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EFFECT OF SAFE ENVIRONMENTAL PRE AND POST HARVEST TREATMENTS AND IRRADIATION ON HANDLING OF SOME FRUITS

BY

Mohamed Abd El-Salam Abd El-Rahman Nawito

B.Sc. Agric., (Horticulture), Ain Shams University, 1982

M.Sc. Degree in Environmental Sciences Department of(Agricultural Sciences), Ain Shams University, 2001

A thesis Submitted in partial fulfillment
of
the Requirement for the Doctor of philosophy Degree

in
Environmental Science

Department of Agricultural Science
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2008

APPROVAL SHEET

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ABSTRACT

Mohamed Abd El-Salam Abd El-Rahman Nawito

EFFECT OF SAFE ENVIRONMENTAL PRE AND POST HARVEST TREATMENTS AND IRRADIATION ON HANDLING OF SOME FRUITS

The present study was carried out during two successive seasons of 2005 and 2006 seasons on"Montakhab El-Kanater" guavas and "Hachiya" persimmons.two different experiments were studied, the **first** one for pre harvest and **second** post harvest. Regarding pre harvest experiment,hand or chemical flower thinning by urea or ethrel and date of fruit picking (maturity) were evaluated on both guavas and persimmons.All flower thinning treatments increased fruit set,total yield,average fruit weight and decreased fruit abscission.However,a great effect on fruit quality and chemical compositions were also found with flower thinning treatments. Chemical flower thinning was more effective than hand thinning in improving yield and quality in "Montakhab El-Kanater" guavas and "Hachiya" persimmons. However,early maturation(120 and 150 days for guava and persimmon,respe.)produced poor fruit quality.Whereas, medium maturaty(130 and 180 days for guava and persimmon respect.) produced fruit with high quality.However,late picking(140 and 210 days for guava and persimmon recp.) produced fruits with less marketability.

On the other side, post harvest treatments including irradiation of fruits with or without pre-cooling process at 0.2,0.4,and 0.8 K.Gy for guavas and 1.5, 2.5 and 3.5 K.Gy for persimmons. Also,hot water at 45 ^{0}C, fungicide at 0.5 and 1.0 g/L.and ethanol vapor at 25 and 50% were evaluated on both fruits. The obtained data were evaluated on discarded fruits %, weight loss %, fruit firmness,fruit marketability, total soluble solids,acidity,L-ascorbic acid (guava), tannins (persimmon), total sugars and fruit respiration. All supplementary refrigeration treatments improved fruit quality during cold storage but ethanol vapor either 25 or 50 % were more effective than other treatments.

Key words:-Guavas – Persimmons - Pre harvest treatments - fruit maturity - fruit quality -

Flower thinning – Urea - Ethrel - Post harvest treatments - Irradiation – Hot water – Fungicides – Ethanolvapor - Physical properties - Chemical properties – marketability - Cold storage.

CONTENTS

Page No.

1- INTRODUCTION ---------- **1**

2- REVIEW OF LITRATURE -- ---------- **3**

Pre harvest treatments ---------- **3**

Post harvest treatments ---------- **5**

3- MATERIALS AND METHODS ---------- **41**

4- RESULTS AND DISCUSSION ---------- **49**

Pre harvest treatments ---------- **49**

Flower thinning ---------- **49**

Maturity stage ---------- **56**

Post harvest treatments ---------- **62**

Guava fruits ---------- **62**

physical properties ---------- **62**

Chemical determinations ---------- **71**

Persimmon fruits ---------- **82**

Physical properties ---------- **82**

Chemical determinations ---------- **91**

5- SUMMARY ---------- **103**

6- REFERENCES ---------- **119**

LIST OF TABLES

Table No.	Description	Page No.
Table(1)	Effect of hand or chemical flower thinning on yield attributes of "Montakhab El-Kanater guavas, during 2005 and 2006 seasons.	50
Table(2)	Effect of hand or chemical flower thinning on fruit quality of "Montakhab El-Kanater" guavas,during 2005 and 2006 seasons.	52
Table(3)	Effect of hand or chemical flower thinning on yield attributes of "Hachiya" persimmons,during 2005 and 2006 seasons.	55
Table(4)	Effect of hand or chemical flower thinning on fruit quality of "Hachiya" persimmons,during 2005 and 2006 seasons.	57
Table (5)	Effect of maturity stage on yield and fruit quality of "Montakhab El-Kanater" guavas,during 2005 and 2006 seasons.	58
Table(6)	Effect of maturity stage on yield and fruit quality of "Hachiya" persimmons, during 2005 and 2006 seasons.	61
Table (7)	Effect of some post -harvest treatments on discarded fruit % of Montakhab El-kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.	63
Table (8)	Effect of some post -harvest treatments on fruit weight loss % of Montakhab El-kanater cv. guava fruits stored at 8 ± 1**°C** and 85 – 90RH during 2005 and 2006 seasons.	65
Table(9)	Effect of some post -harvest treatments on fruit firmness (Ib/inch2) of Montakhab El-kanater cv. guava fruits stored at 8 ± 1**°C** and 85 – 90RH during 2005 and 2006 seasons.	67

Table No.	Description	Page No.
Table(10)	Effect of some post-harvest treatments on marketability (shelf life in days)of Montakhab El-kanater cv. Guava fruits stored at 8 ±1°C and 85 – 90RH for 20 days during 2005 and 2006 seasons.	69
Table(11)	Effect of some post -harvest treatments on total soluble solids (TSS%) of Montakhab El-kanater cv guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and2006 seasons.	72
Table(12)	Effect of some post -harvest treatments on titratable acidity (T.A.%) of Montakhab El-kanater cv. guava fruits stored at 8 ± 1**°C** and 85 – 90RH during 2005 and 2006 seasons.	74
Table(13)	Effect of some post -harvest treatments on L-ascorbic acid content (LAA mg / 100 g fresh weight) of Montakhab El-kanater cv. guava fruits stored at 8 ± 1**°C** and 85 – 90RH during 2005 and 2006 seasons.	76
Table(14)	Effect of some post -harvest treatments on total sugars of Montakhab El-kanater cv. guava fruits stored at 8 ± 1**°C** and 85 – 90RH during 2005 and 2006 seasons.	78
Table(15)	Effect of some post -harvest treatments on the respiration rate(CO 2 mg / kg fruit h.) of Montakhab El- kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.	80
Table(16)	Effect of some post -harvest treatments on discarded fruit % of Hachiya cv. Persimmon in cold storage at 0 ± 2**°C** and 90 – 95RH during 2005 and 2006 seasons.	83
	Effect of some post -harvest treatments on fruit weight loss % of Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.	85

Table No.	Description	Page No.
Table (18)	Effect of some post -harvest treatments on fruit firmness (Ib/inch2) of Hachiya cv. Persimmon in cold storage at 0 ± 2**°C** and 90 – 95RH during 2005 and 2006 seasons.	87
Table (19)	Effect of some post -harvest treatments on Marketability of (shelf-life in days)Hachiya cv. Persimmon stored at 0 ± 2**°C** and 90 – 95RH for 35 days during 2005 and 2006 seasons.	90
Table (20)	Effect of some post -harvest treatments on total soluble solids (TSS%) of Hachiya cv. Persimmon in cold storage at 0 ± 2**°C** and 90 – 95RH during 2005 an 2006 seasons.	92
Table (21)	Effect of some post -harvest treatments on titratable acidity (T.A.%) of Hachiya cv. Persimmon in cold storage a 0 ± 2**°C** and 90 – 95RH during 2005 and 2006 seasons.	94
Table (22)	Effect of some post -harvest treatments on tannins content (mg / 100 g fresh weight) of Hachiya cv.Persimmon in cold storage at 0 ± 2**°C** and 90 – 95RH during 2005 and 2006 seasons.	96
Table (23)	Effect of some post -harvest treatments on total sugars of Hachiya cv. Persimmon in cold storage at 0 ± 2**°C** and 90 – 95RH during 2005 and 2006 seasons.	98
Table (24)	Effect of some post -harvest treatments on the respiration rate (CO 2 mg / kg fruit h.) of Hachiya cv. Persimmon in cold storage at 0 ± 2**°C** and 90 95RH during 2005 and 2006 seasons.	100

1-INTRODUCTION

Guava tree "Psidium guajava L." is one of the most known cultivated trees in the world. Its cultivation started first in Latin America and then spread from Mexico and Peru to all the tropical and subtropical areas in the world. It is common throughout most tropical regions where it enriches the diet of millions of people.

In Egypt, guava trees are widely planted especially in Beheira,El-Sharkia,around Alexandria and a newly reclaimed lands.Guava can grow in many types of soil and it can grow under a wide range of climatic and soil conditions **(Bourke, 1976).** The tree is fairly drought and can tolerate alkaline soil up to pH 8.2 **(Samson,1980).**

The total guava area in A.R.E. is 46.180 thousand feddans in 2006 and the annual production is approximately 422547 tons (9.15 ton/feddan) of guava fruits**(Ann. Rept. of Agric. Statis. Dept., Min. of Agric., 2006).**

Guavas is a very popular fruit, it is generally a good source of lycopene,beta – carotene,vitamin C, protein, fat, carbohydrates, fibers, minerals, vitamins(B1 and B2)and is an excellent source of soluble fiber. Current research suggests that consumption of guava fruit may reduce LDL(the bad) serum cholesterol.Another health benefit attributed to guava is its antimicrobial potential in combating certain bacteria such as Staphylococcus aureus and beta-streptococcus group. Guava is employed as a natural medicine by people who live in the tropics as a treatment for diarrhea **(Whole Health MD. 2000)**.

Guava fruits are consumed either fresh or incorporated in the preparation of jam, jelly, nectar and fruit juices as well as used for flavoring other foods. Guava marketing should be in a proper stage of maturity and must be consumed immediately or stored at low temperature **(Rofael, 1985).**

In Egypt mature fruits of " Diospyros kaki L.cv.Hachiya " are famous used one. These variety become edible only after removal of astringency

whereas untreated samples can be stord for less or more than two months according to storage temperature and variety **(Kitagawa and Glucinam, 1984)**.

Generally, fruit yield and quality either in guava or persimmon greatly affected with flower thinning. It is well known that hand or chemical flower thinning increased fruit yield and produced fruits with good quality **(Ingels et al.,2001)**. Additionally, fruit maturity stage greatly affected yield and fruit quality **(Edmundo et al., 1998)**.

Optimum fruit maturity is important for good marketing of fruits **(Edna Pesis,2005)**.

Regarding post harvest treatments, available review reported that irradiation at different doses improved fruit quality ,decline fruit losses, disinfestations, remove the astringency in mature persimmon fruits and the values of pH, acidity, total soluble solids(T.S.S),moisture and vitamin C **(Farag, 1996, Seung and Kader, 2000 and Marais et al., 2001)**, Available review

reported that hot-water treatment shows potential for both disinfestation and maintaining quality of fruit during cold storage **(Lay- yee et al.,1996), (Smith and Lay, 2000), (Hofman et al.,2002),**Fungicide increased the percentage of marketable fruit , disinfestation and lowered weight loss during cold storage**(Author et al., 1998)**,**(Dov et al., 2001)** and ethanol vapor (E.V.C.) increased the percentage of marketable fruit and shelf life**(Reyes and Paull,1995)** and **(Gonzalez et al.,2003)**.

The present investigation was outlined to study the effect of some pre harvest treatments such as hand or chemical flower thinning and fruit maturity effects on yield and quality of "Montakhab El-Kanater" guavas and "Hachiya" persimmons fruits.As well as post harvest treatments such as irradiation,hot water ,fungicide ,ethanol vapor (E.V.C.) for pro linging storage ability and marketing ability of "Montakhab El-Kanater" guavas and "Hachiya" persimmons.

2-REVIEW OF LITRATURE

I-Pre-harvest treatments

The available review on flower thinning and maturation of guavas and persimmons fruits are rarley. It is well known that fruit trees often set more fruit than they can support or develop adequately, especially if the trees were not propery pruned during the previous season. excessive fruit compete with each other for carbohydrates (stored energy) and remain small. This carbohydrate drain, or "sink", can also weaken the tree and make it more susceptible to pests and sunburn damage. Leaving too much fruit on the tree can also lead to alternate bearing(a cycle in which the tree bears excessively in one year and little the next year) or limb breakage. Thinning the fruit helps prevent these problems from developing**(Ingels , et al.,2001).**

Thinning immature fruit at the appropriate time allows each remaining fruit to develop to its maximum size, with little reduction of tree vigor. Less-crowded fruit receive more sunlight, so fruit color and flavor may be improved.Fruit thinning,also reduces alternate bearing**(Ingels ,et al.,2001)**.

Reducing the fruit load throught proper pruning and fruit thinning, especially near the ends of branches, lessens the chances of limb breakage. To make thinning fruit easier, prune trees adequately to keep them small and lower to the ground **(Ingels , et al.,2001)**.

Fruit thinning can also reduce the spread of some diseases. For example, if the fruits are touching each other, brown rot can quickly spread from one fruit to another just before harvest. Air movement around tighty fruits is minimal, so the surface of unthinned fruit doesn't dry quickly, allowing disease organisms to multiply and spread **(Ingels , et al.,2001).**

guava fruit matures 90 to 150 days after flowering. Generally, there are 2 crops per year in southern Puerto Rico; the heaviest, with small fruits, in late summer and early fall; another, with larger fruits, in late
winter and early spring. In northern India, the main crop ripens in mid-winter and the fruits are of the best quality. A second crop is home in the rainy season but the fruits are less abundant and watery. Growers usually withhold irrigation after December or January or root-prune the trees in order to avoid a second crop. The trees will shed many leaves and any fruits set will drop. An average winter crop in northern India is about 450 fruits per tree. Trees may bear only 100-300 fruits in the rainy season but the price is higher because of relative scarcity despite the lower quality. Of course, yields vary with the cultivar and cultural treatment. Experiments have shown that spraying young guava trees with 25% urea plus a wetting agent will bring them into production early and shorten the harvest period from the usual 15 weeks to 4 weeks**(Morton, 1987).**

Regarding fruit maturation, it is well known that fruits are harvested after having reached a physiological maturity stage, when development is completed and growing has ceased. From this point on, post-harvest
ripening begins, and fruits acquire the organoleptic characteristics to be consumed **(Manrique & Lajolo, 2004; Watada, 1986).** The guava (Psidium guajava) is a native fruit of the American tropics. It is commercially important because of its flavor and aroma. It is nutritionally important due to its excellent source of vitamin C, niacin, riboflavin and vitamin A. The types and amounts of sugars determine the flavor of guavas. Generally, total sugars increases initially and then decreases during ripening. However, the relative proportions of its chemical composition change according to the cultivar and environmental conditions such as the climate and soil. Depending on the cultivar, the flavor compound may accumulate at different proportions during ripening,

and thus may result in guava fruits having distinctive aroma and tastes **(Ali & Lazan,1997; MacLeod & Troconis, 1982).** In present study, the influence of different stages of maturation on the volatile and non-volatile chemical composition of the white guava was investigated (**Flavio, et al., 2007)**.

