10,000 rpm for 10 minutes. The supernatants of sample were transferred separately to a new tube, then 1 ml of isopropanol was added and then kept overnight in a freezer. Centrifugation was performed at 10,000 rpm for 10 minutes. The resulted pellets containing DNA were re-suspended in 1 ml ethanol. Centrifugation was performed at 10,000 rpm for 2 minutes. The DNA pellets were re-suspended in 200 (l TE (10 mM Tris-HCl pH 8.0 and 1 mM EDTA) buffer. DNA was quantities by quantitatively determined and gel electrophoresis.

RAPD -PCR Analysis

In order to obtain clear reproducible amplification products, different preliminary experiments were carried out in which a number of factors were optimized. These factors included PCR temperature cycle profile and concentration of each of the

template DNA, primer, MgCl2 and Taq polymerase. A total of twenty-one random DNA oligonucleotide primers were independently used according to Williams et al. (1990) in the PCR reaction. Only five primers succeeded to generate reproducible polymorphic DNA products. Table (1) lists the base sequences of these DNA primers that produced informative polymorphic bands.

The PCR amplification was performed in a 25 µl reaction volume containing the following: 2.5 µl of dNTPs (2.5 mM), 1.5µl of Mg Cl2 (25 mM), 2.5 µl of 10x buffer, 2.0 µl of primer (2.5 µM), 2.0 µl of template DNA (50 ng/µl), 0.3 µl of Taq polymerase (5 U/µl) and 14.7 µl of sterile ddH2O. The reaction mixtures were overlaid with a drop of light mineral oil per sample. Amplification was carried out in Techni TC-512 PCR System. The reaction was subjected to one cycle at 95 °C for 5 minutes, followed by 35 cycles at 96 °C for 30 seconds, 37 °C for 30 seconds, and 72 °C for 30 seconds, then a final cycle of 72 °C for 5 minutes. PCR products were run at 100 V for one hour on 1.4 % agarose gels to detect polymorphism "Early Swelling" peach cultivar under study. After electrophoresis, the RAPD patterns were visualized with UV transilluminator. RAPD markers were scored from the gels as DNA fragments present or absent in all lanes.

PCR amplification was performed using five random 10 mer arbitrary primers synthesized by (Operon biotechnologies, Inc.Germany).

ISSR-PCR Analysis

ISSR-PCR reactions were conducted using five primers. Amplification was conducted in 25 µl reaction volume containing the following reagents: 2.5 µl of dNTPs (2.5 mM), 2.5 µl Mgcl2 (2.5 mM), and 2.5 µl of 10 x buffer, 3.0 µl of Primer (10 pmol), 3.0 µl of template DNA (25 ng/ µl), 1 µl of Taq polymerase (1U/ µl) and 12.5 µl of sterile dd H2O. the PCRs were programmed for one cycle at 94° C for 4 min followed by 45 cycles of 1 min at 94 °C, 1 min at 57 °C, and 2 min at 72 °C the reaction was finally stored at 72 °C for 10 min. the PCR products were separated on a 1.5 % agarose gels and fragments sizes were estimated with the 100bp ladder DNA marker (Fermentas.com) with sequence (1000, 900, 800, 700, 600, 500, 400, 300, 200 and 100bp).

Only five primers succeeded to generate reproducible polymorphic DNA products. Table (2) lists the base sequences of these DNA primers that produced informative polymorphic bands.

Gel documentation:

Gels were photographed scanned, analyzed using Gel Doc Vilber Lourmat system to capture the image and to calculate band intensities.

Table (1): List of the used RAPD primers, names and their nucleotides sequences.

No.	Name	Sequence	No.	Name	Sequence
1	OP-A10	5´ TCGGCCATAG 3`	4	OP-C12	5` GGG CGG TAC T 3`
2	OP-B06	5´ CCTTGACGCA 3`	5	OP-Q18	5` GGACCCAACC 3`
3	OP-B11	5´ GTGACCCCTC 3`			

Table (2): List of the used ISSR primers, names and their nucleotides sequences.

No.	Name	Sequence	No.	Name	Sequence
1	14A	5´ TCGGCCATAG 3`	4	HB-10	5` GTGTGTGTGTGTGG 3`
2	44B	5´ CCTTGACGCA 3`	5	HB-11	5` GAGAGAGAGAGACC 3`
3	HB-08	5´ GTGACCCCTC 3`			

Storability studies:

Fruits from "Early Swelling" peach cultivar were harvested and picked in carton boxes. Each carton contains boxes (3 - 5 Kg/box), stored at 0°C ± 0.5°C and 90-95% RH for six weeks. Each two carton boxes acted as a replicate and each three replicates were represented "Early Swelling" peach cultivar for following of the changes occurring in physical and chemical properties of the stored fruits.

