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PHYSIOCHEMICAL CHANGES OF JAPANESE PERSIMMON FRUITS DURING STORAGE AS RELATED TO ALTERNATE BEARING

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ABSTRACT

This study was carried out during 2003 and 2004 seasons on ten years old "Costata" persimmon trees (*Diospyros kaki* L.) grafted on D. Lotus rootstock grown in El-Nubaria region where the soil is calcareous to evaluate and compare productively, fruit quality and storability of "Off" and "On" years fruits under storage at room temperature (25 ± 2°C). Generally, the results indicated that, yield of "Costata" persimmon tees as number and weight of fruits (kg/tree) were lower and average fruit weight was higher in "Off" year trees compared to "On" year trees and the differences were always significant. Fruits from light cropping trees were firm and less lossing in weight and breakdown percentages specially, after storage period. while fruits form heavy cropping trees had higher total soluble solids (TSS), total soluble sugars (TS), water soluble pectin (WSP) and pectin methyl esterase (PME) activity.

During storage period at room temperature, colour degree, carotene content, TSS, TS, WSP and PME activity as well as loss in weight and breakdown percentages were increased. On the other hand, fruit firmness, total chlorophyll content, acidity and tannins % were decreased in both seasons.

Thus, it could be concluded that, fruits from "On" year trees had lower storability and keeping quality when stored at room temperature compared to fruits from "Off" year trees under conditions of this experiment.

INTRODUCTION

The Japanese persimmon (*Diospyros kaki* L.) has low chilling requirements (George *et al.*, 1994) and successfully grown under the Egyptian environmental condition. Kaki fruit is a good source of vitamin A, B and C and contains higher level of sugar and pectin content (Hamanava *et al.*, 1990).

Several reports indicated that, alternate bearing habit usually occurs in persimmon trees (Kishimota, 1980, George and Nissen, 1984 and Ryugo *et al.*, 1988), particularly Costata cultivar (Wally, 1987 and Zayan *et al.*, 2002). In the "On" year fruit are produced in large quantities but with rather poor quality such as small size and low keeping quality (Ferguson and Watkins, 1992). Marketing of such fruits becomes somewhat difficult and consequently the grower get low returns.

A number of works have reported that, total soluble solids, total sugars and carotene were increased progressively throughout the storage period at room temperature whereas, the acidity, vitamin C, total chlorophyll and average fruit weight were increased (Kassem, 1991 on apple fruits and El-Azab *et al.*, 1994 on "Costata" persimmon fruits).

The present work aimed to study the effect of alternate bearing (crop loading) on some physiochemical changes of fruits during storage at room

temperature and its keeping quality depending on comparing between "On" and "Off" year "Costata" persimmon trees.

MATERIALS AND METHODS

The present study was carried out in 2003 and 2004 seasons on 10 years old "Costata" persimmon trees (*Diospyros kaki* L.) grafted on D. Lotus rootstock, spaced at 5 x 5 meters and grown in a commercial orchard near El-Nubaria Horticultural Research Station, Beheira Governorate. The soil is calcareous (28.2% $CaCO_3$) and depth of groundwater is about 120-140 cm.

Twenty uniform vigor trees were selected 10 in the status of "On" growing to "Off" year and other 10 in the status of "Off" growing to "On" year depending on the determination of yield data recorded for previous season in 2002 as shown in Table (1).

Table (1):Yield data recorded in 2002 season.

	Group (A) trees		Group (B) trees	
Replications	No. of fruits/tree	Yield (kg/tree)	No. of fruits/tree	Yield (kg/tree)
R_1	275	26.62	133	16.23
R_2	289	29.23	134	18.48
R_3	283	28.50	142	17.60
R_4	290	28.31	143	18.57
R_5	308	30.34	130	16.66
R_6	300	30.93	136	17.36
R_7	306	29.79	147	18.82
R_8	316	32.98	140	18.32
R_9	286	28.30	138	17.34
R_{10}	298	29.55	138	17.51

Group A = 10 trees in the status of "On" going to "Off" year
Group B = 10 trees in the status of "Off" going to "On" year

Experimental trees has been subjected to similar fertilization, irrigation, pruning and best control practices usually done at El-Nubaria region.