II- Post harvest treatments

The available review concerning post harvest treatments such as irradiation, hot water, antifungous (fungicides) and ethyel alchohol vapor on storability of guava (Psidium guajava) and persimmon (Diospyros Kaki l.) are rarely. Generally, this part could be classified to the main following five topics**:-**

1-The effect of irradiation on guava, persimmon and some other fruits on chemical quality and nutritive value:-

Chemical quality attributes of mango exposed to different irradiation doses were studied by numerous investigators.**Mathur and Lewis(1961)** studied the effect of gamma rays 0.12 K.Gy on "Alphonso" mangoes fruit using $CO^{6°}$ at a dose rate of 0.0012 K.Gy/min. They found that retention of moisture was higher in the irradiated fruit, but non- reducing sugar and ascorbic acid contents were less than in the control. The storage life of treated mangoes were 24 days as compared to 16 days at 23- 39 °C for the control.However, Strawberries that received 0.3 and 0.8 megarad of gamma radiation showed significant loss of total ascorbic acid **(Claudia et al., 1963)**.On the other hand, Similar findings had been found with irradiated tomato fruits.**(Bramlage and Lipton, 1965;Abdel-Kader et al., 1968a and 1968ь and Ahmed et al., 1969).**

Romani(1964) mentioned that the major chemical compound of nutritional importance in citrus fruits is ascorbic acid(vitami C). This acid is present cheifly in the reduced form. The irradiation effect on the content of ascorbic acid varies with the level of radiation and type of fruit. Losses in the reduced form of the acid were reported for "Avon " lemon, and "Eurkea" lemon. On the other hand, the irradiation effect on whole oranges indicates an immediate sligh loss in the reduced form of the acid followed by recovery within 24 hours.

Sommer and Fortlage (1966) cleared that in strawberry, a dose of 200 Krad of gamma radiation delays disease development and contact infection by Botrytis Cinerea in refrigerated transport for five days or more, sufficient time to avoid important losses. Conditions in california appear especially favorable for the use of irradiation as a disease control treatment in this fruit.

Dennison and Ahmed(1967) studied irradiation effect on the ripening of Kent mangoes. The fruits were irradiated with 1, 2 and 3 K.Gy. They found that irradiated mangoes were less firm than control fruits immediately after irradiation, but fruit softening due to ripeness was more pronounecd than softening induced by irradiation.

Mumtaz et al.,(1968) reported that irradiation by Co^{60} gamma rays delayed the induction of ripening of hard green mangoes. Best results were obtained when mangoes were irradiated at a dose of 0.3 K.Gy. at room temperature with no significant loss of the nutritive constituents in irradiated mangoes.Organoleptic evaluations showed that the irradiated samples up to 0.3K.Gy.,were still acceptable after two weeks of a storage whereas the control ones had completely shriveled. However, Eating quality (flavour,texture and color)of peaches irradiation with 150, 200 and

250 Krad of gamma irradiation were unaffected although ascorbic acid development was slightly delayed **Larmond and Hamilton,(1968) .**Also, **Monselise and Kahan(1968a)** reported that ascorbic acid content in citrus fruits was affected by gamma irradiation. One day after treatment the loss in ascorbic acid in irradiated fruits was negligible. However, after 40 days, there was a marked reduction in ascorbic acid in fruits subjected to 200, 300 and 400 K rads.

Ahmed et al., (1969) reported that there was loss of about 20% in ascorbic acid content in peache fruits treated with 400 Krad of gamma radiation.

Maxie et al., (1970) showed that gamma irradiation doses greater than 200 Krad markedly decreased the ascorbic acid content in lemon during storage, while oranges at that dose were not affected.

Chou et al.,(1970) observed that heat treatment at 58°C for 4 min before or after irradiation increased the sensitivity of P. Expansum to gamma irradiation.

Loaharanu,(1971) found that irradiation of tropical fruits, mangoes and papayas, at optimum doses, 40 and 70 Krad respectively caused an extention in storage life.No significant differences were detected in terms of nutritive values, vitamin C and reducing sugars, and organolyptic doses
and unirradiated fruits**.**However, storage - life of mangoes could be significantly extended by gamma ray application **Teng-Umnuary, 1966; Ahmed et al., 1969; and Kovacs, (1970)**.

Pablo et al., (1971) mentioned that the irradiated mangoes had higher ascorbic acid contents during storage as compared to unirradiated samples.

Dennison and Ahmed(1971) used a hot water dip at 49°C for 7 min.combined with gamma irradiation at 157 and 210 Krad (1.57 and 2.1 K.Gy.) to give significant reduction in anthracnose fungal infection in Zill mangoes.

Ahmad et al., (1972) carried out experiments on mature green guava fruits subjected to gamma irradiation doses of 0.1, 0.2, 0.3, 0.4, 0.5, and 0.75 K.Gy and stored for 0,5 and 10 days. Optimum radiation dose of 0.3 K.Gy delayed ripening by 5 days.
Radiation increased the soluble: insoluble pectin ratio with increasing doses,but this was reversed during storage. Irradiation of guavas had firmer than normal texture at the end of storage.Reduction in ascorbic acid due to irradiation disappeared during storage. Total soluble solids and acidity were not affected by irradiation. Organoleptic evaluation showed that after 10 days storage irradiated guavas were rated best weight loss of control However,a radiation dose of 0.30 K.Gy was found to be suitable for delaying the ripening of guava(Psidium guajava l.) for 9 days while the control fruit ripened after 4 days **Hussain(1978)** .

Sreenivasan(1974). reported that low-dose irradiation of tropical fruits like mangoes could extend their shelf- life by delaying ripening and senescence. The irradiation of mangoes with a dose of 0.25 K.Gy. resulted in an initial slight reduction in fruittexture(15-20%).

Synthesis and accumulation of carotenoids in the flash of Alphonso mango on ripening was found to be maximal in fruit stored at tropical ambient temperature (28-32 °C) ,**(Thomas and Janave 1975).** They reported that gamma irradiation of preclimateric fruits at 0.25K.Gy did not affect the formation of carotenoid. Storage of preclimateric fruits either irradiated or unirradiated at 7-20 °C for 16-43 days caused a substantial in

carotenoid formation even when these fruits were subsequently ripened under optimal conditions. Regardless of storage temperature,carotenes always exceeded xanthophylls in the ripe fruits and,in general, irradiated fruits showed higher carbohydrate metabolism from glycolysis to the pentose phosphate pathway in the irradiated fruit levels of carotenes in comparison with unirradiated samples. Ascorbic acid loss during ripening, was maximum, at ambient temperature whill storage at low temperatures caused a net increase in ascorbic acid levels, irradiation seemed to accentuate the loss in ascorbic acid during ripening.

Aiyar (1976) irradiated the Alphonso variety of mangoes with 0.25 K.Gy in the preclimacteric state. He mentioned that the loss of ascorbic acid during ripening was found to be accentuated by irradiation. Among the biochemical alterations observed in the irradiated fruit are a switch-over to the glyoxalate cycle and an accumulation of polyphenolics at higher doses.

No changes in the content of reducing or non-reducing sugars in different banana varieties irradiated with 0.2 to 0.4 K.Gy. for the purpose of delaying ripening were detected by **Aiyar (1976)**.Skin browning in the fruits exposed to doses greater than the optimum level had been ascertained to be to increased polyphenol oxidase activity. There is a shift in the carbohydrate metabolism from glycolysis to the pentose phosphate pathway in the irradiated fruit. Although succinic dehydrogenase activity is impaired , the operation of the glyoxalate bypass ansures normal functioning of the tricarboxylic acid cycle.

The effec of gamma radiation on ripening in various varities of mangoes(Mangifera indica l.) was investigated by **Hussain (1978)** . A dose of 0.30K. Gy induced a delay in ripening for one week compared to

control fruits which ripened withen 5 days at room temperature. There was no-significant difference in ascorbic acid,β-carotene, total soluble solid (t.s.s.), acidity,tss-acidity ratio and total sugar content between irradiated and control mangoes. However, irradiated samples had higer sucrose, fructose and lower glucose values.

El-Sayed (1978) found that hot water dipping at 60°C for 2 min., as pre- irradiation treatment of green mature tomato fruits was found to be effective in controlling rots during the storage period. Moreover, this physical treatment could minimize gamma irradiation dose required for shelf- life extension of tomato fruits.Heat treatment combined with 100
Krad dose could extend tomato shelf- life for 13 days without significant effect in fruit quality.

Moshonas and show (1982)stated that vitamin C levels of grapefruit irradiated at 5-60 Krad were significantly lower in juice of most irradiated fruits.

Shirzad and Langerak(1984) reported that gamma irradiation at 1 & 2 K.Gy was used to increase shelf-life of Black Alicante table grapes stored at 10°C and 95% RH.The grape clusters were placed on foam
polystyrene trays and packed with polyvinyl- chloride film. Gamma irradiation at 2K.Gy completely prevented decay of clusters stored for 40 days at 10^{o}C without any discernible change in the organoleptic attributes of the berries.However, **Kalinov (1985)** mentioned that the respiration rates of cultivars Halle and Elberta peaches were determined after treatment with gamma-rays at 2.0 ,2.5 or 3.0 K.Gy, with storage for up to 35 days at three storage temperatures 20-25.5, 5° or 0 °C. The immediate effect of irradiation was enhanced respiration in linear correlation with irradiation dose.Storage at 5° or 0°C reduced the respiration rate by 4

times compared with non-refrigerated storage.Gas exchange at0ºC was, however, considerably lower than at 5oC throughout the whole 35-day storage period. Respiration rate declined after the initial increase at all temperatures and eventually became the same for all irradiated doses. Non irradiation controls showed the highest respiration rates. Also,**Moy and Nagi(1985)** suggested that radiation does of 3.0 K.Gy had no problems to the sensory qualities of citrus fruits.

In their study on valencia orange fruits**, Nagi and Moy(1985)** mentioned that irradiated fruits at 0.30, 0.50, 0.75 or 1.0 K.Gy eight days after harvest and were either stored at 7.2°C for 4 weeks followed by 2 weeks at 21. 10°C or stored at 7.2°C for 7 weeks. The results indicated that the highest doses tolerated without significant quality changes were
0.75 K.Gy for storage at 7.2°C and 0.50 K.Gy for storage at7.2°C and 21.1°C. Doses up to 1.0 K.Gy caused slight changes in aroma, flavor and texture while not affacting ascorbic acid, total acids and t.s.s contents.

The use of irradiation to sanitise fruit cut surfaces should also be investigated,since it has shown good results in delaying ripening of whole fruits,**(Kader,1986). Gunes, Hotchkiss, and Watkins (2001) and Gunes, Watkins,and Hotchkiss(2000)** reported an increase in respiration
rates as well as an inibition of ethylene production in irradiated fresh-cut apple slices. However, undesirable changes in textur induced by irradiation are still a limiting factor for its use in fresh-cut produce.

Farooqi et al., (1987) found that irradiated Kinnow mandarins with gamma rays at doses of 1,2 or 3 K.Gy developed skin injure during subsequent storage in perforated cardboard boxes held at room temperature(20-25 °C)for 5 weeks. Irradiation increased respiration and ethylene production during storage but had no- significant effect on fruit

chemical composition (ascorbic acid , citric acid,and reducing and non- reducing sugars).

Zhao and Wan(1987)found that respiration and ethylene production increased when fruit were irradiated shortly after picking if treated with a dose of 8 K rad,10 days after picking. The respiration rate returned to normal within 5 days,and ethylene production decreased to a very low level.So, it could be recommend that 8 K rad dose to be used for preserving fruits.

Garcia Arteaga et al., (1988) reported that vitamin C in Washington navel orange irradiated with gamma rays 0.35 to 0.5 and 1.0 to 1.5 K.Gy decreased significantly after 12 and 21days, respectively. Total losses
were 3.8 and 18.4 to 29.8 % with radiation doses 0.25 and 0.35 to 1.5 K.Gy , pH increased and soluble solids and acidity tended to decrease with increasing radiation doses.

Mahmoud et al.,(1988a)studied the effect of gamma irradiation at the 0,1,2,3,and 4K.Gy dose levels on extending shelf-life of "le conte" pear.Significant difference has been found between irradiated and non irradiated fruits regarding weight loss,fruit decay,fruit firmness and moisture content during storage.

Mahmoud et al.,(1988b)irradiated le cont pear fruits with gamma irradiation at 0,1,2,3 and 4 K.Gy dose and stored at (0°C±1) levels. Significant differences had been found between irradiated and non- irradiated fruits regarding total solids , titratable acidity, fructose, sucrose, pectates, protopectin and ascorbic acid content.

The effect of gamma irradiation on the ultrastructure of apples and

pears was studied by **Kovacs et al.,(1988).**They found that low dose(1 K.Gy) irradiation induced softening in the fruit, dissolution of middle lamellae, wrinkling of cell membranes which generally remained intact and retention of starch by plastids of the skin. Also, the effect of ionizing irradiation on the respiration intensity of pears during storage was evaluated by **Al-Bachir and Sass (1989).** Examined Jonathan apples and Passe Crassane, Glou Morceau, Faster Beurre and Olivier de Serres pears irradiated with gamma-rays at 500,1000 and 1500 Gy or X-rays at 40,60 and 100 Gy before cold storage in controlled atmosphere (CA) or normal atmosphere. Ripening was accelerated for a short period (5-7 days) immediately after irradiation, as shown by respiration and anzyme activity tests.However, at the end of storage, the respiration rate of the irradiatied fruits was lower in both atmospheres suggesting that irradiated fruits could be stored for longer periods.

Kushad and Myron (1989) investigated the effect of ionizing irradiation on fruit firmness of Staymen apples. They reported that irradiation at 60 K rad resulted in a loss of fruit firmness and a decline in fruit quality overall. There was no difference in quality between unirradiated and irradiated fruits with 30 K rad dose. The results suggested that irradiation dose not increase the storage life, in addition, the dose of 30 K rad is generally low for effective quarantine treatment.

Liu et al.,(1989)irradiated Golden Delicious apples with gamma rays at 0.3- 2 K.Gy and stored them at 8.18°C 85- 95% RH.They found that flesh firmness of apples treated at 0.3- 0.9 K.Gy was greater than that of untreated controls at 48 days.

Singh(1990) reported that irradiation of different varieties of mangoes had little effect on main nutrients, carotenoides and vitamin C in a few

varieties of mangoes, while in the others the vitamin C level was unaffected by radiation. Irradiation reduced carotenoid levels in some varieties.

Patterson,(1990)found that most tropical fruits must be stored at temperatures above 12 °C. These high temperatures promote, however, theripening process (senescence) and the development of microbial decay, resulting in a short shelf- life. For this reason many countries carried out irradiation experiments on mangos is very important for delaying of ripening, insects, flies disinfestation and inactivation of spoilage microorganisms, especially fungal spores.**Thomas, (1986)**additionally, when combined with anther physical process like hot water treatment, irradiation extends the market life of these fruits by reducing postharvest decay caused by fungal pathogens**.**

Khan(1990).held large scale trials to extend the storage life of potatoes,onions and dry fruitsby gamma radiation.It was concluded that radiation preservation of potatoes and onions was much cheaper as compared to conventional methods. A dose of 1 kGy can control the insects in dry fruits and nuts. The consumers acceptability and market testing performed during the last four years are also conducive to the commercialization of the technology in this country. The Government of Pakistan has accorded clearance for the irradiation of some food items like
potatoes, onions, garlic and spices for human consumption. The Pakistan
Radiation Services(PARAS)**,**the commercial irradiator (200 Kci)at Lahore, has already started functioning in April,1987. It is planned to start large scale sterilization of spices by gamma radiation in PARAS shortly.