Physical and chemical properties:

- Weight loss (%) per box was determined periodically according to the equation (weight loss X 100 / the initial weight of box).
- Fruit firmness (g/cm^2) was estimated on ten fruits by Magness and Taylor (1925) pressure tester.
- Fruit colour: Intensity of color was measured by Konick Minolta, Chroma Meter CR-400/410 for the estimation of Hue angle as described by McGuire, (1992).
- Percentage of total soluble solids in fruits juice (TSS) was recorded periodically using a hand refractometer through storage period.
- Total titratable acidity as tartaric acid (%) was also determined periodically (A.O.A.C., 2000).
- TSS/acid ratio was calculated periodically.

Statistical analysis:

The complete randomized design was adopted for this investigation. The obtained data were statistically analyzed according to Snedcor and Cochran (1990). Averages were compared using L.S.D. values at 5% level.

RESULTS AND DISCUSSION

1) Accumulated chilling units:

Table (3) shows accumulated chilling units at El_Tahrir location, 60 km (Alexandria - Cairo Desert Road) calculated by two different methods (<10 °C and <7.2 °C) from leaves defoliation till beginning of flowering during two seasons 2012/2013 and 2013/2014.

It was noticed that the highest chilling units <10 °C was found in the second season, while chilling units <7 °C gave the highest value in the first season. In general, the accumulated chilling units <10 °C gave the highest chilling units in comparison with chilling units <7 °C.

Table (3): Accumulated chilling units from leaves defoliation till beginning of flowering for "Early Swelling" peach cultivar during two seasons 2012/2013 and 2013/2014

Period	Seasons	<10 °C	<7 °C
From leaves defoliation till beginning of flowering (1Nov. to 15 Feb.)	2012/2013	563	112
	2013/2014	577	89

2) Growing degree hours (G.D.H.)

Table (4) shows accumulated growing degree hours at El_Tahrir location in two successive seasons 2012/2013 and 2013/2014 from beginning of flowering till harvest date. The highest amount of accumulation (G.D.H.) was recorded 26014 during the first season 2012/2013, while the lowest amount of accumulation (G.D.H.) was recorded 15166 during the second season 2013/2014.

As previously mentioned by El-Agamy et al., (2002) who stated that GDH was a more accurate method than number of days determining fruit maturity.

Table (4): Accumulated G.D.H. for Early Swelling peach cultivar during two seasons 2012/2013 and 2013/2014

Seasons	Period		G.D.H.
	From beginning of flowering till harvest date		
2012/2013	9/02/2013	13/05/2013	26014
2013/2014	15/02/2014	30/04/2014	15166

3) Phenological studies:

Data in (Table, 5) revealed that the second season was the earliest for dates of onset flowering, full bloom, onset fruit set, pit hardening and fruit maturity for Early Swelling peach cultivar as compared to the first season. This phenomenon may be because the trees in 2nd season has more chilling units (577< 10 °C) than the 1st one (563< 10 °C). Also, chilling units < 10 °C may be more effective on fruit growing season than < 7 °C units under Egyptian conditions.

With respect to number of days by calendar year (Julian day) for phenological dates, it was noticed that the first season had the highest number of days as compared to the second season. These results cleared that more GDH units (26014) mean longer fruit growing season (133 days) while less GDH units (15166) mean shorter season and earlier harvest date (30 April). Results are in agreement with the peach cultivars evaluated for harvest date by Carter et al., (2003) and Yehia et al., (2010).

Table (5): Times of dates and number of days by calendar year (Julian day) for dates of onset flowering, full bloom, onset fruit set, pit hardening and fruit maturity for Early Swelling peach cultivar in 2013 & 2014 seasons

	Onset of flowering		Full bloom		Onset of fruit set		pit hardening		Fruit maturity	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Times of dates	9-Feb.	15-Feb.	18-Feb.	23-Feb.	25-Feb	29-Feb	23-Mar	13-Mar	13-May	30-April
Number of days	40	46	49	54	56	60	82	73	133	120

4) Descriptive measurements

The morphological description was illustrated in Figure (1) according to the International Amelographic Registered Schedule as following:

Tree size is medium, leaf shape is lance-shaped, leaf teeth are serrate, fruit size is medium, fruit shape is spherical-oval, fruit color is yellowish red, flesh color is yellow and pit adherence is free stone fruits.

These results are in accordance with those obtained by El-Sherif, et al., (2009).

Figure (1): The morphological description of Early Swelling peach cultivar

5) Morphological studies

Data in (Table, 6) showed that the highest values in vegetative growth parameter expressed increment length of shoot (28.28 cm), increment diameter of shoot (0.76 cm) and leaf area (35.74 cm^2) were recorded in the second season while the first season had the lowest values (20.54 cm, 0.57 cm and 30.97 cm^2) in these parameters respectively.

These variations may be attributed to tree age increment.