Yield as number and weight (kg) of fruit per tree were recorded and fruits of both "Off" and "On" year trees were harvested at first week of October 2003 and 2004 (October, 2 and October, 5, respectively) when fruit colour was yellow or orange according to (Ben-Air and Guelfate-Reich, 1973). Forty five fruits were selected at random from each tree at harvest time of both seasons and stored at room temperature about (25 $\pm$ 2°C) and relative humidity of (R.H) 70-85% in cardboard boxes. The storage period stopped at 30 days because storage at room temperature caused high loss of fruit number due to breakdown and shrinking symptoms. A sample of fruits was taken, 50 fruits for each treatment (5 fruits for each replicate) on a time scale of 0 and 30 days of storage to determine physical and chemical fruit characteristics:

•Average fruit weight (g).
•Skin and flesh firmness (lb/in^2) was measured without and with skin removed on the two opposite sides by using Magness-Taylor type pressure tested with 5/6 inch standard plunger.
- Fruit colour was visually determined for each fruit sample according to colour degree expressed on number as follow:
  0 = green colour and 10 = deep orange .
- Total soluble solids (TSS), total acidity and tannin content (AOAC, 1970) were determined in fruit juice.
- Total soluble sugars (TS) were determined according to the method descried by Dubois *et al.* (1956).
- Fruit chlorophyll and carotene pigments were determined colouremetrically by extracting them from 100 g skin and pulp of the fruits with 85% acetone solution according to the method described by Wettestein (1957).
- Water soluble pectin (WSP) were determined according to procedure of Carre and Haynes (1922).
- Pectin methyl esterase (PME) activity was determined according to procedure of Somogyi and Romani (1964) as modified by Belli-Donini and Stornatudo (1969).

Loss of fruit weight and breaking percentages were calculated after 10, 20 and 30 days of storage as follow:

- Weight loss: ten fruits of each cardboard box were assigned number and their initial weight was determined and again when the sample were taken out of the storage and then weight loss percentage was calculated.
- Breakdown fruits: whether due to diseases or physiological disorders were counted and calculated as percentage.

The obtained data were statistically analyzed using t-test in groups to compare between the means representing the effect of crop load of "Off" and "On" year trees.

RESULTS AND DISCUSSION

I.Productivity of alternate bearing "Costata" persimmon trees:

Data presented in Table 2 showed that, yield as number of fruits per tree was higher in "On" year trees compared to "Off" year trees and the differences were always significance. The reduction in number of fruits per "Off" year trees may be due to the great decrease in amount of bloom which influenced by decreasing C/N ratio in the previous "On" year at the time of flower bud initiation. The present results are in harmony with those obtained by Zayan *et al.* (2002) who reported that heavy crop in "On" year trees reduced the size of crop in the following year.

Table (2): Yield of "Off" and "On" Costata persimmon trees in 2003 and 2004 seasons.

Cropping status	Average fruit weight (g)	No. of fruits/trees	Yield (kg/tree)
	2003 season		
Off	124.08	149	18.49
ON	97.66	307	30.00
Sign.	**	**	**
	2004 season		
Off	129.08	136	17.53
ON	99.26	293	29.05
Sign.	**	**	**

Each value represented the mean of ten tree replications
** significant at 1% according to t-test.

As for yield kg/tree, it is clear that yield of "On" year trees was higher than "Off" year trees. High yield in "On" year trees may be due to high number of fruits although its had less fruit weight. These results are in line with those reported by Ryugo *et al.* (1988), who found that, "Fuyu" persimmon trees tend to bear in alternate years, produced large quantities of small fruits in the "On" year and low crop of large fruit in the "Off" year.