Sornsrivecai et al.,(1990)irradiated "Anna" immature green apples, harvested 117 days after full bloom 5 days after or after 1-3 months

storage at 3°C with daylight fluorescent lamps (2) months storage at 3°C with daylight fluorescent lamps(21 and 30 W/Cm² for 72 h).Irradiation increased TSS, while malice acid levels decreased.

On the other hand,**Mitchell,et al.,(1992)** carried out experiments on capsicums (green and red), cucumbers, custard apples, lemons, lychees, mandarins,mangoes,nectarines,papaws,peaches,persimmons, andzucchinis which were irradiated at 0, 75, or 300 Gy in replicated factorial experiments. Commodities were analyzed shortly after irradiation and again after 3 to 4 weeks of storage at 1-7 °C for soluble solids, pH, titratable, acidity, internalcolor, total vitamin C, dehydroascorbic acid, organic acids, and sugars. Significant small changes were recorded in some variables for some commodities.Storage effects were greater than irradiation effects.

Lacroix et al.,(1993) irradiated mangoes of Nahung Glahng Wahn variety from thailand at 0.49 to 0.77 K.Gy. The results indicated that irradiated groups appeared to have a slightly content of ascorbic acid on the first day after irradiation than their corresponding controls.

Budagovskii et al.,(1993)treated Antonovka obyknovennya apple fruit with laser before storage from Oct. to April. 73% of Laser- treated fruits were marketable after storage until Apr. compared with 53% in the control.

Tiryaki et al.,(1994)irradiated apple fruits with gamma rays for delaying postharvest decay. Doses of 1,2,3 and 3.5 K.Gy did not give a complete control of postharvest decay of fruit but delayed the infections.

Kovacs et al.,(1994)found that the sucrose content of Mustsu apple

fruits harvested of different maturity stages(120,140 or 147 days) after full bloom,DAFB was similar.The sucrose content of fruit irradiation with gamma irradiation (1.0 K.Gy) increased significantly within 1-3 days of irradiation particularly for the latter 2 stages of maturity.After 20-50 days of storage at 10°C the sucrose content of untreated fruits(harvesed 120 and 140 DAFB)was higher than that at the beginning of storage but the sucrose content of irradiated fruits(harvesed 140 and 147 DAFB)was lower than at the beginning of storage.Results of trials with cultivars Gloster,Idared and Starking was also reported. With these cultivars there was generally no difference in sucrose content between unirradiated and irradiated fruits after 21 weeks of storage at 5-8°C.The sacrose content at harvest was higher in Mutsu followed by Gloster,Idared and Starking apple fruits but the differences between cultivars decreaed during storage.

Dong et al.,(1995) indicated that the red colour of Royal Gala apple fruit skin increased in intensity following irradiation with ultraviolet (UV)
and white.The enhanced red colour was due to an increase in anthocyanin concentration and the increase was dose dependent.The red skin colour further increased after storage at 4°C in the dark. During the course of irradiation the enzymatic activities of phenylalanine ammonin-lyase (PAL) and chalcone isomerase(CHI)increased 10 to 20- fold.

Miller and McDonald(1995) assessed the quality of "Sarpblue" and "Climax" blueberries after low-dose electron beam irradiation,add an alternative to methyl bromide fumigation.Berries were irradiated at 0.25,0.5,0.75 or 1.0 K.Gy and held in storage at 1°C for 1,3,7 days,and for 2 additional days at 15°C. Peel colour,total soluble solids,and titratable acidity were not affected by dosage.The firmness of(Sharpblue)berries was slightly significantly affected by dose, but firmness of (Climex)berries was not effected by irradiation. Flavor and texure were negatively affected

as dosage increased for berries of both cultivars. Weight loss and decay were not effected by dosage. Moreover, **Stevens et al.,(1996)**irradiated apples fruit with low hormelic doses of UV light (245nm,UV-C)for controlling postharvest decay of Golden Delicious apples. The fruits irradiated with low UV- C doses and stored exhibited less fruit decay percentage.

Farag,(1996) irradiated mature persimmon fruits "Hachiya variety" with different doses as (1.0,2.0 and 3.0 K.Gy),to remove the astringency and to improve its quality.Irradiated, unirradiated fruits were stored at cold storage(5-7°C.80-90% RH),the biochemical and physical parameters were studied weekly.Irradiation process accelerated all the biochemical changes of ripening especially at high doses (2.0 and 3.0 K.Gy). The values of pH, acidity,total soluble solids(T.S.S), T.S.S/ acid ratio, moisture and vitamin C were changed markedly either after irradiation directly or during storage.Reduction of tannins was more significant by irradiation,it decreased linearly with increasing doses with high significant of correlation coefficient values(r). Gas chromatography analysis of tannins, and the relative compounds proved presence of Catchine, ellagic acid, protocatecheuic, gallic, propylgallate besides some phenolic and unknown compounds.Irradiation increased the hydrolysis effect of condensed tannins consequently caused deastringency especially at high doses (2.0 and 3.0 K.Gy).Also, using high performance liquid chromatography (HPLC) for sugar analysis proved increasing of reducing sugars as glucose, fructose and glactose in irradiated than non- irradiated fruits which proved the degradation effects of condensed tannins by irradiation.Panel test,proved acceptance the consumer (palatability)of irradiated samples with high percentage after few days of irradiation due to radio-deastringency.Also,the fruits were Homogenous in orange colour and with accepted texture as proved after measuring firmness and colour

pigments.It can be recommended that using 2.0 and 3.0 K.Gy will remove the astringency of persimmon fruits "Hachiya variety" and improve quality for consumption.

Wilson et al.,(1997)designed an apparatus to deliver low-dose UV- C light to the surface of fruits on a processing line and tested for its control of post harvest decay.Post harvest decay after 28 days storage of Empire apples at 18°C was reduced by 52% compared to untreated controls.

Seung and Kader(2000). Stated that ionizing radiation may be used for sprout inhibition, insect control,or delay of ripening of certain fruits and vegetables.**Mitchell et al.,(1992)** studied the irradiation effect on horticultural crops at relatively low doses and found that irradiation at 300 Gy had no significant effects on L-ascorbic acid (AA) and L-dehydroascorbic acid (DHA).Irradiation at 75-100 Gy irreversibly inhibited sprouting of potatoes regardless of storage temperature.Losses in
vitamin C were lower in potato irradiated for sprout control and subsequently stord at 15°C than in non-irradiated tubers stord at 2-4°C, **(Joshi et al.,1990).'**Galia' muskmelons were irradiated at doses up to 1
K.Gy as a quarantine treatment,and the treatment had no effect on vitamin C content**(Lala-guna, 1998).** In general doses of 2-3 K.Gy combined with refrigeration were useful for extending the shelf- life of strawberries **(Graham and Stevenson,1997).**During storage AA levels significantly in creased while DHA content decreased in irradiated strawberries.

Aegerter and Folwell(2000)analyzed alternative treatment scenarios with capabilities equal to those acieved by methyl bromide for treatment of apple irradiation with the only alternative identified that was available for all the fruits in this study.Cost increases for all fruit treated with irradiation ranged from two to 14 times methyl bromide cost.

Gurbuz et al.,(2000). Measured respiration and ethylene production rates of irradiated apple slices from Delicious,Empire,Idared and Rome apple cultivars for 72h.Dose less than 1.2 K.Gy had no effect on rates of Co2 production and O2 consumption,and irradiation at doses between 1.2 and 2.4 K.Gy had minimal effect for all cultivars, respiratory quotient increased with irradiation dose.The degree of maturity of slices affected respiratory responses.Irradiation reduced ethylene production of all slices . These results suggested that irradiation doses of up 2.4K.Gy can be used with minimum effect on the respiratory physiology tissues.

Marais et al.,(2001)subjected Cripps,Pink apples to 72 hours of postharvest irradiation developed a better red blush with high pressure sodium (HPS)(hue angle 56.5°)than with UV-B plus incandescent (UVB+1) lamps(hue angle 70.7°).only HPS lamps were used in subsequent experiments.The increase in red colour (hue angle decrease of 14.9°) in Braeburn apples held at 0.5°C for 8 weeks prior to treatment was
smaller than in fruit stored for 4 weeks (hue angle decrease of 23°).No increase in odor or anthocyanin concentration was observed in Forelle pears that were similarly treated.

2-Effect of Hot-water on guava, persimmon and some other fruits:-

Smoot and Melvin(1963)found that hot water at 127.5°f was effective for controlling decay due to *Penicillium Italicum* by dipping valencia orange fruits for 5 min. during 1-3 days after harvest. The treatment had given a good result than that obtained by using Na-o-phenylphenate.

Wild (1993)reported that chilling injury in Marsh grapefruit during storage at 1˚C was reduced by 61% by dipping in hot-water(50˚C)for 2 min.,before storage.

Nardin and Sass(1994)found that treated Red Delicious,Grany Smith and Morgenduft apple fruit with hot-water resulted in an inefficient reduction in fruit scald.Also,**Bhadra and Sen(1999)**subjected Custard apple fruits (Annons sqymosa L.)to hot-water 52°C,whereas control fruits were dipped in distilled water and both were stored at 28- 32°F and 70% RH.The treatments prolonged storage life of fruits than control.

Rodov et al.,(1995).found that the effect of hot-water dip (2 min at 35˚C)on reducing decay of various citrus fruits was comparable with that of curing(3 days at 36˚C).

Lafuente et al.,(1995)found that the effect of hot-water dip on Fortune mandarins may be comparable with that of curing,but after 30 days storage the beneficial effect offered by curing was higher.

Forney(1995) stated that hot-water dip alone reduced weight loss of stored fruits, probably by improving the membrane function of the cell or the cuticular properties at the fruit surface of citrus cultivars.

Schirra el al.,(1995)dipped tarocco oranges for 3 min.in water at 25˚C or 52˚C.The fruits were stored for 2 months at 8˚C and held for one subsequent week of simulated shelf-life,at 20˚C.After storage and simulated shelf-life,fruits dipped in water at 52˚C showed less chilling and storage decay {unspecified} than fruits dipped in water at 25˚C.

Philip et al.,(1995)found that the mortality response of lightbrown apple moth **(**LBAM**;** Epiphyas postvittana Walker)and long tailed mealy bug (MB**;** Pseudococcus Longispinus Targioni-Tozetti)on persimmons to hot-water immersion treatments between 44 and 54ºC was examined.The calyx of the persimmon was found to offer thermal protection for both

LBAN and MB resulting in lower insect mortality under the calyx compared to that on the outsideof te fruit.The mean immersion time for mean 99% mortality(LT_{99})of LBAN at 44ºC was 32.5 min, and this time decreased with increasing temperature to 7.4 min. At 54ºC MB were found to be much more tolerant to hot-water immersion than LBAN.The mean LT_{99} of MB at44ºC was 74.2 min,which decreased to 15.1 min at 54ºC. Hot-water immersion appears to be a potentially usful disinfestation method.

Saucedo et al., (1995) treated mangos with hot water (46.1°C for 0, 80 and 90 min) and then stored at low temperature. Results showed that these treatments increased the yellow colour and weight losses of the fruits and
reduced chilling injury and decay. The best hot water treatment was for 90 min. In addition, **Oosthuyse (1996)** treated mango fruit with hydro heating at 50 or 55°C for 5 or 7 min., after treatment fruits were stored at 11°C for
28 days and ripened at 20°C. Fruits treated for 5 or 7 min. at 50°C had the best flavour. After treatment for 5 min, skin colouration increased with the increase in bath temperature, but it decreased with the increase in bath temperature following treatment for 7 min. The percentage of good quality fruit present on ripening was greatest following treatment for 5 or 7 min at 50°C. Hydro heating at 50°C for 5 min is recommended. Also, **Zambrano and Materano (1998)** investigated harvest mango Palmer fruits at the preclimacteric stage and immersed in hot water (38, 46 or 54°C) for 30 min. prior to storage at 5°C for 2, 4 or 6 weeks. After storage they were kept at 20°C until ripe.Treatment with hot water at 38°C reduced the development of chilling injury in storage. Symptoms of chilling injury increased as storage duration increased. Total soluble solids was highest (13.27° Brix) in fruits treated with hot water at 38°C while titratable acidity was highest in fruits treated with hot water at 54°C.

Post-harvest heat treatment applied prior to low temperature storage can reduce the incidence of chilling injury in cold-sensitive fruits, such as avocado **(Woolf et al., 1995)** mango **(McCollum et al 1993)** persimmon **(Lay-Yee et al.,1997**and **Woolf et al.,1997).**Heat treatments (HTS), with both hot air and hot water,can also be used for disinfestations **(Lurie,1998).**However,HTS can alter several components of fruit quality **(Roman and Yahia, 2002)**. Hot water treatment (HWT) can be more easily applied commercially than hot air treatments,particularly if the duration of treatment is short.HWT reduced CI after storage but did not eliminate it and the responses were variable**(Grove et al.,2000).**Fruits and vegetables commonly tolerate temperature of 50-60°C for 5-10 minutes **(McCollum et al 1993)**. This temperature range and durations treatments are also recommended for reducing mangos fruits sensitivity to chilling injury **(Kruger et al., 1996).**

Lay- yee Michael et al.,(1996)found that 'Fuyu' persimmon (Diospyros Kaki L.) hot-water treated at temperatures ranging from 47 to 54ºC. for durations from 2.5 to 120 min(depending on temperature), with air and water-treated fruit(20ºC for 120 or 60 min, respectively)as controls. Eollowing treatment,fruit were stored at 0ºC in air for 6.5 weeks then held at 20ºC for 5 days and assessed for quality. Whereas, a number of hot-water treatments caused damage in the form of skin or flesh browning, no damage was observed with certain treatments which showed potential as disinfestation treatments(47ºC for 90 and 120 min,50ºC for 30 and 45 min,52ºC for 20 and 30 min,and 54ºC for 20 min).These treatments also reduced incidence and severity of chilling injury observed in fruit following cold storage,relative to that found in controls.Results suggested that hot-water treatment shows potential for both disinfestation and maintaining quality of persimmon fruit during cold storage.

A matrix of 80 hot water treatment (HWT) temperations/durations and controlled atmosphere (CA) storage regimes were tested for effects on respiratory activity, ethanol (E_tOH)and acetaldehyde accumulation (AA), and storage quality of‘Fuyu’ persimmon **Douglas el al.,(1997)** . Fruit were hot water treated at 47°C for 45,60,90,or 120;min,50°C fot 30,45,55,or 60 min;52°C for 20,30,40,or 50 min; 54°C for 15,20,25,or 30 min; and as a control treatment,20°C in air.After treatment, fruit were stored in air,5% Co_2: 2%O_2, 10% Co_2: 2%, or 100% N_2 for 6 weeks at 0°C. Fru was assessed after a 5 day shelf -life at 20°C. Respiration(Co_2 production)was measured on fruits held at 20°C following HWT.After strage,C_2H_4, Co_2, EtOH and AA production were measured on selected treatments at 0,1,3,and 5 days at 20°C.Hot water treatment alone,or in combination with CA, ameliorated chilling injury(CI).External browning symptoms developed on fruit in some treatments upon removal fromstorage,severity of symptoms being positively correlated with increasing HWT duration,
and most severe in the CA treatments,especially the 100% N_2 CA.CO_2 production increased after HWT and then decreased(within 24h), but remained at a higher level than the non-heated control.Fllowing storage, CO_2 production rates of fruit from all treatments were relatively similar by the end of 5 days At 20°C. E_tOH and AA production were the greatest in the 100% N_2 treatment.Fruit under the longer HWT durations had lower Co_2 and C_2H_4 production after storage and accumulated more E_tOH and AA during the 5 day shelf lif.These were also the treatments resulting in the lowest levels of CI.Possible mechanisms of HWT and CAalleviation of CI in ‘Fuyu’persimmon were discussed.

harvested Custard apple fruits and treated with hot-water at 52°C, whereas control fruits were dipped in distilled water at 28- 32°F TSS**.**total sugar and reducing sugar contents increased as storage progressed, whereas titratable acidity and ascorbic acid content decreased **Bhadra and Sen(1999)**.