Table (6): Morphological characteristics of "Early Swelling" peach cultivar in 2013 & 2014 seasons

Seasons	Increment length of shoot (cm)	Increment diameter of shoot (cm)	Leaf area (cm^2)
2013	20.54	0.57	30.97
2014	28.28	0.76	35.74
L.S.D. at (0.05) =	4.37	0.13	3.19

6) Yield and fruit physical and chemical characteristics:

Data in (Table, 7) revealed that fruit set had the lowest percentage (24.29%) in the first season while the highest percentage of fruit set (35.17%) were recorded in the second season.

With respect to yield, it is noticed that yield had the highest value (52.02kg/tree) in the second season while the lowest value (45.03kg/tree) were recorded in the first season.

As for average fruit weight and size, the first season had lower value (66.4g) for fruit weight and (65.1cm3) for fruit size while higher value (70.3g) for fruit weight and (68.5cm3) for fruit size were recorded in the second season.

Concerning average fruit firmness and color, it was noticed that the second season had the highest value (134.7 g/cm^2) for fruit firmness and the lowest value (80.63) for fruit color while the lowest value (125.1 g/cm^2) for fruit firmness and the highest value (84.49) for fruit color were recorded in the first season.

As for T.S.S. and total acidity, the first season had the highest value (12.31) for T.S.S. and the lowest value (0.54) for total acidity while the lowest value (11.43) for T.S.S. and the highest value (0.61) for total acidity were recorded in the second season. We can deduce from these results that, increment of fruit yield, weight, size and firmness as well as better color and TSS with less acidity may be due to tree age increment. Also, better TSS with less acidity mean better taste. These results are in concordance with those obtained by El-Sherif, et al., (2009) and Yehia et al., (2010).

Table (7): Yield and fruit physical and chemical characteristics of Early Swelling peach cultivar in 2013 & 2014 seasons

Seasons	Fruit set (%)	Yield/tree (kg)	Fruit weight (g)	Fruit size (cm^3)	Fruit firmness (g/cm^2)	Fruit skin color (Hue angle)	T.S.S (%)	Total acidity (%)
2013	24.29	45.03	66.4	65.1	125.1	84.49	12.31	0.54
2014	35.17	52.02	70.3	68.5	134.7	80.63	11.43	0.61
L.S.D. at (0.05) =	7.53	4.61	2.9	3.1	6.48	2.67	0.38	0.04

7) Histological studies:

Stages flower bud differentiation:

The investigation during season 2012/2013 mainly occurred to detect qualitatively the different stages of floral initiation and differentiation. Microscopic synchronization of longitudinal sections out from buds beginning on the first of June till early February or (at pink bud stage), emphasized the presence of seven distinct stages which could be distinguished by the following characters:-

Stage I: The apices are round in shape (dome) occurred on Jun. 15, no differences could be noticed between a vegetative or a floral buds. It is considered as the pre-differentiation stage and the buds are termed as neutral buds. The apex was composed of a corpus formed of a central mass of meristimatic cells covered with a tunica of two layers of regularly arranged cells (Fig. 2).

Stage II: The apices become broader and more flat in shape occurred on Jun. 30. It is considered the first evidence of floral bud differentiation (Fig. 3).

Stage III: A sepal primordium begins to appear at one side of the flat apex occurred on Sep. 1, and it grew more in length and the petal initials start to appear just inside the sepal primordia (Fig. 4).

Stage IV: Pistil primordia occurred on Oct. 1 appeared as a central mantle of meristimatic cells in the center of the cup (Fig. 5).

Stage V: The pistil becomes more elongated occurred on Nov. 15, sepals, petals and anthers grow more in size (Fig. 6).

Stage VI: The initiation of the ovarian cavity occurred on Dec. 7 inside the pistil is the distinguishable character of stage VI. The stigma and style can be clearly noticed (Fig. 7).

Stage VII: The anther locules can be distinguished and the pollen mother cells are noticeable occurred on Feb. 9 (Fig. 8).

Similar results for flower bud differentiation were observed in previous studies of Abbas (1995) on "Early Grand" and "Zewayed" peach cultivars, El-Agamy et al., (2002) on "San Pedro", "Y9/106" and "Rubidoux" peach cultivars and Khalifa et al., (2012) on "De Wet", "Desert Pearl", "Hermosillo" and "Bokkeveld" peach cultivars.

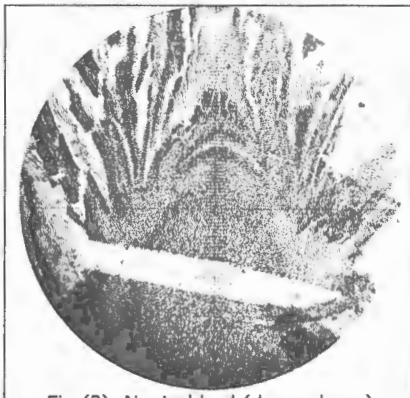


Fig (2): Neutral bud (dome shape)
(Stage I)