Generally, average fruit weigh from "Off" year trees was significantly higher than that from "On" year trees in both seasons as shown in Table 2. These results could be due to the reduction in fruit number in "Off" year. Similar results were obtained by Brar *et al.* (1987) and Zayan *et al.* (2002).

II.Physical and chemical fruit properties:

Fruits from light and heavy cropping persimmon trees were stored for 30 days at room temperature to evaluate physical and chemical fruit properties and its changes during storage period in both "Off" and "On" year trees.

a.Physical fruit properties:

1.Fruit firmness:

Data concerning skin and flesh firmness of "Costata" persimmon fruit presented in Table 3 indicated that, at harvest time, persimmon fruits from "Off" year trees were less firmness than those from "On" year trees. While, after 30 days of storage at room temperature, fruits from "Off" year trees recorded higher firmness than those from "On" year trees in the two seasons. The reduction in fruit firmness of "Off" year trees at harvest time may be due to the increase in fruit size and the reduction in fruit Ca^{++} concentration whereas, after storage period, fruits from "Off" year trees had higher firmness than those form "On" year trees due to the increment in water soluble pectin and pectin methyl esterase activity in fruits from "On" year trees as shown in Table 4 and Fig. 1. These results agree with those reported by Ferguson and Watkins (1992) on apple they found that, fruits from light cropping trees had large size, low Ca-concentration and less firmness compared to fruits from heavy cropping trees. While, after storage period, fruits from light cropping had higher firmness than those from heavy cropping ones.

As for the effect of storage period, it is clear that, skin and flesh firmness were significantly decreased during storage in both seasons. Similar results were obtained by Maksoud (1981) and Zayan *et al.* (2002) on "Costata" persimmon and Takata (1982), Taira *et al.* (1990) and Turk (1993) on other Japanese persimmon cultivars.

Table (3):Firmness and colour changes of "Off" and "On" Costata persimmon fruits during storage at room temperature (25 ± 2°C). in 2003 and 2004 season.

Storage period	Cropping status	Fruit firmness (lb/in^2)		Colour degree	Pigments (mg/100 g)	
		Skin	Flesh		Total chl.	Carotene
	2003 season					
0 days	Off	17.23	10.80	6.74	7.42	5.20
	On	18.53	11.28	6.96	7.37	5.22
	Sign.	**	**	N.S	N.S	N.S
	Means	17.88	11.04	6.85	7.40	5.21
30 days	Off	12.30	7.95	9.06	2.30	6.69
	On	11.63	7.25	9.24	2.26	6.71
	Sign.	**	**	N.S	N.S	N.S
	Means	11.97	7.60	9.15	2.28	6.70
Significance of means		**	**	**	**	**
	2004 season					
0 days	Off	17.30	10.80	6.74	7.38	5.20
	On	18.63	11.38	7.04	7.17	5.27
	Sign.	**	**	*	**	*
	Means	17.97	11.09	6.87	7.28	5.24
30 days	Off	12.68	8.18	9.14	2.23	6.70
	On	11.80	7.58	9.20	2.19	6.72
	Sign.	**	**	N.S	N.S	N.S
	Means	12.24	7.88	9.17	2.21	6.71
Significance of means		**	**	**	**	**

Each value represent the mean of ten tree replications
*, ** and N.S. significant at 5%, 1% and not significant, respectively according to t-test.
0 = green colour, 10 = deep orange colour

2.Fruit colour:

Data in Table 3 revealed that higher values of colour degree and carotene content belonged to fruits from "On" year trees in either at harvest time or after storage period in both seasons. While, higher values of total chlorophyll contents belonged to fruits from "Off" year trees. Differences were only significant at harvest time in the second season. These results could be due to the role of heavy cropping and reducing shad, which in turn enhanced fruit maturity and improved its colour. Similar results were obtained by Zayan *et al.* (2002) on "Costata" Persimmon.