Smith and Lay(2000)subjected Royal Gala apples from 2 orchards from each of 2 regions and up to 3 harvest dates to hot-water treatments, (HWTs) at 44,45 or 46°C for 35,40,45 minutes.Following treatments, fruits were placed in cold storage at 0.5°C for 0,4,7 or 10 weeks,then held at 20°C for 7 days prior to assessment for quality. A number of HWTs were associated with damage in the form of skin browning and internal breakdown.Incidence of damage increased with increasing length of time in cold storage.Incidence of HWTs associated damage varied between regions,harvest dates and orchards.Early-harvest fruits had lower levels of damage than mid-and late harvest fruits.A HWTs of 44°C for 35 minutes, followed by 6 or 10 weeks of cold storage at 0.5°C, was fond to be tolerated by all fruits tested.

Suresh et al.,(2001) investigated the effects of hot water and hot air treatments on the reduction of chilling injury and quality of Kensington Pribe mango fruits. Heat treatments included exposure to 38-40°C for 14 hr, hot water for 10 min at 46-48°C and hot air for 10 min at 46-48°C. Treated and untreated fruits were stored at 5°C.Heat treatments did not result in a substantial reduction in chilling injury development after 21 and 35 days of storage at 5°C.All heat treatments increased respiration rate,but ethylene production, physiological weight loss during storage and total soluble solids were increased only by some heat treatments.

Hofman et al.,(2002) placed avocado fruits in water at 38-42°C for 20-60min disinfested for 16 days at 1°C, then ripened at 20°C. Hot water treatment significant by reduced skin damage caused by cold disinfestations. Also reduced rots in ripe fruit with 40 and 41°C for 30 min being consistently the most effective. The severity of vascular browning (VB) and mesocarp discolouration (MD) in ripe fruit was generally low, and increased following cold disinfestations. Hot water treatments reduced

VB severity but had no effect on MD. Treatment at 41°C for 25-30 min and 42°C at 25 min increased the percentage of externally acceptable fruit (less than 5% of the skin area with defects) from 0 to about 80% in 3 days after removal from disinfestations. The same treatment also increased the percentage of ripe fruit with acceptable flesh quality (less than 5% of the flesh with rots or disorders) from 0 to 16-20%, due mainly to reduced body rots, These results indicate the commercial potential of HWTs of about 41°C for 25-30 min or 42°C for 25 min to improve avocado external and internal fruit quality following cold disinfestations.

3-The effect of ethanol vapor on guava, persimmon and some other fruits:-

Heins,(1980) used ethanol in solution to delay carnation senescence via inhibiting the climacteric ethylene**.**Also,**Saltveit and Ballinger, (1983) and Kelly and Saltveit(1988)**elhanol is conditions**.** Additionally, **Saltveit and Ballinger, (1983)and Ke et al.(1990)**. It is also accumulated in a short period of anaerobically stored fruits without adversely affecting fruit subsequent quality **.**Also, **Saltveit and Mencarelli,** (**1988)** found that exogenous application of ethanol vapor inhibited tomato fruit ripening via inhibiting ethylene biosynthesis and action**.** Ethanol and acetaldehyde are natural component in almost every fruit aroma **Pesis et al.,(1989)and Frenkel and Erez, (1996).** Ethanol did not exhibit toxicity either for the fruits or for human health even at high concentrations**.** However,**Saltveit and Sharaf (1992)** A howed that levels of ethanol residues were diminished in such fruits 72h after transferring to ethanol free air**.** Also,**Abd El-Samad,(1998)** found that ethanol vapor application was also effective in reducing the percentage of decayed fruits. This may be due to the antiseptic impact of ethanol on the microorganisms, which last for a long time**.** The mode of action of ethanol in terms of counteracting

ethylene biosynthesis and action may explain the delayness of tomato fruit ripening obtained with ethanol vapor application **Atta-Aly et al., (1999) .**

Wang and Adams (1982)found that ethanol vapor was able to protect fruit system for ethylene production since a considerable reduction in ethylene was only obtained by the chilled fruits without ethanol vapor exposure**.**However, **Abd El-Samad, (1998)** indicated that ethanol vapor exposure reduced fruit respiration level and arrested ethylene capability from inducing fruit respiration which may be the reason behind fruit reduced sensitivity to chilling injury. Furthermore, chilling injury caused a partial destruction in ethylene production by the chilled fruits. Ethanol vapor exposure however, was able to sustain and protect ethylene producing system**.**

Cote et al.,1993 and Abd El-Samad,(1998) observed that ethanol vapor has a direct or indirect protective role for cell membrane as well as ethylene production system. Besides in reducing respiration and protecting ethylene producing system ethanol vapor role in protecting cell membrane is another suggested role for ethanol in reducing fruit sensitivity to chilling injury**.**

Reyes and Paull (1995).found that treating fruit of guava(Psidium guajava L.cv.Beaumont) with 100µl–¹ etylene(C_2H_4)at 20°C for 24h resulted in a significant increase in the rate of skin yellowing and softening of immature-green fruit,whereas ethylene -treated and quarter-yellow fruit did not differ from non-treated control fruit in rate of skin yellowing and softening.Titratable acidity(TA)and total soluble solids (tss)of fruit at mature-green and later stages were not significantly affected by ethylene treatment.Immature-green fruit, whether or not treated with ethylene, became ‘gummy’and shrivelled during ripening and had a higher juice viscosity.

Oetiker and Yang, 1995; Saltveit,1999) found that most changes during the ripening of climacteric fruit,such as skin and pulp colors, firmness, SSC,acidity and respiratory rate,derived from physiological processes regulated by internal ethylene production**.**Also**,(Feng et al.,2000;Kluge et al., 2002),** apple**(Fan et al.,1999;Rupasinghe et al., 2000),**banana**(Sisler et al.,1996;Golding et al., 1998;Jiang et al.,1999),** tomato**(Sisler and Serek, 1997)** found that 1-MCP is known to compete for the ethylene-binding site in the cell and,when applied at the right time, blocks the ethylene-binding sites and prevents the ethylene effects,such as the synthesis of degradative enzymes, increase in respiratory rate and the ethylene production. Recent studies indicate that 1-MCP may inhibit ethylene production with consequent delaying in ripening of fruits,such as avocado**.**

Pesis et al., (1997) treated Tommy Atkins and Keitt mango fruits by ethanol vapor before cold storage. Ethanol vapor reduced CI symptoms that developed at 5°C .

Golding et al.,1998),apple**(Fan,& Mattheis, 1999),**avocado**(Feng et al.,2000),**plum**(Valero et al.,2003)**and pear**(Trinchero, et al.,2004)** reported that ethylene production of control fruit increased rapidly and reached maximum values on day 4,being about 12-fold compared to 0 -day.hereafter,the ethylene production decreased quickly until day 8 .1-MCP treatment greatly inhibited fruit ethylene production during the first 8 days;the ethylene production peak was recorded on day 14,being about tenfold compared to day 0. The results demonstrated that 1-MCP treatment can delay the onset of ethylene climacteric.This delayed onset of ethylene climacteric by 1-MCP has also been reported for banana.

Abdi et al.,(1998),apricots**(Fan et al., 2000),** apple **(Pre-Aymard et al.,2003)**and banana**(Lohani et al.,2004)** found that The rate of CO_2

production exhibited a typical climacteric pattern of respiration of persimmon fruit during ripening at 20°C.The climacteric peak of control fruit was observed on day 4,being about fourfold compared to day 0.then the rate of CO_2 production began to decrease sharply.1-MCP not only delayed the onset of the respiratory climacteric but also effectively suppressed the respiratory production. The respiratory climacterics of 1-MCP-treated persimmon fruit was recorded on day 16,showing about 73.4% of control maximum , indicating 1-MCP could suppress the respiration of persimmon fruit.This suppression in respiration by 1-MCP has been reported for other fruits including plum.

Watkins et al.,2000),banana**(Pelayo et al., 2003),** Kiwifruit**(Boquete et al.,2004)**and plums **(Menniti et al.,2004)** reported that firmness of fruit is one of the most common physical parameters used to assess the progress of ripening.The effect of 1-MCP tretment on the firmness of persimmon fruit was evaluated during ripening.As shown in control fruit softened rapidly during ripening at 20°C.The decline in firmness observed was about fourfold within 8 days.Fruit softening was greatly inhibited by 1-MCP treatment in the first 10 days,then the fruit began to soften sharply,and reached almost the same firmness as the control fruit in 22 days. This clearly suggests that 1-MCP inhibts softening of persimmon fruit.A similar result was also reported in other fruits including apple.

Gonzalez et al., (2003) exposed Tommy Atkins mangos and papaya fruits to methyl jasmonate (MJ) vapours (10^{-4} M) for 24h at 25°C reduced chilling injury during subsequent storage for 21 days at 25°C and after 5 days of shelf life 20°C.The chilling tolerance induced by MJ was positively correlated with the reduction in the percentage ion leakage of mango and papaya tissues. The overall quality of MJ treated fruits was also better than that of control fruits. MJ treatment increased the total

soluble solids but did not affect titratable acidity or pH. MJ also did not change the normal climacteric rise respiration, water loss and softening rates. MJ treatment may prevent chilling injury symptoms of mango without altering the ripening process.

Shinji et al.,(2003). Investigated the potential for commercial use of 1-methylcyclopropen(1-MCP) to extend the shelf-life of 'Tonewase ' and 'Saijo' fruit,Japanese astringent persimmon cultivars, in combination with a de-astringency treatment using high CO_2 concentration.the non-1-MCP treated fruit softened within 5 days after harvest,resulting in unacceptable quality.the 1-MCP treatments at more than 100nll $-^1$ for 16-48h inhibited fruit softening for 12-16 days after harvest at room temperature, for' Tonewase'and'Saijo'respectively.treatment with 10 nll $-^1$ 1-MCP had a limited inhibitory effect on softening. A time lag of up to 12h from harvest to the beginning of 1-MCP treatment did not reduce the beneficial effects of 1-MCP. Fruit treated with 1-MCP renained insensitive to ethylene for 4 days after the end of the treatment.These results indicate that 1-MCP has the potential to extend the shelf-life of Japanese persimmons.

Eliane Bassetto et al.,(2005) Found that 'Pedro Sato'guava fruit were treted with 0,100,300 or 900nll $-^1$of 1-methylcyclloprope ne(1-MCP)for 3,6,or 12h and stored at 25°C.Skin color,pulp color, weightloss, firmness,titrableacidity,ascorbc acid,soluble solids, decay incidence and respiration rate were evaluated. All the treated fruit could be stored for up to 9 days while the non-treated fruit could be stored for only 5 days.The 100 and 300 nll^{-1} 1-MCP concentration were inefficient for the 3h of exposure time,however storage was improved with treatments by6 or 12h. 1-MCP at 300 nll^{-1} for 6 or 12h and at 900 nll^{-1} for 3h showed the best results.Fruit treated with 900 nll^{-1} of 1-MCP for 6 or 12h did not ripen.

Zisheng Luo(2005). Stored postharvest persimmon fruit (Diospyros Kaki L.cv.Qiandaowuhe) at 20°C after being exposed to 3μll–¹ 1 methylcyclopropene (1-MCP)for 6h or not (control). Several parameters (firmness, respiration and ethylene production, pectic substances and cell wall hydrolysis enzymes activites) were examined to determine the efficacy of 1-MCP treatment in delaying persimmon fruit ripening. Results showed That'Qiandaowuhe'persimmon fruit displyed a typical climacteric pattern of respiration and ethylene production.Peak CO_2 production and etylene production was observed on the fourth day.Fruit softening was accompained by a progressive increase in water-soluble pectic substances (WSP)and a progressive decrease in cheator-soluble pectic substances (CSP) and alkali- soluble pectic substances (ASP).The activities of pectin methyl esterase (PME)and polygalacturonase (PG)stared increasing sharply and reached a maximal value on days 4 and 6, respectively, and then decreased slowly. 1-MCP tretment delayed the onset of climacteric ethylene production and respiration in persimmon fruit,and also significantly retarded the activities of PME and PG during ripening at 20°C.Consistent with the activity trends of cell wall hydrolysis,1-MCP treatment also delayed the depolymerization of CSP and ASP and reduced the increase of WSP compared with the control fruit.Thus,application of 1-MCP can greatly extend the postharvest life of'Qiandaowuhe'persimmon fruit.

The recent availability of the inhibitor of ethylene perception,1- methylcyclopropene (1-MCP),has resulted in an explosion of research on its effects on fruits and vegetables, both and a tool to futher investigate the role of ethylene in ripening and senescence,and as a commercial tecnology to improve maintenance of product quality. The commercialization of 1-MCP was followed by rapid adoption by many apple industries around the world,and strengths and weaknesses of the new tecnology have been

identified.However,use of 1-MCP remains limited for other products,and therefore it is still necessary to speculate on its commercial potential for most fruit and vegetables.In this review, **Chris (2006).** the effects of 1-MCP on fruit and vegetables are conidered from two aspects,First,a selected number of fruit (apple, avocado, banana, pear, peaches and nectarines, plums and tomato)are used to illustrate the range of responses to 1- MCP , and indicate possible benefits and limitations for commercialization of 1-MCP-based technology.Second,an outline of general physiological and biochemical responses of fruits and vegetables to the chemical is provided to illustrate the potential of use of 1-MCP to better understand the role of ethylene in ripening and senescence processes.

The effects of 1-methylcyclopropene (1-MCP) as an ethylene inhibitor , on endogenous ethylene production and chlorophyll degradation in the West Indian lime(Citrus aurantifolia, Swingle cv.'Paan') were examined under ambient conditions (24-31°C and 73-81% RH) **Tin Ohnmar Win et al.,(2006).** Fruit treated with 250 or500 nll^{-1} 1-MCP effectively retarded yellowing for 21 days at ambient storage.Application of 1000 nll^{-1} 1-MCP accelerated yellowing within 9 days,while 750 nll^{-1} 1-MCP treated fruit completely turned yellow at 15 days.Chlorophyllase and chlorophyll degrading peroxidase activities in flavedo tissue of lime peel were delayed in 1-MCP treated fruit at concentrations of 250 and 500 nll^{-1}.Ethylene production rate of 1000 nll^{-1} 1-MCP treated fruit was 1.6 times higher than that of untreated fruit. Nevertheless,1-MCP at low concentrations(250 or 500 nll^{-1}) effectively suppressed endogenous ethylene production. Ascorbic acid content was reduced in fruit treated with 1000 nll^{-1} 1-MCP but not in fruit treated with 250,500 or 750 nll^{-1}.Before commercial of limes with 1-MCP becomes possible,the appropriate concentration and treatment temperature, fruit maturity stage and storage temperature must be determined.