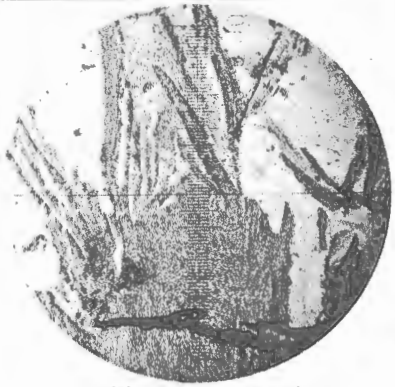


Fig (3): Apex become Flat
(Stage II)

Fig (4): Sepal and petal initials
(Stage III)

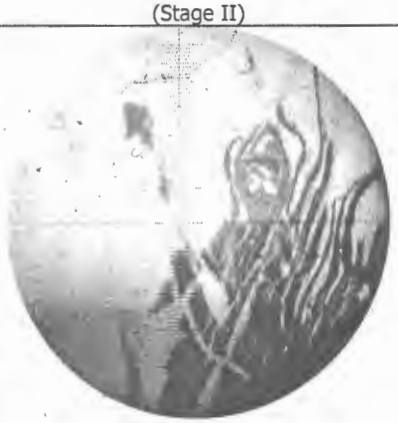


Fig (5): Pistil primordia
(Stage IV)

Fig (6): Pistil become elongated
(Stage V)

Fig (7): Ovary cavity
(Stage VI)

Fig (8): Pollen mother cells
(Stage VII)

8) Genetic studies:

SDS-Protein electrophoresis

The electrophoretic banding pattern of proteins extracted from leaves of "Early Swelling" cultivar and their denistrometric analysis are illustrated in Table (8) and Figure (9). The presence and absence of band were assessed with (1) and (0), respectively.

Results of leaves SDS-PAGE revealed a total number of fourteen bands with molecular weight (MW) ranging from about 22.0 to 160.0 KDa.

Peroxidase banding patterns:

Figure (10) represents peroxidase electrophoresis banding patterns among examined fresh leaves of "Early Swelling" cultivar.

Data being represented explain that, total of eleven bands were characterized for the studied cultivar with different density of bands

Poly phenyl Oxidase banding patterns:

Figure (11) demonstrated Poly Phenyl Oxidase (PPO) banding patterns among examined leaves of "Early Swelling" cultivar. Obtained results illustrated five bands with differences in banding patterns density.

Molecular genetic identification:

Randomly amplified polymorphic DNA (RAPD) markers:

Data of the amplified fragments using those five 10-mer arbitrary primers for Early Swelling cultivar succeeded in amplifying DNA fragments Table (9) and plate (1).

Primer OP-A10 resulted in four bands with molecular sizes from 200 to 480bp and Primer OP-B06 resulted in ten bands with molecular sizes from 160 to 870bp. While, Primer OP-B11 indicated the amplification of six bands with molecular size range from 200-600bp and Primer OP-C12 indicated the amplification of six bands with molecular weight size range from 220 -600bp. On the other hand, primer OP-Q18 resulted in seven DNA fragments with molecular weight ranging in 220-850bp.

Inter Simple Sequence Repeats (ISSRs):

Data of the amplified fragments using those five ISSR primers for the "Early Swelling" peach cultivar in amplifying DNA fragments Table (10) and (plate 2).

Primer 14 A resulted in three bands with molecular sizes from 400 to 620bp and Primer 44 B resulted in two bands with molecular sizes 220 and 340bp. While, Primer HB-08 indicated the amplification of four bands with molecular size range from 260-540bp and also Primer HB-10 indicated the amplification of five bands with molecular weight size range from 480 -1050bp. On the other hand, primer HB-11 resulted in two DNA fragments with molecular weight ranging in 490 and 640bp.

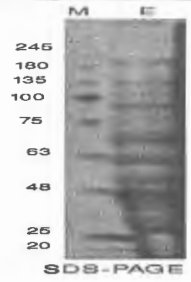


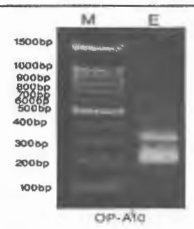
Fig.(9): SDS-protein banding patterns of leaf proteins Early Swelling cultivar.

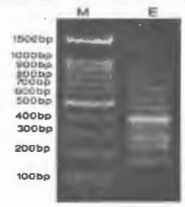
Fig. (10): Peroxidase isozyme banding patterns of leaf from Early Swelling cultivar.

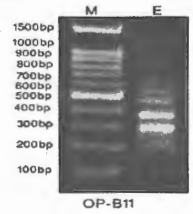
Table (8) : Densitometric analysis for SDS leaf proteins from "Early Swelling" peach cultivar.

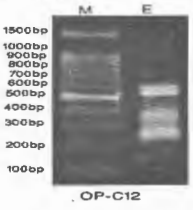
Band No.	M.W KDa
1	160
2	135
3	115
4	90
5	85
6	72
7	68
8	56
9	48
10	37
11	33
12	28
13	25
14	22

Fig. (11): Poly phenyl Oxidase isozyme banding patterns of leaf from Early Sweeling cultivar.