Regarding the effect of storage period, it is clear that colour degree and carotene content were significantly increased with storage period, whereas total chlorophyll content was significantly decreased in both seasons. These results are inagreement with those reported by Maksoud (1981) and El-Azab *et al.* (1994) on Japanese persimmon. Also, Joon (1997) reported that, carotene content was increased while, chlorophyll content was decreased during storage period of "Fuyu" persimmon fruits.

b.Chemical fruit properties:

1.Total soluble solids (TSS) and total acidity:

As shown in Table 4 it is clear that TSS value was significantly higher in fruits from "On" year trees than those from "Off" year trees at harvest time and after storage period in both seasons. Whereas, insignificant differences were noticed in total acidity between fruits from "On" and "Off" year trees. These results are in harmony with those reported by Mikhael (2001) on "Costata" persimmon, who found that, fruits from "On" year trees had significantly higher TSS and slightly lower acidity compared to fruits from "Off" year trees at harvest time due to the effect of heavy cropping on advancing fruit maturity.

Concerning the effect of 30 days storage at room temperature, it is clear that TSS value was increased, while total acidity was decreased during storage. Similar results were obtained by Maksoud (1981), Abd El-Wahab *et al.* (1983) and El-Azab *et al.* (1994) on "Costata" persimmon.

2.Tannin content:

Data presented in Table 4 indicted unsignificant differences in the percentage of tanning contents between fruits from "Off" and "On" year trees at harvest time or after storage period in both seasons.

As for the effect of 30 days storage at room temperature, it is clear that, tannin content in the fruits was decreased at the end of storage period. These results are in accordance with those obtained by Abd El-Wahab *et al.* (1983), Habashy (1992) and El-Azab *et al.* (1994) on "Costata" persimmon. They reported that, the astringency estimated as soluble tannins percentages was reduced by extending the storage period due to approaching ripening.

3.Total soluble sugars (TS):

Data concerning total soluble sugars (TS) presented in Table 4 indicted that this value gave the same trend of TSS, it was significantly lower in fruits from "Off" year trees than those from "On" year trees at harvest time and after storage period in both seasons. The reduction of TS value in fruits from "Off" year trees could be attributed the role of light cropping in increasing shade conditions (Suzuki *et al.*, 1989). The present results are in disagreement with those reported by Brar *et al.* (1987) on grapes, who found that sugar content was decreased with increasing crop load.

It is clear that, total soluble sugars value was increased after 30 days storage at room temperature. This increase may be due to the conversion of starch to sugar. Similar results were obtained by Maksoud (1981) and Abd El-Wahab *et al.* (1983).

4.Water soluble pectin (WSP):

Data obtained in Table 4 indicted that, water soluble pectin values were greater in fruits from "On" year trees than those from "Off" year trees. The differences were only significant after storage period in both seasons due to the increase in pectin methyl esterase activity in fruits from "On" year trees. Similar results were obtained by Mastui and Kitagawa (1992) and Mikhael (2001) on persimmon fruits.

Regarding the effect of storage period, it is clear that water soluble pectin (WSP) was increased after 30 days of storage at room temperature (25

± 2°C) in both seasons. This result is in harmony with that reported by Abd El-Wahab *et al.* (1983) they found that, WSP of "Costata" persimmon fruits was continuously increased during storage period at room temperature.

Table(4):Chemical changes of "Off" and "On" Costata persimmon fruits during storage at room temperature (25 ± 2°C) in 2003 and 2004 season.

Storage period	Cropping status	TSS (%)	Acidity (%)	Tannins (%)	TS (%)	WSP (g/100 g)
	2003 season					
0 days	Off	20.0	0.45	2.33	14.5	0.318
	On	20.8	0.43	2.12	15.1	0.338
	Sign.	*	N.S	N.S	**	N.S
	Means	20.4	0.44	2.23	14.8	0.328
30 days	Off	23.2	0.30	0.61	16.9	0.591
	On	23.7	0.29	0.52	17.2	0.631
	Sign.	*	N.S	N.S	*	**
	Means	23.5	0.30	0.57	17.0	0.611
Significance of means		**	**	**	**	**
	2004 season					
0 days	Off	21.4	0.44	2.29	15.7	0.325
	On	22.2	0.43	2.11	15.9	0.343
	Sign.	**	N.S	N.S	**	N.S
	Means	21.8	0.44	2.20	15.8	0.334
30 days	Off	24.2	0.28	0.57	17.6	0.599
	On	24.9	0.27	0.50	18.1	0.635
	Sign.	**	N.S	N.S	**	**
	Means	24.6	0.28	0.54	17.9	0.617
Significance of means		**	**	**	**	**