4-The effect of fungicide on guava, persimmon and some other fruits:-

Kaplan and Dave (1981)reported that imazalil had proved to be effective in controlling sporulation and decay occurred by Picillium digitatum and P.italicum of citrus.

Al-Faro et al.,(1986)treated Valencia oranges with TBZ at 680 ppm+sopp,"2-phenyl phenol"at 960 ppm stored undipped individual polyethylene wraps , after 3 monthes storage at 21 - 33° C . Fruit quality
(firmness, texture and organoleptic properties) was best in undipped fruits wrapped in polyetylene.

Penrose et al.,(1989)studied the effect of temperature of fruit or dissolution and time period and time in fungicidal dip on the efficacy of fungicides iprodoine (Rovral)or imazadil, for control of blue mould of apple fruits.Iprodione was more effective on warm fruit (19°C) than cold one (6°C). Whilst the reverse was true of imazalil. Extended periods of immersion in the fingicides slightly reduced the incidence of rotting but not any useful degree.

Wild(1990b)reported that dipping fruits for 2min in hot solution(53°C with Valencia and 50°C with Washington navel and Marsh graperuit)at 1000 ppm TBZ before cold storage at 1°C or in hot soluation of 500 ppm benomyl reduced the chilling injury and storage decay.In another study**(1990a).**he observed the same results and added that dipping in cold solution had little or no effect.

Babu et al.,(1990) evaluated fungicides treatments for extending the storage life of castrated apples *(Annone suqumosa)*.fruits dipped in 500ppm Bavistin(carbendazim)and placed in polyethylene bags containing

KMNO4 had a storage life of 9 days, compared with 5 days for untreated fruits.

Sharma (1990)reported that hot water treatment combined with 200ppm carbendazim at 50°C for 4 min was an effective substitute for cold water dips containing 1000ppm of fungicide for the control of brown
rot of apples.Also **Bryk (1991)**studied the effect of dipping apple in solutions of 900ppm fungicide before cold storage on reducing fruit rotting caused by deferent fungus. Rotting by Botrylis cinerea was best limited by Procymidone (100%)and flusifazole (61.2%).Both fungicides gave 100% control of *Monilinaia fructigene*. They were also the best against *Penicillin expanse* but control was only 41.6% and 41.6% and 43.6% respectively.

Martinez et al.,(1991) treated Valencia orange fruits by dipping in IMZ solution(800 ppm)then coated with various wax formulations. After 15 days storage at 20°C,70 RH the weight loss was lower in coated fruits(3.1- 4.5%)than in uncoated control fruits(6.3%).

McDonald et al.,(1991) applied 1000 ppm TBZ or IMZ at 24 or 53°C to grapefruit to reduce fruit suceptibility to chilling injury and decay.They noticed that fruits dipped in fungicides had less chilling injury than fruits dipped in water alone. They added that IMZ was more effective in reducing cilling injury than TBZ.Fungicides reduced decay principally stem-end rot and *(Penicillium)* at both temperatures.

Wild(1993)reported that the fungicide TBZ at 1000mg/L applied as a cold dip(14°C)reduced the susceptibility of fruits to chilling injury by 28% over an 8 weeks storage period. The susceptibility of Washington navel oranges to chilling injury was reduced by 65% after dipping in hot TBZ

(50°C)for 2 min.Wax application and pre-storage curing for 1 week at 20°C also reduced chilling injury damage in oranges.

Schirra and Mulas (1993) indicated that acidity, T.S.S and other maturity indices of grapefruit were not significantly affacted by TBZ and IMZ fungicides.

Mansek and Vasilakakis(1993) studied the effect of postharvest treatments with dipheylamine (DPA), ascorbic acid on superficial scald and quality of Imperial Double Red Delicious (IDRD) and Granny Smith apples.Fruits treated with 2000ppm DPA and held for 6 months developed a low percentage of scald 7.91% compared with 32.84% in control fruits after exposure to 20°C for one day, while fruit treated with 4000ppm DPA has only 26,5% scald.

Sholberg et al.,(1995) demonstrated the effect of 1.5 µg ml.fungicides on low-Temperature Basidimycete (LTP) rot of apples. Flusilazale. And Tridimeton were the most effective fungicides, reducing growth by 98.2 and 71.5%, respectively, when used at 1 µg/ ml. Macozeb was effective at higher concentration reducing growth by 96.9% (when used at 100 µ/m/).

John et al.,(1995) dipped Granny smith apple fruits in water (control), 2500ppm dipheylamine or 1% Semperfresh (a sucrose- ester coating) along or before storage. Apples were removed from storage after 4 or 6 months and shelf- life at normal room temperatures assessed over 10 days.Noscald developed during shelf- life in apples stored for 2 months but 10% of control fruits were affected after 1 month and > 25% after 6 months. None of the Semperfresh treatments were effective in protecting against scald in apple fruits stored for 6 months unlike dipheylamine which reduced incidence to< 10% Semperfresh Ascorbyl Palmitate could replace dipheylamine for short storage periods.

Brown and Chambers (1996) found that the natural incidence of green mold was usually not controlled as effectively as with labeled rate of the commercially used fungicides; thiabendazole and imazalil on Florida citrus.

Sharma et al.,(1997)studied the development of storage scab in Golden Delicious and Red Delicious apple fruits. The fruits were dipped in fungicidal suspension for 5 minutes. Test fungicides were Bilertanal (0.075%), Captan(0.2%)and Carbendazim **(**0.05%). Observation was recorded on the incidence of scab and fruit and fruit rotting after 45-60 and 90 days. Postharvest fungicidal dip treatment of apple fruits significantly reduced the incidence of scab in storage. Bitertonal (0.075%)gave complete control of this disease up to 90 days and was followed by Carbendazim dip treatment.

Author et al.,(1998) studied the effect of fungicides Thiabendazole(TBZ)or Imazalil (IMZ) applied at 1000 and 3000 ppm a,i at 25,40 and 50°F on lime fruits (Citrus aurantifolia)to reduce cilling injury (CI), decay and electrolyte leakage during cold storage at 3°C for 6 weeks. They found that fruits dipped in IMZ at 3000 ppm a,i at 25°F for 5 min and TBZ at 1000 ppm a,i at25°F for 2 min showed the lowest chilling injury.There was a positive correlation between CL and water loss.Fruits showed the lowest chilling injury also had the lowest weight loss during 6 weeks of storage at 3°C.

Canji- Mogadam and Rahemi(1998) found that dipped fruits lime in IMZ at 3000 ppm at 25°C for 5 min and TBZ at 1000 ppm at25°C for 2 min showed the lowest chilling injury.There was a positive correlation between CL and water loss.Fruits that showed the lowest chilling injury also had the lowest weight loss during 6 weeks of storage at 3°C.

Dov et al.,(2001)found that black-spot symptoms, caused by Alternaria alternata,develop in‘Triumph’ persimmon fruit during prolonged storage at-1°C. Preharvest dip treatment in the organic chlorine compound Troclosene sodium extended the storage life of the fruit by delaying development of black-spot disease(BSD). Troclosene sodium was more stable and efficient for the control of A. alternata than calcium hypochlorit.At 500µg ml–¹ Troclosene sodium significantly reduced the development of BSD in persimmon fruit sampled in 15 orchards in differnet growing regions of Israel.Following commercial dipping and storage at-1°C,the percentage of marketable fruit after 4 months of storage was 15-40% higher than in untreated fruit.Present results suggest that the BSD can be controlled by a simple dip treatment with chlorine disinfectant.

5-The effect of storage temperature on guava, persimmon and some other fruits:-

Lin and Wang (1982) Pointed out that storing of delayed harvested orange fruits at 5°C developed 61.9% decay occurred after 117 days compared with 20.8% in those harvested normally. Meanwhile,chilling injury,was observed when stored fruits subjected to <5°C. However, storing under 10°C and 15°C resulted in 2-1% and 1-3% decay, respectively after 128 days while the decay increased to 41.4% and 18.8% after 177 days.

Su et al.,(1988)stated that subjecting of orange fruits to 10- 15°C and 85- 95 % RH for 7-10 days before storage at 2- 4°C for 127 days led to reduction of brown blotches during cold storage from 62- 66% in the control to 5- 7% in pretreated fruits. Also, pre- treatment reduced the water content of the rind,improved rind quality and decreased sensitivity

to low temperature injury.This may be a result of endogenous ethylene production and respiration rates in storage were reduced by the pretreatment.

Hamauzu et al.,(1994) found that during storage of harvested tomato fruits at 30 or 35°C, ascorbic acid and α-tocopherol contents decreased, especially in the epidermis. They added that,high temperature influence changes of carotene contents in the surface tissues more than they do in the fleshy pericarp.

Reyes and Paull (1995) found that the storage of guava(Psidium guajava L.cv.Beaumont)at 15°C delayed deterioration of quarter-yellow and half-yellow fruit and allowed gradual ripening of mature-green fruit to full color in 11 days.Ripening was delayed most by the lowest temperture(10°C)for the mature-green fruit,and degreasingly less for the riper fruit and higher temperatures(20°C).

Changes in quality, total ascorbic acid and deydroascorbate in fresh cut ‘ Selva’ strawberries(Fragaria × ananassa Duch) held for 7 days and ‘Fuyu’ persimmons (Diospyros Kaki L.)held for 8 days at 5°C in air or controlled atmospheres were evaluated **(Kimberly and Adel 1997)**, various atmospheres had significantly different effects on the color, pH,and titratable acidity of the fruits.The two fruits responded differently to the wounding stress in regards to oxidation of ascorbic acid,but in both cases,the postcutting life based on visual quality ended before significant losses of total ascorbic acid occurred.Controlled atmospheres of 2% O2,air + 12% CO2,or 2% O2 + 12% CO2 had no significant effect on changes in total ascorbate content for either fruit.Washing of intact or sliced strawberries in 100 ppm sodium hypochlorite was found to induce significant oxidation of reduced ascorbic acid,but resulted in no changes in total ascorbic acid.

Liu et al.,(1998)said that Tankan fruits (citrus tankan Hayata)were stored under 4 or 5 temperatures for 2- 5 months. Tankan stored at 0°C and 5°C had chilling injuries. The fruits stored at 10, 12.5 and 15°C had similar decay and water loss rates,but some fruits stored at 10°C and 12.5°C developed off-flavours which seemed to be related to chilling injury. The fruits stored at 20°C had higher rates of decay and weight loss and poorer orange colour development on the rind when compared to similar fruits stored at 10- 15°C.The optimum storage temperature 15°C, Tankan can be stored for 4 months,and this may be extended to 5 months with some sacrifice in fruit quality.

Piga et al.,(2000)stated that orange fruits stored at 2°C appeared to be resistant to chilling injury and stored better than those held at 8°C,as the former treatment resulted in lower weight loss and better appearance during storage and SL periods.On the other hand,a more pronounced loss
of product due to rots was registered for 2°C stored fruits compared with 8°C stored fruits.the taste of fruits was always judged acceptable,with slight differences between the 2 treatments.

Victor et al.,(2000) indicated that Oroblanco fruits (citrus grandis L.x C.paradisi Macf)were stored for 2 weeks at 1°C (simulated low temperature quarantine treatment),followed by 12- 13 weeks at 11°C (simulated sea transportation to Japan)and additional week at 20°C (simulated retail shelf-life period).They detected that the lowest weight loss and the highest firmness were observed with individually seated fruit.

Cortez et al.,(2000) found that storing orange fruits in ambient conditions (21± 0.43°C and RH 60 ±1%)was preferred than in a cold room (1± 0.5°C and RH 85 ± 2.5%).After 15 days of torage a significant

difference was observed between treatments in the concentration of ascorbic acid (decrease at 20 and 8% in fruits stored at 21 and 1°C,respectively).

Tervel et al.,(2000)carried out experiments on oranges(cv. Baianinha) stored for 15 days under ambient condition (21°C,60% RH) or in cold storage (1°C,85% RH).They found that during storage, ascorbic acid decreased by 20% and 8%,titratable acidity decreased by 14% and 8% and the Brix : titratable acidity ratio increased by 30% and 18% under ambient conditions and in cold storage, respectively.

Seung and Adel (2000) stated that vitamin C, including ascorbic acid and dehydroascorbic acid, is one of the most important nutritional quality factors in many horticultural crops and has many biological activities in the human body. The content of vitamin C in fruits and vegetables can be influenced by various factors such as genotypic differences, preharvest
climatic conditions and cultural practices, maturity and harvesting methods, and postharvest handling procedures. The higher the intensity of light during the growing season, the greater is vitamin C content in plant tissues. Nitrogen fertilizers at high rates tend to decrease the vitamin C content in many fruits and vegetables. Vitamin C content of many crops can be increased with less frequent irrigation. Temperature management after harvest is the most important factor to maintain vitamin C of fruits and vegetables; losses are accelerated at higher temperatures and with longer storage durations. However, some chilling sensitive crops show more losses in vitamin C at lower temperatures. Conditions favorable to water loss after harvest result in a rapid loss of vitamin C especially in leafy vegetables. The retention of vitamin C is lowered by bruising, and other mechanical injuries, and by excessive trimming. Irradiation at low doses (1 kGy or lower) has no significant effects on vitamin C content of

fruits and vegetables. The loss of vitamin C after harvest can be reduced by storing fruits and vegetables in reduced O2 and/or up to 10% CO2 atmospheres; higher CO2 levels can accelerate vitamin C loss. Vitamin C of product is also subjected to degradation during processing and cooking. Electromagnetic energy seems to have advantages over conventional heating by reduction of process times, energy, and water usage. Blanching reduces the vitamin C content during processing, but limits further decreases during the frozen-storage of horticultural products.

Suntornsuk Leena et al.,(2002)reported that Vitamin c content in fresh and freeze-dried herbal juice, such as guava(Psidium guajava Linn.)emblic myrobolan (Phyllanthus embica Linn.),lemon(Citrus aurantifollia Swing), sweet pepper(Capsicum annuum Linn.), Garcinia schomburgkiana Pierre and passion(Passiflora laurifoia Linn.) was determined by direct titration with iodine.The method showed excellent linearity($r^2 > 0.99$)over the concentration renges tested(100-500%of the amount found in the juice samples), good precision (R.S.D.<1.5%) and recovery (>97%). The limit of detection and limit of quantitation were 2.2 and 7.3mg, respectively. The amount of vitamin C found were 80.1mg /100g for guava, 226.0mg /100g for emblic myrobolan, 52.8mg /100g for passion fruit, 10.5mg/100g for lemon and 4.6mg /100g for G.schomburgkiana. The stability of vitamin C during the first 4 weeks was remarkably improved after freeze-dried process. The percent reductions of vitamin C after freeze-dried process were 41.4 and 20.4% for guava and emblic myrobolan, respectively. After 8 weeks, the freeze-dried samples contained only traces amount of vitamin C tested by thin layer chromatography.

3-MATERIALS AND METHOD

The present work was carried out during the years 2005 and 2006 on “Montakhab El-Kanater” guava and "Hachiya" persimmon trees grown in sandy soil in a private orchord at Badr center, Behira Government. Guava and persimmon trees were 7- year old and planted at 4X4m apart (guava) and 4X6m apart (persimmon) and drip irrigated the trees were almost uniform in vigor and normal horticultural practices were done as recommended in this respect two different experiments were conducted**:**

I-Pre- harvest treatments

This part included flower thinning and maturity stages determination.