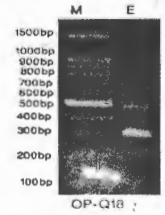


Plate (1): RAPD profiles of "Early Swelling" peach cultivar amplified with five primers.

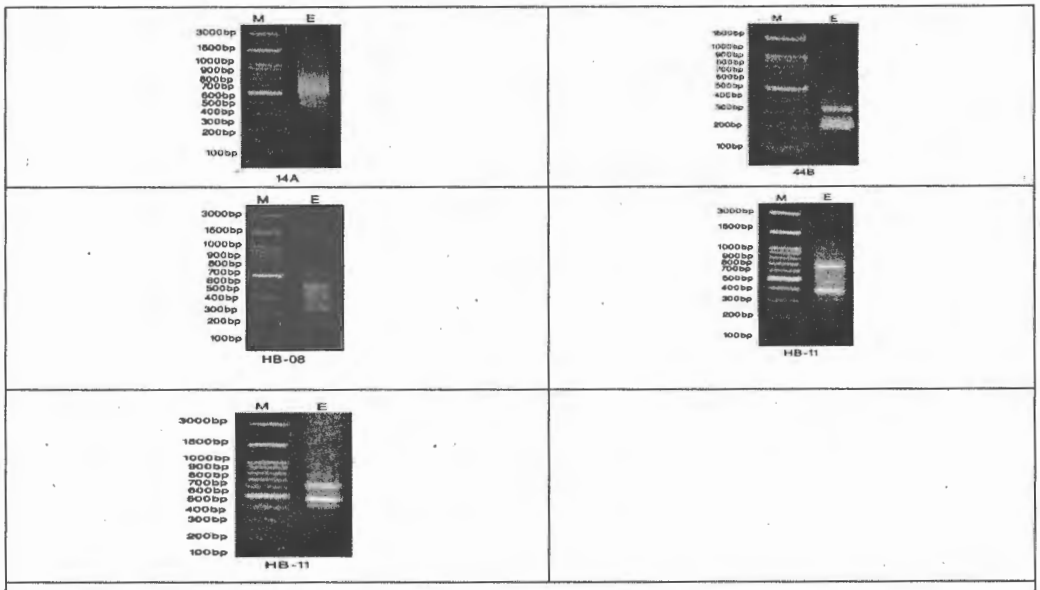


Plate (2): ISSR profiles of "Early Swelling" peach cultivar amplified with five primers.

Table (9) : Densitometric analysis for RAPD-PCR from "Early Swelling" peach cultivar.

Band No.	OP-A10	OP-B06	OP-B11	OP-C12	OP-Q18
1	480	870	600	600	850
2	320	800	520	540	740
3	270	700	460	400	600
4	200	620	370	330	500
5	-	540	300	270	300
6	-	470	200	220	280
7	-	400	-	-	220
8	-	290	-	-	-
9	-	240	-	-	-
10	-	160	-	-	-

Table (10) : Densitometric analysis for ISSR-PCR from "Early Swelling" peach cultivar.

Band No.	14A	44B	HB-08	HB-10	HB-11
1	620	340	540	1050	640
2	500	220	400	900	490
3	400	-	340	800	-
4	-	-	260	560	-
5	-	-	-	480	-

9) Storability:

Results in Table (11) show that effect of cold storage period (weeks) on fruit physical and chemical characteristics of "Early Swelling" peach cultivar in 2013 & 2014 seasons.

With respect to fruit weight loss, it is noticed that fruit weight loss (%) increased gradually till the end of the cold storage period. This increase can be probably due to moisture loss from the fruits during cold storage. The highest percentage of fruit weight loss (57.31 & 60.74%) was recorded after six weeks of cold storage in the two seasons respectively.

Concerning fruit firmness, it is obvious that fruit firmness decreased gradually till the end of the cold storage period. The lowest value of fruit firmness (13.41 & 18.77 g/cm^2) was recorded after six weeks of cold storage in the two seasons respectively.

As for average fruit skin color, it is obvious that fruit skin color increased gradually till the end of the cold storage period by decrease value of hue angle. The lowest value of hue angle (the highest red skin color) (59.06 & 54.37) was recorded after six weeks of cold storage in the two seasons respectively.

With respect to T.S.S., it is noticed that T.S.S. (%) increased gradually till the end of the cold storage period. This increase can be probably due to moisture loss from the fruits during cold storage. The highest percentage of T.S.S. (16.57 & 16.49%) was recorded after six weeks of cold storage in the two seasons respectively.

Concerning total acidity, it is obvious that total acidity decreased gradually till the end of the cold storage period. The lowest value of total acidity (0.19 & 0.25 %) was recorded after six weeks of cold storage in the two seasons respectively.