Each value represent the mean of ten tree replications
*, ** and N.S. significant at 5%, 1% and not significant, respectively according to t-test.
TS = Total soluble sugars
WSP: Water soluble pectin g/100 g fresh weight

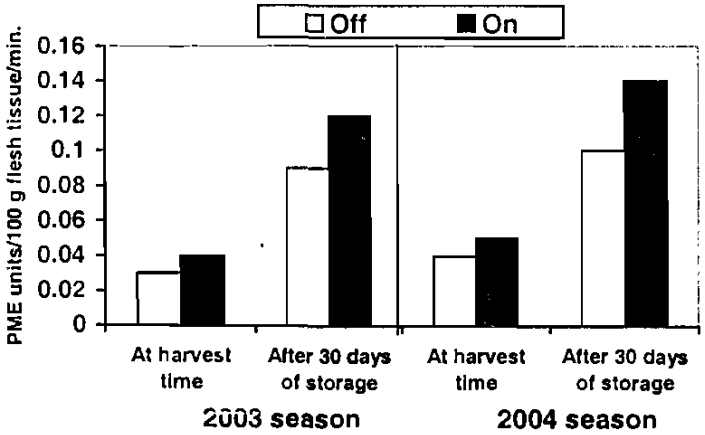

Fig. (1):Pectin methyl esterase (PME) activity of "Off" and "On" year "Costata' persimmon fruits in 2003 and 2004 seasons.

5.Pectin methyl esterase (PME) activity units/100 g/minute:

As shown in Fig. 1, it is clear that PME activity values of fruits from "On" year trees were higher than those from "Off" year trees. The differences were only significant after storage period in both seasons.

It is clear that PME reached a minimum activity at harvest time. These results herein are in line with those reported by Mastui and Kitagwa (1992) on "Fuyu" and "Hiratanenshi" persimmon which they indicated that no PME activity was found on fruits at harvest time.

As for the effect of storage period, it is clear that PME activity units were increased in "Costata" persimmon fruits during storage. Similar results were obtained by Awad (1985) and Wally (1987) on persimmon and Barrett and Gonzalez on Cherry (1994).

III.Fruit weight loss and breakdown percentages:

Data presented in Fig. 2 show loss percent in weight of Costata" persimmon fruits, these values showed higher values in fruits from "On" year trees in different storage periods compared to fruits from "Off" year trees in both seasons and the differences were always significant.