1-Flower thinning

At full bloom stage for guavas and persimmons, 6 treatments were designed with 3 replicates (each replicate was represented one tree) for each treatment.

A- Unthinned trees

B- Hand thinned trees by removing the flowers at 5cm space between the flowers.

C- Spraying urea at 2%

D- Spraying urea at 4%

E- Spraying ethrel (2-chloroethylphosphonic acid) at 100ppm

F- Spraying ethrel (2-chloroethylphosphonic acid) at 200ppm

Complete randomized block design(6 treatments X 3 replicates =18 trees for each guavas and persimmons)were used.

Measurements:yield attributes inculuding:-Fruit set%, Fruit abscission %, Total yield Kg/ tree, Average fruit weight(g),Average fruit length (cm), Average fruit diameter (cm). However, fruit quality including:- Maturity time, Fruit firmness Ib/inch^2, T.S.S%, Acidity%, L-ascorbic acid mg/100g

fresh fruit weight for guava fruits,Tannins mg/100g fruit weight for persimmon fruits,Total sugars% were determined according to **(A.O.A.C.,1990).**

2-Maturity stage effect

The fruits of both guavas and persimmons were picked at 3 stages :-

1- stage I (early mature) : 120 days for after full bloom for guava and 150 days after full bloom for persimmon.

2- stage Π (optimum mature) : 130 days for after full bloom for guava and 180 days after full bloom for persimmon.

3- stage ΙΙΙ (late mature) : 140 days for after full bloom for guava and 210 days after full bloom for persimmon.

The fruits of each stage were characterized by mature green for guavas and yellowish color for persimmons.

A complete randomized block design (3 treatments X 3 replicates = 9 trees for each guavas and persimmons were followed.

Measurements: Average yield Kg/tree , Average Fruit weight(g) , Shelf life in days , Fruit firmness Ib/inch2 , T.S.S % , Acidity % , L-ascorbic acid mg/100g fresh fruit weight for guava fruits , Tannins mg/100g fresh fruit weight for persimmon fruits , Total sugars % were determined **(A.O.A.C.,1990).**

ΙΙ-Post-harvest treatments

The fruit were picked at maturity stage, mature green for guava and yellowish color for persimmon **(Edmundo Mercado-Silva et al.,1998).** The guava and persimmon fruits were immediately transported to the laboratory of Horticulture Dept. Faculty of Agric., Ain shams University. Maturity stage started at 2 **,** 8 August for guava fruits and at 19 **,** 26 November for persimmon fruits of the two years (2005 and 2006 respectively) .

The fruits were cleaned and divided into twelve groups; each group was 18 Kg of fresh and healthy fruits (12 treatments X 3 replicates X 2 boxes X 3 Kg for each box = 216 Kg for each.

Twelve different experiments were carried out as follows:-

1 - treatment 1: control (untreated).
2 - treatment 2: irradiation at 0.2 K.Gy for guava,1.5K.Gy for persimmon without pre-colling.
3 - treatment 3: irradiation at 0.4 K.Gy for guava,2.5K.Gy for persimmon without pre-colling.
4 - treatment 4: irradiation at 0.8 K.Gy for guava,3.5K.Gy for persimmon without pre-colling.
5 - treatment 5: irradiation at 0.2 K.Gy for guava,1.5K.Gy for persimmon after colling for 6 h.
6 - treatment 6: irradiation at 0.4 K.Gy for guava,2.5K.Gy for persimmon after colling for 6 h.
7 - treatment 7: irradiation at 0.8 K.Gy for guava,1.5K.Gy for persimmon after colling for 6 h
8 - treatment 8: dip fruits in hot- water at 45˚C for 5 min.
9 - treatment 9: dip fruits in 0.5gm/L. fungicide (Smisclex) for 5 min.
10 - treatment 10: dip fruits in 1.0gm/L. fungicide(Smisclex) for 5 min.
11 - treatment 11: Ethanol vapor(CH 3 CH 2 OH) 25 % for 3h.
12 - treatment 12: Ethanol vapor(CH 3 CH 2 OH) 50 % for 3h.

Each replicate was consisted of two boxes, one box for studying physical properties and the other for determining chemical constituents.

1- Control treatments

The fruits(guava and persimmon) were kept in carton boxes in each boxe without any treatment, and stored at the same conditions as previously mentioned

2- Irradiation treatments

The guava and persimmon fruits which aupposed to be irradiated treatments were divided two groups .The first group was kept for 6 hr. in cold storage after harvest and irradiation process while the second group received irradiation directly after harvest .Irradiation treatments for both groups were carried out at room temperature using Co-60 source at the National Center for Radiation Research and Technology (NCRRT), Nasr City, Cairo, Egypt. The irradiation facility used was an Egypt's Mega Gamma- 1, of the type J-6500 supplied by the Atomic Energy of Canada Limited. The applied doses were 0.0, 0.2, 0.4, 0.8 K.Gy for guava and 1.5, 2.5 ,3.5 Killogrey K.Gy for persimmon.The dose rate delivered during the experimental duration was 1K.Gy/hr.,as monitored by radiochromic film **(McLaughlin et al., 1985).** After irradiation treatment the experimental materials(fruits) were transferred into a cold storage room adjusted at 8 ± 1˚C and 85- 90 % RH for guava fruits and 0 ± 2˚C and 90-95 % RH for persimmon fruits.

3- Hot-water treatments

Fruits were immersed in hot water path at 45˚C for 5 min, then they were immediately towel- dried , placed in carton boxes and stored at 8 ± 1˚C and 85- 90 % RH for guava fruits and 0 ± 2˚C and 90- 95 % RH for persimmon fruits. using the system designed by **Lay-Yee Michael et al., (1997).**

4- Fungicide treatments

Clean fruits(guava and persimmon) were dipped in water containing 25 or 50% Sumisclex fungicide (50% WP) for 5 min, then they immediately towel- dried , placed in carton boxes and stored at 8 ± 1˚C and 85- 90 % RH for guava fruits and 0 ± 2˚C and 90- 95 % RH for persimmon fruits, (**Hamouda,2000).**

5- Ethanol vapor treatments

Guava and persimmon fruits were treated with ethanol vapor using the system designed by **Atta- Aly et al.,(1999)** . Fruits of each replicate were placed inside 5 liter glass jar and the air flow was passed through another 1 liter glass jar containing 25 or 50% ethanol alcohol(CH_3 CH_2 OH) passing and enriching the fruits ambient with ethanol vapor. The out- come of air flows was connected to a rubber tube carrying it out of the jar. Fruits were treated with ethanol vapor for 3hr and stored under cold condition (8 ± 1˚C and 85- 90 % RH) for guava fruits and 0 ± 2˚C and 90- 95 % RH for persimmon fruits.

The following measurements were done:-

A- Fruit physical properities:

1- Discarded fruits%

Fruit showed any sign of decay or visual disorders during the cold storage time were counted and discarded every 4 days in guava and 7 days in persimmon , then the percentage of discarded fruits was calculated according to **Kabeel (1990)** as follow:-

$$\text{Decay \%} = \frac{\text{Decayed fruits Weight}}{\text{Total fruits sampleweight}} \times 100$$

Any treatment was terminated in case of having 50% discarded fruits.

2- Fruit weight loss(WL %)

Percentage of fruits weight loss was calculated at zero time of storage, then the initial weight of guava or persimmon fruits were recorded and fruit weight loss was calculated by weighing the same fruits at the cold storage durations and every 4 days for guava fruits and every 7 days for persimmon fruits (**Kabeel ,1990)** .

$$WL\ \% = \frac{\text{Fruit initial weight– fruit weight at each sampling date}}{\text{Fruit initial weight}} \times 100$$

3- Fruit firmness (Lb./inch²)

Flesh firmness was determined of any given sample by peeling the two opposite sides of the fruit away of the suture and the firmness of each side was determined by using a Magness-Taylor type pressure tester by a standard 5/16 of inch plunger,and the firmness was recorded in Lb./ inch².Fruit firmness was recorded before and after treatments and after cold storage as well as every 4 days for guava fruits and every 7 days for persimmon fruits.

4- Fruit shelf- life (in days)

A fruit sample from each replicate was taken out of storage room and left at room temperature (28 – 32 ˚C for guava , 20 – 22 ˚C for persimmon , when 50 % of fruits was scalded, the shelf- life was terminated and the number of days was calculated and considered as shelf- life.

B- Fruit chemical analysis

1- Total soluble solids (T.S.S. %)

20 grams of fruit tissues were homogenized in a blender. The homogenized tissues were filtered using whatman No. 1 filter paper.The clear juice was decanted and used for T.S.S. and titralable acidity analysis. Using hand refractometer, TSS % was measured using drops of the above extracted juice according to **(A.O.A.C.,1990).**

2- Titratable acidity (TA %)

Titratable acidity % was meas used by titrating 10 ml of the extracted juice against 0.1 N of NaOH using phenol phathalin indicator

according to the official methods of Analysis **(A.O.A.C.1980) .**Titratable acidity was expressed as percentage of citric acid (g citric acid / 100 ml juice).

3- L- Ascorbic acid (mg / 100 g fresh weight)in case of guava

Determination of the L- ascorbic acid content (V. C) was determined and expressed as mg / 100 g fresh weight. 10 g. of the fruit tisues were homogenized in 100 ml of 3 % oxalic acid, the extraction was filtered and 10 ml was titrated against 2,6- dichlo phenolendo phenol dye following the methods described by **A.O.A.C. 1980 .**

4- Assay of tannins content (mg / 100 g fresh weight) of kaki

Total tannies were determined by using colourmetric method **(A.O.A.C.1970)** at 760 wave length. The concentration was calculated from a standard curve of pyrogallol as mg per /100 g fruit weigth.

5- Total sugar content

Sugars were extracted from 10 g of well chopped and mixed flesh of each fruit sample.It was determined colourimetrically in an ethanolic extract using phenolsulfuric acid method as described by **Dubois et al., 1956** and the concentration was calculated from a standard curve of clucose as g /100g fresh weight.

6- Respiration rate (mg CO2/ Kg fruit/hr)

Carbon dioxide produced by guava or persimmon fruits was determined before treatments and after finished from treatments and then every 4 days from guava fruits during cold storage at 8 ± 1˚C and every 7 days from persimmon fruits during cold storage at 0 ± 2˚C until experiment termination. The air- flow was passed through concentrated NaOH, to insure that air- flow is CO2 free, before passing into 1- liter jar

fruit container (fruit ambient) one fruit / jar was concidered as one replicate . The out - coming air - flow was then passed into 100 ml NaOH
of 0.1 N for 1hr . such solution was then titrated against 0.1 NHCl
(A.O.A.C., 1970) and CO2 levels produced by the fruits were then calculated as mg CO2 / Kg fruits / hr.

Experimental design and statistical analysis

All treatment in this study were arranged in complete randomized block deign. The obtained data were subjected to analysis of variance
using the general linear module procedure of **SAS (1985)**, where appropriate treatment means were separated using Duncan's multiple range test**(Duncan's 1955)** and all percentages were transferred to angles before statistical analysis.

4-RESULTS AND DISCUSSION

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I-Pre-harvest treatments

Data presented in tables(1-6)show the effect of flower thinning and fruit maturity stage on yield and quality of "Montakhab El-Kanater" guavas and "Hachiya" persimmon during 2005 and 2006 seasons.

A-Flower thinning

1-On Montakhab El-Kanater guavas

As it shown in tables(1&2),yield attributes and fruit quality was greatly affected by hand or chemical flower thinning during 2005 and 2006 seasons.

1-1-Yield attributes

Fruit set% increased with all treatments (hand or chemical flower thinning) compared to control . However,thinning with 4% urea was superior than other treatments but with non significant differences with 2% urea or 100 & 200 ppm ethrel. Generally,it could be concluded that fruit set with Montakhab El-Kanater guavas greatly increased from 6.32% with control to 9.92-11.60% with chemically thinned flowers(data of fruit season).Regarding fruit abscission, it is clear that hand or chemical flower thinning reduced fruit abscission than control.The great effect on fruit abscission was obtained with 4% urea treatment which recorded the least fruit abscission%(12.10 & 11.77% for first and second season, respectively).However,hand thinning came next after control where slightly reduced fruit abscission.

Total yield data of"Montakhab El-Kanater" guavas showed that all flower thinning treatments increased total yield per tree than control.The high total yield(56.4 & 58.6 Kg/tree)was obtained With 4% urea treated

Table (1) : Effect of hand or chemical flower thinning on yield attributes of "Montakhab El-Kanater guavas, during 2005 and 2006 seasons.

Thinning method	Fruit set%	Fruit Abscission%	Total yield Kg/tree	Av. Fruit weight(g)	Av.Fruit length(cm)	Av.Fruit diameter(cm)
	2005 season					
Control	6.32 B	17.46 A	38.70 D	141.6 C	7.4 C	3.8 D
Hand thinning	6.78 B	15.52 AB	44.6 C	165.4 B	8.8 BC	4.6 C
Urea 2%	9.92 A	13.08 BC	49.0 B	161.0 BC	9.2 B	5.0 BC
Urea 4%	11.60 A	12.10 C	56.4 A	186.6 A	10.6 A	5.6 A
Ethrel 100 ppm	10.12 A	13.44 BC	47.3 BC	168.4 BC	9.0 B	4.8 BC
Ethrel 200 ppm	10.84 A	14.10 BC	50.6 B	166.7 AB	9.4 B	5.2 AB
	2006 season					
Control	6.17 A	16.92 A	39.40 C	132.4 C	8.00 C	4.1 C
Hand thinning	7.13 A	14.84 AB	46.20 B	170.5 AB	8.7 BC	4.7 B
Urea 2%	10.26 A	12.81 BC	50.11 B	164.3 B	9.5 AB	5.3 A
Urea 4%	11.43 A	11.77 C	58.6 A	181.1 A	10.5 A	5.7 A
Ethrel 100 ppm	10.00 A	12.13 BC	49.1 B	160.5 B	8.7 BC	5.3 A
Ethrel 200 ppm	16.00 A	14.00 ABC	49.7 B	160.0 B	9.1 B	5.4 A

Values followed by the same letter (s) are not significantly different at 5% level.

trees for both studied seasons.Additionally,ethrel 200 ppm treatment was also effective in inprovment tree yield of"Montakhab El-Kanater" trees.It is clear that,hand or chemical flower thinning increased tree yield from 38.70 Kg/tree for untreated trees to 44.6-56.4 Kg/tree for different thinning treatments(data of first season).These findings could be attributed to that flower thinning either handly or chemically improved fruit set and consequently improved tree yield.

As it obtained in total yield,average fruit weight greatly tended similarly with total yield. The higher fruit weights(186.6 & 181.1g)were obtained with 4% urea flower thinning treatments for the studied seasons.Generally,it could be concluded that hand or chemical flower thinning of "Montakhab El-Kanater" guavas was effective in increasing average fruit weight than control.Urea at 4% was more favourable treatments than 2% or ethrel with 100 or 200ppm.

Fruit length and diameter(fruit dimension)clearly affected with thinning treatments than with control. Fruit length increased from 4.7-8.00cm in unthinned trees to 8.7-10.6cm for different thinning treatments. However,fruit diameter improved from 3.8-4.1cm for unthinned trees to 4.6-5.7cm for thinning treatments.The great effect on both fruit length and diameter was obtained with 4% urea which considerd as a good thinners materials for "Montakhab El-Kanater" guavas.