As for T.S.S./acid ratio, it is noticed that T.S.S./acid ratio increased gradually till the end of the cold storage period. The highest value of T.S.S./acid ratio (87.21 & 65.96) was recorded after six weeks of cold storage in the two seasons respectively. We can deduce that fruit quality of "Early Swelling" peach has improved by cold storage at 0°C and 90-95% RH for six weeks period where TSS increased gradually while acidity decrease which means better taste.

These results are in concordance with those obtained by Zhou et al., (2000) and Crisosto et al., (2004) they reported that two days of delayed storage at 20 °C prior to storage at 0°C for 42 days prevented chilling injury in 'Flavortop' nectarines. Also, Lurie & Crisosto, (2005) showed that preconditioning of stone fruits involves exposing the fruit to warm conditions for 1 or 2 day(s) after harvest before placing them in 0°C storage; this treatment can extend peach and nectarine storage life.

Table (11): Effect of cold storage period (weeks) on fruit physical and chemical characteristics of Early Swelling peach cultivar in 2013 & 2014 seasons

	Fruit weight loss (%)		Fruit firmness (g/cm^2)		Fruit skin color (Hue angle)		Total soluble solids (%)		Total acidity (%)		T.S.S./acid ratio	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
D1 (1 week)	0.00	0.00	116.71	123.04	77.25	73.04	12.94	11.82	0.51	0.57	25.37	20.74
D2 (2 week)	9.85	10.58	75.31	84.78	72.69	63.71	13.96	12.83	0.46	0.51	30.35	25.16
D3 (3 weeks)	10.94	19.33	53.67	61.83	69.45	61.94	14.27	14.04	0.40	0.44	35.68	31.91
D4 (4 weeks)	29.50	30.91	27.33	35.78	67.28	59.83	15.86	15.61	0.33	0.38	48.06	41.08
D5 (5 weeks)	40.06	45.52	22.78	26.72	61.85	57.61	16.31	16.07	0.24	0.31	67.96	51.84
D6 (6 weeks)	57.31	60.74	13.41	18.77	59.06	54.37	16.57	16.49	0.19	0.25	87.21	65.96
L.S.D. at (0.05) =	8.34	9.61	7.36	6.97	1.43	2.17	0.34	0.29	0.04	0.03	8.50	9.67

In conclusion, from the obtained results for "Early Swelling" peach cultivar, it is characterized by early fruit maturity with good yield and fruit characteristics. Thus, it is recommended to widespread cultivation of this cultivar in Egypt.

REFERENCES

1. A.O.A.C., (2000): Association of Official Anatical Chemists, Washington D.C., International 17th Edition, Revision I. USA P. 495-510.
2. Abbas, M.T. (1995): Histological studies on flower bud differentiation and flower development in two peach cultivars under North Sinai conditions. Egypt. J. Appl. Sci., 10(2): 285-295.
3. Bartolozzi, F.; Warburton, M. L.; Arulsekar, S. and Gradziel T.M. (1998): Genetic characterization and relatedness among California almond cultivars and breeding lines detected by Randomly Amplified Polymorphic DNA (RAPD) analysis. Journal of American Society for Horticultural Science, 123: 381-387.
4. Carter, M.; Rom, C.R. and Striegler, R.K. (2003): Early performance of peach cultivars in South-West Arkansas. AAES Research Series (520) Horticultural studies pp: 14-17.
5. Chaparro, J.X., D.J Werner, D.O Malley and R.R Sederoff (1994): Targeted mapping and linkage analysis of morphological, isozyme and RAPD markers in peach. Theoretical Applied Genetics, 85: 805-815.
6. Crisosto, C.H., Garner, D., Andris, H.L. & Day, K.R. (2004): Controlled delayed cooling extends peach market life. HortTechnology, 14, 99–104.
7. Davis, B.J. (1964): Disc electrophoresis, II Methods and application to human serum proteins. Am – N-Y-Acad.Sci.121:404-427.
8. Dellaporta, S. L.; J. Wood and J.B. Hicks (1983): A plant DNA mini preparation. Version III. Plant Mol. Biol., Rep.1: 19-21.
9. El-Agamy, S.Z.; El-Salhy, A.M.; Mohamed, T.R. and El-Wasfy, M.M. (2002): Histological and physiological studies on flowering and fruiting of some peach cultivars under Assiut environment. Egypt. J. Hort., 29(1): 167-186.
10. Eliwa,G.T.(2005): Approach to new Peach cultivars by the AID of Horticultural studies on Mit-GhamrPeach chosen strains. J. Agric. Sci. Mansoura Univ.,30 (8): 4649-4663.
11. EL-Said, M.A.; L.M. Ibrahim; A.E. Aboul Ata; E.Abdel-Aziz; N.M.Mansour and H.M.Mazyad.(1997): Virus free Plum and peach mother plants production in Egypt. A.R.C., P.O.B. 12619, Giza Egypt.P.177.
12. El-Sherif, H.M.; Taha, N.M. and Hussein, A.M. (2009): Evaluation of two Italian peach cultivars grown under Egyptian condition. Annals of Agric. Sci., Moshtohor. Vol. 47(2): Ho. 195-201.
13. Graham, R.C.; U. Lundholm and M.J. Karnovsky (1964): Cytochemical demonstration of peroxidase activity with 3aminoethylcarbazole.J. Histochem.Cytochem.13:150-152.