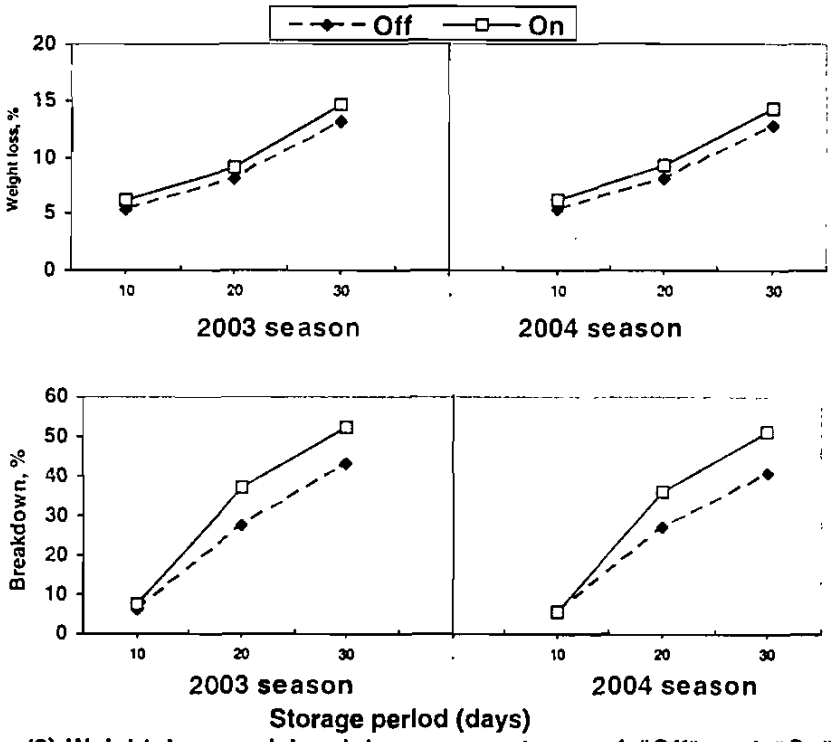

Fig. (2):Weight loss and breakdown percentages of "Off" and "On" year "Costata" persimmon fruits during storage at room temperature in 2003 and 2004 seasons.

This result may be due to the increment in specific surface of smaller fruits from "On" year trees. These results are in agreement with those reported by El-Shemy and El-Morsy (2001) on apple fruits they found that weight loss percent of fruits from thinned trees was generally lower than fruits from unthinned trees since the second are smaller, had higher surface/volume ratio than the first and consequently water loss will be higher in the small fruits. Moreover, loss percent in fruit weight was continuously increased as the storage period progressed. The present results are in harmony with those obtained by Habashy (1992) and Turk (1993) on Persimmon and El-Shemy and El-Morsy (2001) on apple they found that, fruit weight loss percentage was increased as the storage period advanced.

As for breaking percentage as shown in Fig. 2, its value was greater in fruits from "On" year trees than those from "Off" year trees in both seasons. The differences were significant after 20 and 30 days of storage, while after 10 days of storage the differences were insignificant. On the other hand, this value was increased as the storage period advanced due to decline in fruit firmness and increasing the percent of loss in fruit weight. The obtained results herein are in line with those reported by Abd El-Wahab *et al.* (1983) on a persimmon fruits, who found that decay percentage was continuously increased during the storage period.

Conclusively, fruits from "On" year trees had lower storability when stored at room temperature compared to fruits from "Off" year trees. So, reducing alternate bearing tendency by thinning fruits in "On" year trees is not only improved fruit quality especially average fruit weight and size but also improved storability and keeping quality of 'Costata" persimmon fruits.

REFERENCES

Abd El-Wahab, F.K.; A.B. Abou Aziz; F.A. Latif and M.A. Maksoud (1983). Behaviour of persimmon fruits under cold storage. Annals Agric. Sci., Fac. Agric., Ain Shams Univ., 28(1): 287-299.

Association of Official Agriculture Chemists (1970). Official Methods of Analysis. 11th Ed., p. 240, Washington DC., U.S.A.

Awad, M. (1985). Persimmon pectin methyl esterase: extraction and variation during ripening. J. Food Sci., 50: 1643-1645.

Barrett, D.M. and C. Gonzales (1994). Activity of softening enzymes during cherry maturation. J. Food Sci., 49(3): 574-577.

Belli-Donini, M.L. and M.R. Stornatudo (1969). Pectin changes in the ripening irradiated and stored strawberries . J. Food Sci., 34: 509-514.

Ben-Aric, R. and S. Guelfate-Reich (1973). The effect of maturity at harvest on the keeping quality of "Fuyu" persimmon. I.T.R. commission C_2 Jerusalem 3, Israel.

Brar, S.S.; A.S. Bindra; Soham-Sing and S.S. Cheema (1987). A note on the effect of crop load on yield and quality of grapes (*Vitis vinifera* L) cv. Perlette as manifest on commercial scale. Haryana. J. Hort. Sci., 15(1-2): 48-50 (C.F. Hort. Abst., 57: 5396).