1-2-Fruit quality

Maturation in "Montakhab El-Kanater" guavas was advanced with hand or chemical flower thinning by about 2-15 days than unthinned trees.However, urea 2 & 4% treatments were superior than other treatments in first season in advanced fruit maturation than control. Whereas,urea and ethrel treatments were similar in their effects during second season.Hand thinning slightly affected fruit maturation by about 2-4 days only than control.

Table (2) : Effect of hand or chemical flower thinning on fruit quality of "Montakhab El-Kanater" guavas,during 2005 and 2006 seasons.

Thinning method	Maturaty Time	Fruit firmness lb./inch2	T.S.S %	Acidity %	L-ascorbic Acid mg/100g.f.w	Total sugars %
	2005 season					
Control	15/8/2005	8.60 B	9.20 BC	0.43 A	92.6 A	6.40 B
Hand thinning	11/8/2005	8.64 B	9.00 C	0.43 A	89.4 A	6.30 B
Urea 2%	2/8/2005	8.96 AB	9.60 AB	0.41 A	83.5 BC	6.60 AB
Urea 4%	2/8/2005	9.20 A	9.00 C	0.41 A	88.6 AB	6.40 B
Ethrel 100 ppm	1/8/2005	9.06 AB	9.40 ABC	0.40 A	79.6 C	6.80 AB
Ethrel 200 ppm	1/8/2005	8.84 AB	9.80 A	0.40 A	79.0 C	7.10 A
2006 season						
Control	23/8/2006	8.80 BC	9.4 AB	0.45 A	91.7 A	7.30 BC
Hand thinning	21/8/2006	8.84 BC	9.00 B	0.44 AB	90.5 A	7.08 C
Urea 2%	10/8/2006	9.20 AB	9.80 A	0.43 AB	87.2 A	8.00 A
Urea 4%	10/8/2006	9.60 A	9.40 AB	0.41 B	81.6 B	7.2BC
Ethrel 100 ppm	10/8/2006	8.80 BC	9.40 AB	0.41 B	76.5 B	7.2 BC
Ethrel 200 ppm	10/8/2006	8.60 C	9.8 A	0.41 B	77.2 B	7.6 AB

Values followed by the same letter (s) are not significantly different at 5% level.

Fruit firmness data exhibited a slight effect to different treatments where control fruits recorded 8.60-8.80 ib/inch^2 against 8.60-9.20 ib/inch^2 for different treatments during the studied seasons.Moreover,urea 4% treated produced fruit guava fruits than other treatments for both studied seasons.

Regarding fruit chemical components,total soluble solids and total acidity slighty affected with different flower thinning treatments.Total soluble solids ranged from 9.2-9.4% for unthinned fruits compared to 9.0 - 9.8 % for different treatments with slight significant differences.

However, fruit acidity ranged from 0.40-0.45% either in thinned or unthinned fruits.L-ascorbic acid greatly decreased with hand or chemical flower thinning than control.L-ascorbic acid decreased from 92.6-92.7 for control to 76.5-90.5 for different flower thinning treatments.The decrease of L-ascorbic acid with hand or chemical flower thinning could be attributed to the increase of fruit weight and consequently decrease chemical components as L-ascorbic acid.The significant effect of hand or chemical flower thinning on total sugars% of guava fruits was only noticed with 200ppm ethrel(first season)and urea 2% (second season).The differences between different treatments were negligable in most cases.

2-On Hachiya persimmons

As it shown in tables(3&4),yield attributes and fruit quality greatly affected with hand or chemical flower thinning during 2005 and 2006 seasons.

2-1-Yield attributes

Frist attribute for yield is fruit set% which considered the main target in improving tree yield.Data tabulated in table(3)show that all flower thinning treatment increased fruit set in"Hachiya" persimmons than control.However,urea 4% and ethrel 200ppm treatments recorded the

higher fruit set% (3.63 & 3.44% respectively in first season).Hand thinning was also effective in encreasing fruit set% which considered more safty than chemical thinners but labor expensive.Fruit abscission clearly decreased with hand or chemical flower thinning and this could be explained that hand or chemical flower thinning eliminate from weak flowers and quit the fit flowers which produced a good remained fruits. Generally,fruit abscission in "Hachiya" persimmons in unthinned trees reached to 22.8-23.1% against 16.2-20.4% for different treatments.

The least fruit abscission%(16.2 & 17.4%)were recorded by 4% urea for both season.

Total yield data showed that tree yield(Kg/tree) greatly increased with hand or chemical flower thinning.However,chemical flower thinning was more effective than hand thinning in increasing total yield.Tree yield increased from 31.7-33.5Kg/tree for unthinned trees to 35.7-46.2Kg/tree for hand or chemical flower thinning treatments.Urea 4% treatment recorded the high tree yield (45.6 & 46.2Kg/tree)in both studied season. Average fruit weight significantly increased with some chemical flower thinning treatments i.e urea 4% and ethrel 200ppm.Average fruit weight increased from 124.1-125.7g in unthinned trees to 130.4-146.6g in thinned trees. The increase in average fruit weight as a result of flower thinning mainly attributed to the increase in net photosynthesis assimilations.

Fruit dimensions(length & diameter)showed a clear increase as a result of flower thinning compared to control.No significant differences were detected between different chemically flower thinning treatments compared with hand thinning in average fruit length.Moreover,no significant differences were obtained between hand thinning or control.However,average fruit diameter greatly affected with hand or chemical flower thinning than fruit length.The great effect on fruit diameter was obtained with 4% urea during the two studied seasons.The increase in fruit dimensions(length & diameter)greatly correlated with the increase in fruit weight as shown in table(3).

Table (3) : Effect of hand or chemical flower thinning on yield attributes of "Hachiya" persimmons, during 2005 and 2006 seasons.

Thinning method	Fruit set%	Fruit Abscission%	Total yield Kg/tree	Av. Fruit weight(g)	Av.Fruit length(cm)	Av.Fruit diameter(cm)
	2005 season					
Control	2.43 D	22.8 A	31.7 D	124.1 C	5.7 B	7.1 D
Hand thinning	3.16 BC	19.4 B	36.3 C	130.0 C	5.7 B	7.4 CD
Urea 2%	3.11 BC	18.5 BC	42.0 B	130.6 C	6.2 A	7.9 B
Urea 4%	3.63 A	16.2 D	45.6 A	146.6 A	6.3 A	8.4 A
Ethrel 100 ppm	2.96 C	18.1 BC	41.5 B	132.6 BC	6.3 A	7.6 BC
Ethrel 200 ppm	3.44 AB	17.6 CD	43.2 AB	141.5 AB	6.2 A	7.9 B
	2006 season					
Control	2.64C	23.1 A	33.5 C	125.7 B	5.5 B	7.3 D
Hand thinning	3.20 B	20.4 B	35.7 C	136.7 AB	5.7 B	7.5 CD
Urea 2%	3.20 B	19.6 BC	44.6 AB	133.4 B	6.3 A	8.2 B
Urea 4%	3.77 A	17.4 D	46.2 A	148.2 A	6.6 A	8.7 A
Ethrel 100 ppm	3.00BC	19.0 BC	43.7 B	130.4 B	6.4 A	7.7 C
Ethrel 200 ppm	3.66 A	18.2 C	43.0 B	145.6 A	6.6 A	8.2 B

Values followed by the same letter (s) are not significantly different at 5% level.

2-2-Fruit quality

Maturity stage of"Hachiya" persimmons greatly affected with hand or chemical flower thinning, where all treatments advanced fruit maturity by about 15-20 days than control.However,urea at 2 or4% was more effective than ethrel in advanced fruit maturity.Generally,it could be noticed that fruit maturity greatly affected with environmental conditions from year to another.

Fruit firmness of"Hachiya" persimmons greatly affected with hand or chemical flower thinning treatments. However,urea and ethrel as chemical flower thinning agents produced firm fruits than hand thinning. The great effect on fruit firmness was obtained with 4% urea which recorded 9.61 and 9.76 ib/inch^2 for both studied seasons. Total soluble solids and total sugars were increased with hand or chemical flower thinning with slight differences between different treatments.On contrary,total acidity and total tannins contents were decreased with all thinning treatments,this finding were correlated with maturation advanes.

B-Maturity stage

1-On Montakhab El-Kanater guavas

As it shown in table(5) picking guava fruits after different days of full bloom greatly affected fruit yield and quality during 2005 and 2006 seasons.

Average fruit yield(Kg/tree)was high with picking fruits after 130 days of full bloom which considered the optimum time for maturation of "Montakhab El-Kanater"guavas.However,early picking of fruits(120 days A.F.B.)or late(140 days A.F.B.) significantly decreased tree yield.The optimum maturation stage either in guavas or other fruits is more important in producing good yield and quality. The reduction of yield with early maturation attributed to lack of carbohydrates accumulation and

Table (4) : Effect of hand or chemical flower thinning on fruit quality of "Hachiya" persimmons, during 2005 and 2006 seasons.

Thinning method	Maturaty Time	Fruit firmness lb./inch2	T.S.S %	Acidity %	Total tannins mg/100g.f.w	Total sugars%
	2005 season					
Control	1/12/2005	8.84 BC	15.78 D	0.197 A	28.6 A	12.11 C
Hand thinning	20/11/2005	8.57 C	16.10 CD	0.185 AB	26.3 BC	13.27 BC
Urea 2%	15/11/2005	9.16 AB	16.26 BC	0.180 AB	27.1 AB	13.44 ABC
Urea 4%	15/11/2005	9.61 A	16.80 A	0.173 B	25.0 CD	14.00 A
Ethrel 100 ppm	20/11/2005	9.25 AB	16.67 AB	0.178 AB	23.4 D	13.62 AB
Ethrel 200 ppm	20/11/2005	9.32 AB	16.32 ABC	0.186 AB	26.4 B	13.50 ABC
2006 season						
Control	10/12/2006	8.76 CD	16.32 BC	0.184 A	30.0 A	13.20 A
Hand thinning	28/11/2006	8.64 D	16.84 A	0.172 AB	27.1 BC	13.84 A
Urea 2%	25/11/2006	9.22 BC	17.10 A	0.160 B	26.4 BD	13.94 A
Urea 4%	25/11/2006	9.76 A	17.00 A	0.160 B	24.7 D	14.26 A
Ethrel 100 ppm	28/11/2006	9.45 AB	16.80 AB	0.172 AB	28.3 AB	14.10 A
Ethrel 200 ppm	28/11/2006	9.44 AB	16.20 C	0.169 AB	25.5 CD	14.10 A

Values followed by the same letter (s) are not significantly different at 5% level.

Table (5) : Effect of maturity stage on yield and fruit quality of "Montakhab El-Kanater" guavas,during 2005 and2006 seasons.

Fruit characters / Maturity stage (Days A.F.B)	Av.Yied Kg/tree	Av. fruit Weight(g)	Shelf life in days	Fruit Firmness Ib./inch2	T.S.S %	Acidity %	L-ascorbic Acid mg/100g fruit	Total sugars %
2005 Season								
120 days A.F.B	38.15AB	168.4B	12.6B	8.700A	9.6A	0.42A	97.3A	7.2A
130 Days A.F.B	40.2A	181.4A	15.4A	8.00B	9.6A	0.40A	77.1B	7.4A
140 days A.F.B	37.11B	150.8C	9.7C	7.80B	9.9A	0.40A	72.5B	8.1A
2006 Season								
120 days A.F.B	33.12C	177.3B	13.0B	8.4A	9.2B	0.43A	87.7A	7.6A
130 days A.F.B	39.73A	184.1A	16.3A	8.4A	9.7AB	0.40B	81.2AB	7.6A
140 days A.F.B	35.12B	176.7B	11.4B	7.6B	10.2A	0.41AB	75.3B	8.5A

A.F.B = After Full Bloom
Values followed by the same letter (s) are not significant different at 5% level

water supply to the fruits.On the other hand,the reduction of yield with late maturation attributed to the increase in fruit respiration and consequently consumption of carbohydrates and other nutritve materials.

Average fruit weight showed similar trend where the higher fruit weight of"Montakhab El-Kanater"guavas was obtained with the fruits picked after 130 days A.F.B.Significant differences were obtained between the three time of maturation in first season.Shelf life of fruits was greatly affected by fruit maturity where early harvest(120 days A.F.B.)produced fruits with less shelf life.Late harvest(140 days A.F.B.)greatly decreased fruit shelf-life as the fruits become more ripe with increased respiration rate than optimum harvested fruits.

Fruit firmness was decreased with delaying of fruit harvest due to advanced fruit maturity, the storage components conversion from bound forms to free forms espicially pectic substances which are responsible for fruit firmness.The same trend of results was also found in the second saeson.

Regarding chemical charactersits,a slight change in T.S.S,acidity and total sugars was obtained during different harvest times.On the other hand,L-ascorbic acid greatly decreased with delaying of fruit harvest,where the higher values were obtained with early fruit harvest.

2-On Hachiya persimmons

As previously stated with regard to guava fruits, maturity stage greatly affected yield and quality of"Hachiya" persimmons during 2005 and 2006 seasons.

Optimum harvest of"Hachiya fruits"(180 days) after full bloom produced higher yield,fruit weight and long shelf life.On the contrary, harvest of fruits after 180 days A.F.B. produced less firm fruits and Total soluble solids contents.Tannins and acidity was decreased with advanced fruit maturation,on contrary,total sugars was increased with progress in fruit maturation.

The obtained data are in harmony with those of **Ingels , et al.,2001,**who mentioned that thinning immature fruits at the appropriate time allows each remaining fruit to develop to its maximum size, with little reduction of tree vigor. Less-crowded fruit receive more sunlight, so fruit color and flavor may be improved. Fruit thinning, also reduces alternate bearing.

Additionally, **Morton, 1987.** reported that guava fruit matures 90 to 150 days after flowering. Generally, there are 2 crops per year in southern Puerto Rico; the heaviest, with small fruits, in late summer and early fall; another, with larger fruits, in late winter and early spring. In northern India, the main crop ripens in mid-winter and the fruits are of the best quality. A second crop is home in the rainy season but the fruits are less abundant and watery. Growers usually withhold irrigation after December or January or root-prune the trees in order to avoid a second crop. The trees will shed many leaves and any fruits set will drop. An average winter crop in northern India is about 450 fruits per tree. Trees may bear only 100-300 fruits in the rainy season but the price is higher because of relative scarcity despite the lower quality. Of course, yields vary with the cultivar and cultural treatment. Experiments have shown that spraying young guava trees with 25% urea plus a wetting agent will bring them into production early and shorten the harvest period from the usual 15 weeks to 4 weeks. **Flavio, et al., 2007,** found that fruits are harvested after having reached a physiological maturity stage, when development is completed and growing has ceased. From this point on, post-harvest ripening begins, and fruits acquire the organoleptic characteristics to be consumed **(Manrique & Lajolo, 2004; Watada, 1986).** The guava (Psidium guajava) is a native fruit of the American tropics. It is commercially important because of its flavor and aroma. It is nutritionally important due to its excellent source of vitamin C, niacin, riboflavin and vitamin A. The types and amounts of sugars determine the flavor of guavas. Generally, total sugars increases

Table (6) : Effect of maturity stage on yield and fruit quality of "Hachiya" persimmons, during 2005 and 200 seasons.