14. Jonathan, F.W. and N.F. Weeden. (1990): Visualization and interpretation of plant isozymes. Isozymes in plant Biology. D.E. Soltis and P.S. Soltis (eds). London Chpman and Hall, pp.5-45.
15. Khalifa, H.H.; Moatamed, A.M.; Yahia, T. A. and Hejazy, A.A. (2012): Histological studies on flower bud differentiation and flower development of four peach cultivars grown under Egyptian desert conditions. J. Biol. Chem. Environ. Sci., 7(4): 151-157.
16. Laemmli, U.K. (1970): Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature, 227: 680-685.
17. Lu, Z.; G. L. Reighard,; W. V. Baird; A. G. Abbott; S. Rajapakse and Z. X. Lu (1996): Identification of peach rootstock cultivars by RAPD markers. HortScience. 31 (1): 127-129.
18. Lurie, S. & Crisosto, C. (2005). Chilling injury in peach and nectarine. Postharvest Biology and Technology, 37, 195–208.
19. Magness, J.R. and Taylor, C.F. (1925): An improved type of pressure for the determination of fruit maturity. U. S. Dept. Agric., pp. 350-358.
20. Mansour, N.M.; Fathi, M. A. and Hassan, H. Z. (1998): Selection and evaluation on the Horticultural and biochemical genetic bases of early peach of Sinai. Proceedings of the 26th Annual meeting of genetics Alexandria, 29-30 Sep. 347-360.
21. Mansour, N.M.; Fathi, M. A.; Hassan, H. Z. and Shahin, B.A. (1999): Horticultural evaluation and biochemical genetic identification of some selected local peach strains at Dakahlia. Minufiya Journal of Agriculture Research. Vol.24 no.5: 1741-1763.
22. Mansour, N. M. and Shaltout, A.D. (1986). Flower bud development in Mit-Ghamr Peach. Egypt.J.Hort., 13(1):29-34.
23. Mansour, N.M. and Stino, G.R. (1986): Growth and flowering behaviour of some American peach cultivars under Egyptian climate. Agricultural Research Review, Egypt. 64(3): 397-411.
24. McGuire, R.G. (1992): Reporting of objective colour measurements. HortScience 27 (12): 606-609.
25. Mehanna, H.I.; Hassan, M.M. and Stino, G.R. (1982): Evaluation of selected strains from local peach trees grown in Egypt. Res.Bulletin No.1970, Fac. Agric. Ain Shams Univ.
26. Ortize, A.; R. Renaud; I. Calzada and E. Ritter (1997): Analysis of plum cultivars with RAPD markers. J. Horticultural-Science. 72 (1): 1-9.
27. Rajapakse, S.; Belthoff, L.E.; A.E Estager, G.H.; Scorza, R.; Verde, I.; Bellard, R.E.; Baird, W.V.; Callahan, R.; Monet, A. and Abbott, A.G. (1995): Genetic

linkage mapping in peach using morphological, RFLP and RAPD markers. Theoretical Applied Genetics, 90: 503-510.

28. Sass, J.H. (1940): Elements of botanical micro-technique. Book Co., New York, London, 523p.
29. Shallenberger, R.S.; Labell, R.L.; Mattic, L.R. and Noyes, J.C. (1959): How ripe should apple be to make fancy? Farm Res., New York State Agric. Stn. Quart. Bull. 25(37).
30. Shaltout, A.D. (1987): Florida Prince, a promising peach cultivar recently introduced to Egypt Bulletin of Fac. of Agric. University of Cairo Vol. 38 No. 2.
31. Shaltout, A.D. (1995): Introduction and production of some low medium chill peach and apple cultivars in sub-tropical climate of Egypt. Assiut Journal of Agricultural Science. Vol. 26(1): 195-206.
32. Snedecor, G. W. and Cochran, W.G. (1990): Statistical Methods. 7th ed., The Iowa State Univ. Press. Ames. , Iowa, U.S.A., pp. 593.
33. Stino, G.R.; Mansour, N.M. and Hamouda, A. (1982): Characters of four American peach cultivars grown in Egypt. Research Bulletin No. 2082 December, Fac. Agric. Ain Shams Univ., Cairo, Egypt.
34. Studier, F.W. (1973): Analysis of Bacteriophage T4 early RNAs and proteins of slab gel. J.Mol.Bio. 79:237-248.
35. Tankesley, S.D and Rick, C.M. (1980): Genetic of estrases in species of Lycpersicon. Theor. Appl.Genet.56:209-219.
36. Warburton, M. L. and F. A. Bliss (1996): Genetic diversity in peach (Prunus persica L. Batch) revealed by randomly amplified polymorphic DNA (RAPD) markers and compared to inbreeding coefficients. J. American Society for Horticultural Science. 121 (6): 1012-1019.
37. Williams, J.G.; Kubelik, A.R.; Livak, K.J.; Rafalski, J.A. and Tingey, S.V. (1990): DNA polymorphisms amplified by arbitary primers are useful as genetic markers. Nucleic Acids Res., 18: 6531-6535.
38. Yehia, T.A.; Hussien, A.M.; Hegazi, A.A. and Hussien, H.H.K. (2010): Evaluation of some newly cultivated peach cultivars (Prunus Persica L.) under desert conditions of Egypt. J. Biol. Chem. Environ. Sci., 5(1): 299-315.
39. Zhou, H.W., Lurie, S., Lers, A., Khatchitski, A., Sonego, L. & Ben Arie, R. (2000). Delayed storage and controlled atmosphere storage of nectarines: Two strategies to prevent woolliness. Postharvest Biology and Technology, 18, 133–141.