Carré, M.H. and D. Haynes (1922). The estimation of pectin as calcium pectate and the application of this method to the determination of soluble pectin in apples. Biochem. J. 16: 60.

Dubois, M.; K.A. Gilles; J.K. Haniton; P.A. Rebers and F. Smith (1956). Colorimetric method for determination of sugars and related substances. Analytical Chemistry, 28(3): 350-356.

El-Azab, E.M.; M.A. Aly; N. Ramadan and N. Abo El-Maged (1994). Effect of NPK fertilization and two storage methods on the physiochemical changes of persimmon fruits. Menofiya. J. Agric. Res. 19(2): 1191-1215.

El-Shemy, M.A. and A.A. El-Morsy (2001). Quality of Anna apple fruits during cold storage as affected by hand thinning CaCl and hot water dipping treatments. J. Agric. Res. Tanta Univ., 27(2): 334-347.

Fergson, I.B. and C.B. Watikins (1992). Crop load effects mineral concentration and incidence of biter pit in "Cox's Orange Pippine" apple fruits. J. Amer. Soc. Hort. Sci., 117(3): 373-376.

George, A.P. and Nissen (1984). The persimmon a new look at an ancient crop. Australian. Hort., 82(1): 28-41 (C.F. Hort. Abst., 54: 4126).

George, A.P.; R.J. Callins and T.S. Rasmussen (1994). Phenological of non-astringent persimmon in subtropical.Australian J. Hort. Sci., 59(5): 937-946.

Habashy, S.I. (1992). Effect of ethephon treatment on Japanese persimmon fruits. M.Sc. Thesis, Fac. of Agric. Zagazig Univ.

Hamanava, A.; J. Payne; Koehler and R. Eilenmiller (1990). Provitamin A (alpha-carotene, beta-carotene and beta-cryptoxanthin) and ascorbic acid content of Japanese and American persimmon. J. Food Quality, 13(2): 85-95.

Joon, Y.Y. (1997). Changes in chlorophylls and carotenoids in the peel of "Fuya:" sweet persimmon fruits during cold and C.A. Storage. J. Korean Soc. Hort. Sci., 37(4): 544-547.

Kassem, H.A. (1991). The effect of nitrogen, phosphorus and potassium fertilization on leaf and fruit mineral content, yield, fruit quality of "Barker" apple trees and physiochemical changes of fruits during cold storage. Ph.D. Thesis, Fac. Agric., Alex. Univ.

Kishimoto, O. (1980). Estimating the optimum range of fruit thinning and pruning in Japanese persimmon and Japanese per. Sep Bull. Coll. Agric. Utsu: Univ. (33): 78.

Maksoud, M.A. (1981). Physiological studies on persimmon fruits. M.Sc. Thesis, Cairo Univ.

Matsui, T. and H. Kitagawa (1992). Seasonal changes in pectin methyl esterase and polyglacturonase activities in persimmon fruits. Technical Bull. Fac. Agric. Kagawa Univ. 43(1): 45-50 (C.F. Hort. Abst., 62: 2573).

Mikhael, G.B.(2001). Effect of some agricultural treatments on growth and yield as related to alternate bearing of Japanese persimmon. Ph.D. Thesis, Fac. of Agric., Kafr El-Sheikh, Tanta Univ.

Ryugo, K.; C.A. Schoedr; A. Sugiura and K. Yonemori (1988). Persimmon for California. California Agriculture, July-August: 7-9.

Somogyi, L.P. and R.J. Ramoni (1964). Irradiation-induced textural changes in fruit and its relation to pectin metabolism. J. Fd. Sci., 29: 366-371.

Suzuki, A.; Aoba; Murakami and T. Maotani (1989). Effect of nitrogen nutrition on physiological fruit drop of Japanese persimmon *Diospyros kaki*. Thumb. Bull. of the fruit trees Res. Station, Series A, Ibaraki No. 16: 39-45.