تقييم وتوصيف صنف الخوخ "إيرلى سويلنج" تحت ظروف الآراضى المستصلحة فى مصر

وسام أحمد نبيل[1]، ماجدة نصر[1]، ناهد أحمد[2]، علاء عبدالرؤوف[3]

[1]قسم بحوث الفاكهة متساقطة الأوراق- معهد بحوث البساتين – مركز البحوث الزراعية – مصر
[2]قسم بحوث تداول الفاكهة – معهد بحوث البساتين – مركز البحوث الزراعية – مصر
[3]معمل المناخ – مركز البحوث الزراعية – مصر

أجرى هذا البحث لمدة موسمين متتاليين (٢٠١٢/٢٠١٣ - ٢٠١٣/٢٠١٤) بأحد المزارع الخاصة بمنطقة ريجوا التابعة لمحافظة الجيزة لدراسة وصف وتقييم أشجار مثمرة لصنف الخوخ "إيرلى سويلنج" المطعوم على أصل النيماجارد عمر أربعة سنوات نامية فى تربة رملية، على مسافة ٣ X ٦ متر، وتروى بنظام الرى بالتنقيط .

أظهرت النتائج أن صنف الخوخ "إيرلى سويلنج" من أصناف الخوخ المبكرة وأن عدد ساعات البرودة اللازمة له تراوحت بين (٨٩-١١٢) على ٧°م، (٥٦٣-٥٧٧) على ١٠°م وأن عدد الوحدات الحرارية المتراكمة تراوحت بين (٢٦٠١٤، ١٥١٦٦) وحدة حرارية، إكتمل نمو الثمار فى حدود (٧٤-٨٣يوم) من بداية التزهير وحتى إكتمال نمو الثمار خلال موسمى الدراسة. كما أظهرت الدراسة نجاح هذا الصنف تحت الظروف المصرية حيث أعطت نموا" قويا" وجودة عالية للثمار، حيث كان محصول الشجرة ، وزن وحجم الثمار متوسطا. أما شكل الثمار بيضاوى كروى. ولون الثمار أحمرا" مشوبا" بالأصفر. كما أوضحت نتائج الدراسة أن توقيت التكشف الزهرى يرتبط إرتباطا وثيقا بالمراحل الفينولوجية حيث تبدأ عملية التكشف الزهرى بعد مرحلة تساقط الأوراق (أواخر شهر سبتمبر) وتستمر غالبا حتى بداية التزهير (بداية شهر فبراير). وبالنسبة إلى دراسة التعريف الوراثي الجزيئي و البيوكيماوى لعمل البصمة الوراثية، أوضحت النتائج ظهور ١٦ حزمة منتجة من تقنية **ISSR** ويتراوح الوزن الجزيئي لها بين ٢٢٠-١٠٥٠ زوج من القواعد ومن ناحية أخرى نتج ٣٣ حزمة فى تقنية **RAPD** ويتراوح الوزن الجزيئي لها بين ١٦٠-٨٧٠ زوج من القواعد بينما في الفصل الكهربائي للبروتين الكلى نتج ١٤ حزمة يتراوح الوزن الجزيئي لها بين٢٢ كيلو دالتون و ١٦٠ كيلو دالتون و نتج عن الفصل الكهربائي لإنزيم البيروكسيديز ١١ حزمة متباينة الكثافة ونتج أيضا عن الفصل الكهربائي لإنزيم البولى فينيل أكسيديز ٦ حزم متباينة الكثافة. وبالنسبة إلى دراسة القدرة التخزينية، فقد أظهرت النتائج أن ثمار الخوخ "إيرلى سويلنج" إحتفظت بصفاتها الجيدة متمثلة فى قلة الفقد فى الوزن وتحسين الصفات الطبيعية والكيماوية للثمار خلال فترة التخزين البارد لمدة ستة أسابيع. ومن النتائج المتحصل عليها لهذا الصنف فأنه يوصى بإنتشار زراعته فى مصر سواء للسوق المحلى أو التصدير.