Taira, S.; Y. Kubo; A. Sugiura and T. Tomano (1990). Comparative studies of postharvest fruit quality and storage quality in Japanese persimmon (*Diospyros kaki* L. cv. Hiratanenshi) in relation to different methods for removal of stringency. J. Jap. Soc. Hort. Sci. 56(2): 215-221 (Hort. Abst. 60: 678).

Takata, M. (1982). Effect of ethylene on respiration, ethylene production and ripening of Japanese persimmon fruit harvested at different stages of development. J. Jap. Soc. Hort. Sci. 51: 203-209.

Turk, R. (1993). The cold storage of persimmon (*Diospyros kaki* cv. Fuyu) harvested at different maturities and the effect of different CO_2 application on fruit ripening. Acta Hort., 343: 190-194.

Wally, A.S.M. (1987). Hormonal control and fruit drop and ripening of kaki (*Diospyros kaki* L.). Ph.D. Thesis, Fac. of Agric., Cairo Univ.

Wettestein, D. Van (1957). Chlorophyll-Latale under submikroskopische formewe chesel der plastiden. Experimental Cell Res., 12: 427.

Zayan, M.A.; M.A. El-Hamady; E. Morsy; A.S. Wally and G.B. Mikhael (2002). Different alternate bearing effects on "Costata" persimmon trees. 2nd Inter. Conf. Hort. Sci., Fac. of Agric., Kafr El-Sheikh, Tanta Univ. Egypt (II): 763-781.

التغيرات الطبيعية والكيماوية فى ثمار الكاكى اليابانى أثناء التخزين وعلاقتها بتبادل الحمل

مرفت عبدالمجيد الشيمى ، جهاد بشرى ميخائيل
معهد بحوث البساتين ـ مركز البحوث الزراعية ـ مصر

أجريت هذه الدراسة خلال موسمى ٢٠٠٣ ، ٢٠٠٤م على أشجار كاكى صنف كوستاتا عمر ١٠ سنوات والمطعومة على أصل الكاكى الطرابلسى والنامية فى منطقة النوبارية ذات التربة الحيرية لتقييم جودة الثمار ومقدرتها التخزينية فى سنتى الحمل الخفيف والحمل الغزير عند تخزينها على درجة حرارة الغرفة (٢٥ + ٢°م).

وقد أظهرت النتائج ما يلى:

- أعطت أشجار الكاكى صنف كوستاتا الخفيفة الحمل أقل محصول من الثمار من حيث عدد الثمار والوزن كجم/شجرة وأعلى متوسط وزن للثمار مقارنة بالأشجار الغزيرة الحمل وكانت الفروق بينهما دائما معنوية.
- أوضحت النتائج أن ثمار الأشجار الخفيفة الحمل كانت أكثر صلابة وأقل فى النسبة المئوية للفقد فى الوزن والنسبة المئوية للتلف خاصة فى نهاية فترة التخزين بينما ثمار الأشجار الغزيرة الحمل كانت أعلى فى محتواها من المواد الصلبة الذائبة الكلية (TSS) والسكريات الذائبة الكلية (TS) والبكتين الذائب فى الماء (WSP) كما كانت أعلى فى نشاط إنزيم البكتين ميثيل أستيريز (PME).
- بينت النتائج أن التخزين على درجة حرارة الغرفة أدى إلى زيادة درجة التلوين ومحتوى الثمار من المواد الصلبة الذائبة الكلية (TSS) والسكريات الذائبة الكلية (TS) والبكتين الذائب فى الماء ونشاط إنزيم البكتين ميثيل أستيريز علاوة على زيادة النسبة المئوية للفقد فى الوزن والنسبة المئوية لتلف الثمار ومن جهة أخرى فقد انخفض محتوى الثمار من الكلوروفيل الكلى والحموضة والتانات فى كلا الموسمين.
- من ذلك يمكن أن نستنتج أن ثمار الأشجار الغزيرة الحمل كانت أقل فى مقدرتها التخزينية والحفاظ على صفات الجودة عند التخزين على درجة حرارة الغرفة مقارنة بثمار الأشجار الخفيفة الحمل.