Fruit characters / Maturity stage (Days A.F.B)	Av.Yield Kg/tree	Av. fruit Weight(g)	Shelf life in days	Fruit Firmness Ib./inch2	T.S.S %	Acidity %	Total tannins mg/ 100g fruit	Total sugars %
2005 Season								
150 days A.F.B*	31.5B	120.4A	8.30AB	9.00A	15.8C	0.180A	2.84A	12.6B
180 days A.F.B	33.8A	129.1A	10.10A	8.60A	17.3B	0.162AB	2.53B	14.7B
210 days A.F.B	30.9B	125.0A	7.00B	8.56A	19.7A	0.153B	2.55B	15.8A
2006 Season								
150 days A.F.B	29.3A	117.4B	6.12B	7.41A	14.9C	0.177A	3.11A	13.3B
180 days A.F.B	30.7A	121.4B	9.00A	5.36B	16.5B	0.153B	2.82B	14.1B
210 days A.F.B	27.4B	137.7A	6.73B	5.74B	20.4A	0.150B	2.60C	17.8A

A.F.B = After Full Bloom

Values followed by the same letter (s) are not significant different at 5% level

initially and then decreases during ripening. However, the relative proportions of its chemical composition change according to the cultivar and environmental conditions such as the climate and soil. Depending on the cultivar, the flavor compound may accumulate at different proportions during ripening, and thus may result in guava fruits having distinctive aroma and tastes. **(Ali & Lazan,1997; MacLeod & Troconis, 1982).** In this study, the influence of different stages of maturation in the volatile and non-volatile chemical composition of the white guava was investigated.

Π-post harves treatments

A-Guava fruits

1- Physical properties

1-1-Discarded guava fruits(%).

Data presented in table (7)show the effect of irradiation doses, hot water, fungicide and ethanol vapor concentration(E.V.C.)on discarded fruits% of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

It could be easily noticed that,discarded fruits% increased with advancement in cold storage durations regardless of the used treatments.It is clear that, all treatments gave a long storage life compared to the control. Significants reduction of discarded fruits were observed in most cases.For example,after 12 days of cold storage the least discarded fruits% was recorded by those fruits treated with 0.8K.Gy irradiation dose after cooling,0.4 and 0.8 K.Gy before-cooling, 0.5gm/L. and 1.0gm/L.fungicied and 25% and50% ethanol vapor concentration(E.V.C)followed by irradiation dose 0.4K.Gy after cooling, 0.2K.Gy befor-cooling , hot water and 0.2K.Gy after cooling where values of discarded fruits were 4.45, 4.45, 4.45 and 6.67 respectively,for the first seasons.However, the highest discarded fruit% was obtained with control. Moreover, with extension of

Table (7):Effect of some post -harvest treatments on discarded fruit % of Montakhab El-kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days									
	2005 seasons.					2006 seasons.				
	4	8	12	16	20	4	8	12	16	20
Control	0.0 A	0.0 A	13.33 A	33.33 A	0.0 G	0.0 A	2.23 A	8.89 A	35.55 A	44.45 A
0.2 K . Gy	0.0 A	0.0 A	6.67 B	15.55 BC	24.45 B	0.0 A	0.0 B	2.23 BC	8.89 B-D	24.45 C
0.4 K . Gy	0.0 A	0.0 A	4.45 B	13.33 B-D	20.00 BC	0.0 A	0.0 B	0.0 C	11.11 BC	22.22 C
0.8 K . Gy	0.0 A	0.0 A	0.0 C	6.67 D-F	11.11 EF	0.0 A	0.0 B	0.0 C	4.45 C-E	15.55 DE
0.2 K . Gy*	0.0 A	0.0 A	4.45 B	8.89 C-F	17.78 CD	0.0 A	0.0 B	4.45 B	6.67 B-E	20.00 CD
0.4 K . Gy*	0.0 A	0.0 A	0.0 C	11.11 B-E	22.22 BC	0.0 A	0.0 B	2.23 BC	8.89 B-D	15.55 DE
0.8 K . Gy*	0.0 A	0.0 A	0.0 C	4.45 EF	11.11 EF	0.0 A	0.0 B	0.0 C	2.23 DE	13.33 E
Hot water	0.0 A	0.0 A	4.45 B	17.78 B	35.55 A	0.0 A	0.0 B	0.0 C	13.34 B	31.11 B
Fungicide (0.5 g /L)	0.0 A	0.0 A	0.0 C	6.67 D-F	13.33 DE	0.0 A	0.0 B	0.0 C	4.45 C-E	11.11 E
Fungicide (1.0 g /L)	0.0 A	0.0 A	0.0 C	4.45 EF	8.89 EF	0.0 A	0.0 B	0.0 C	2.23 DE	11.11 E
E.V.C.(25%)	0.0 A	0.0 A	0.0 C	4.45 EF	11.11 EF	0.0 A	0.0 B	0.0 C	4.45 C-E	4.45 F
E.V.C.(50%)	0.0 A	0.0 A	0.0 C	2.23 F	6.67 F	0.0 A	0.0 B	0.0 C	0.0 E	2.23 F

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C. : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

cold storage time to be 16 days fruits that were treated with E.V.C 50%,E.V.C 25%,1.0 gm/L.fungicide and irradiation dose 0.8K.Gy before-cooling recorded the least discarded fruits% (2.23,4.45,4.45 and 4.45) respectively followed by 0.5gm/L. fungicide, irradiation dose 0.8K.Gy after cooling and irradiation dose 0.2K.Gy before-cooling recorded 6.67,6.67 and 8.89 respectively. However, after 20 days of cold storage,the untreated fruits were terminated due to its discarded recorded percentage of decay above 50%.While E.V.C 50%, 0.5gm/L. fungicide E.V.C 25% and irradiation dose 0.8K.Gy after or before-cooling treatments recorded dicreased fruits% of 6.67, 11.11, and 11.11% respectively.The high significant effect in this respect was observed in the fruits that were treated with E.V.C 50% where the decay fruits% reached 0.0,2.23,and 6.67 after 12,16 and 20 days in the first season compared with control and other treatments in the same days.The same trend of results was also found in the second season.

It could be concluded that Montakhab El-Kanater "Guava" fruits could be stored well for 16 days (a post harvest treatment) with the use of E.V.C 50%.This treatment considered safe as an environmental treatment.

1-2-Fruit weight loss(%).

Data presented in table (8)show the changes in weight loss% of Montakhab El-Kanater guava fruits as affected by irradiation doses, hotwater, fungicide and ethanol vapor concentration (E.V.C.) and stored at 8±1˚C and 85-90% RH during 2005 and 2006 seasons.

There was an obvious increase in weight loss% with development in cold storage duration regardless of the used treatments.However,there was a significant effect of most treatments on reducing the rate of weight loss especially with E.V.C 50% treatment compared to irradiation, fungicide, hot water and untreated fruits (control).After 12,16 and 20 days of cold storage the least weight loss percentage was recorded by E.V.C 50% were 1.42,3.54 and 4.83 respectively and followed E.V.C 25% were 1.75,3.63

Table (8):Effect of some post -harvest treatments on fruit weight loss % of Montakhab El-kanater cv. Guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days									
	2005 seasons					2006 seasons				
	4	8	12	16	20	4	8	12	16	20
Control	1.43 B	3.10 A	5.00 AB	7.18 A	0.0 E	1.54 BC	3.26 A	5.10 AB	6.82 A	8.86 A
0.2 K . Gy	1.44 B	3.00 A	5.07 AB	6.00 BC	7.91 A	1.62 B	2.84 A-C	4.92 AB	6.10 AB	7.85 B
0.4 K . Gy	1.35 B	2.98 A	4.53 B	5.84 BC	7.56 AB	1.49 BC	3.20 AB	5.00 AB	6.00 AB	7.30 B
0.8 K . Gy	1.18 B	2.70 A	3.66 C	5.10 CD	6.19 C	1.25 B-D	2.38 C	4.56 BC	5.77 B	6.12 C
0.2 K . Gy*	1.52 B	3.02 A	5.50 A	6.41 AB	8.33 A	15.0 BC	2.73 BC	4.75 A-C	6.40 AB	7.74 B
0.4 K . Gy*	1.29	3.00 A	5.14 AB	6.42 AB	7.68 A	1.50 BC	3.10 AB	5.20 A	6.10 AB	7.80 B
0.8 K . Gy*	1.12 BC	2.79 A	3.370 C	5.11 CD	6.41 BC	1.16 B-E	2.56 C	4.22 C	5.04 C	6.20 C
Hot water	1.96 A	3.14 A	4.78 AB	7.14 A	8.68 A	2.11 A	3.20 AB	4.85 AB	6.45 AB	9.00 A
Fungicide (0.5 g /L)	1.20 B	2.66 A	3.84 C	5.45 B-D	6.22 C	1.11 C-E	1.54 D	2.80 D	4.10 D	5.40 CD
Fungicide (1.0 g /L)	0.78 CD	1.06 B	2.32 D	4.60 D	5.20 CD	0.90 DE	1.66 D	2.70 D	4.22 D	5.40 CD
E.V.C.(25%)	0.76 CD	1.16 B	1.75 DE	3.63 E	5.19 CD	0.93 DE	1.74 D	2.73 D	3.89 D	5.20 D
E.V.C. (50%)	0.61 D	0.72 B	1.42 E	3.54 E	4.83 D	0.74 E	1.54 D	2.56 D	4.00 D	5.46 CD

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy* : Irradiation with pre-cooling

and 5.19 at the same days of cold storage,followed by fungicide with the two used concentration,irradiation dose 0.8K.Gy after or befor-cooling at the same days of cold storage. On the contrary, there was a sharp increase in fruit weihgt loss% by hot water treatment which recorded 4.78,7.14 and 8.68 after 12,16 and 20 days respectively.
The same trend of results was also found during of the experiments the second season,of study.

1-3-Fruits firmness(Lb./inch^2)

Data presented in table (9)show the effect of treatments in flesh firmness of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90% RH during 2005 and 2006 seasons.

Generally, it could be easily noticed that fruit firmness decreased with advanced in cold storage durations regardless of the used treatments. However,it is clear that all used treatments significantely decreased the losses in fruit flesh softening during all cold storage durations compared with control.

At the beginning of cold storage experiment, there were no differences between different treatments or untreated fruits (control).After 16 days of cold storage in the first season,the highest fruit firmness(5.50 Lb./inch^2)was recorded by those fruits treated by hot water followed 50% E.V.C, 25%E.V.C,1.0gm/L.fungicide and 0.8K.Gy irradiation dose after and before-cooling were recorded 5.42,5.08,5.08,4.92 and 4.58 Lb./inch^2 respectively.On the other hand, after 20 days of cold storage,the highest fruit firmness(4.67 Lb./inch^2)was recorded by 50% E.V.C,next 25% E.V.C,1.0gm/L. fungicide and 0.8K.Gy irradiation dose after or before-cooling were recorded 4.42, 4.42,4.08 and 3.92 Lb./inch^2 of fruit firmness.But the lowest fruit firmness1.42 Lb./inch^2 was recorded by hot water treatment at 20 days of cold storage.

The same trend of results was also found in the second season.

Table (9):Effect of some post -harvest treatments on fruit firmness (Ib/inch2) of Montakhab El-kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days											
	2005 seasons.						2006 seasons.					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	8.58 A	7.08 AB	6.08 B	5.58 A-C	2.70 D	-	7.67 A	6.42 B	5.08 D	4.00D	3.00 D	1.08 F
0.2 K . Gy	8.58 A	7.50 AB	6.42 AB	4.83 C	4.00 C	2.58 CD	7.92 A	6.67 AB	5.00 D	4.25 CD	3.50 C	2.00 E
0.4 K . Gy	9.00 A	7.50 AB	6.83 AB	5.17 BC	4.67 C	2.58 CD	8.08 A	7.00 AB	6.08 A-C	4.50 CD	3.58 C	2.58 D
0.8 K . Gy	8.83 A	7.92 AB	6.83 AB	6.00 A-C	4.92 AB	4.08 A	7.83 A	7.00 AB	6.08 A-C	4.83 B-D	4.00 BC	3.17 C
0.2 K . Gy*	8.75 A	7.83 AB	6.75 AB	5.00 C	3.58 C	2.42 D	7.92 A	6.92 AB	6.00 A0-C	4.50 CD	3.85 C	2.00 E
0.4 K . Gy*	8.17 A	7.92 AB	6.50 AB	5.25 BC	3.92 C	2.58 CD	7.92 A	6.83 AB	5.42 CD	4.83 B-D	3.75 BC	2.25 DE
0.8 K . Gy*	9.00 A	7.75 AB	7.00 A	5.92 A-C	4.58 B	3.92 AB	7.83 A	7.33 A	5.83 BC	5.00 BC	4.17 B	3.42 C
Hot water	9.00 A	5.50 B	7.00 A	5.08 C	5.50 D	1.42 E	8.08 A	7.00 AB	5.83 BC	4.17 CD	2.50 E	1.50 F
Fungicide (0.5 g /L)	9.17 A	7.50 AB	6.42 AB	5.00 C	4.08 C	3.25 BC	8.00 A	7.17 AB	6.25 AB	5.50 AB	4.92 A	3.92
Fungicide (1.0 g /L)	9.00 A	8.33 A	7.08 A	6.42 AB	5.08 AB	4.42 A	7.83 A	7.00 AB	6.08 A-C	5.67 AB	4.75 A	4.08 A
E.V.C.(25%)	8.67 A	8.00 AB	6.92 AB	6.17 A-C	5.08 AB	4.42 A	8.17 A	7.08 AB	6.33 AB	5.50 AB	5.00 A	3.48 BC
E.V.C.(50%)	8.83 A	8.08 AB	7.25 A	6.58 A	5.42 A	4.67 A	8.00 A	7.17 AB	6.58 A	5.92 A	5.25 A	4.00 A

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C. : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

1-4-Shelf-life(marketability)

Results of table(10)show the effect of some treatments on the shelf life(days) of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90% RH during 2005 and 2006 seasons.

It is obvious that, as days of cold storage was increased shelf life was decreased.However,the high shelf life(5.00 and 5.00 days)were found with the fruits treated with 50% E.V.C and 25% E.V.C followed by irradiation dose 0.8K.Gy after or before-cooling and 1.0gm/L. fungicide were recorded 4.33,4.33 and 3.67 days respectively in the first season.It is clear that, the treated fruits significantly differed between them and untreated fruits(control)in their firmness. However,the fruits treated with hot water had less marketing life(1.67 day)than other treatments.This finding generally,could be explained by the increase of hot water treat fruits in their respiration rate which leadto high senescence fruit.

A slight differences were noticed during the second season of study.

The present results are in agrement with those of**, Seung and Kader (2000)** who found that Ionizing radiation may be used for sprouting inhibition, insect control,or delay of ripening of certain fruits and vegetables. **Also, Mitchell et al.,(1992)** studied the irradiation effect on horticultural crops at relatively low doses and found that irradiation at 300 Gy had no significant effects on L-ascorbic acid (AA) and L-dehydroascorbic acid (DHA).Irradiation at 75-100 Gy irreversibly inhibited sprouting of potatoes regardless of storage temperature.Losses in vitamin C were lower in potato irradiated for sprout control and subsequently stord at 15°C than in non-irradiated tubers stord at 2-4°C **(Joshi et al.,1990).**However,**'**Galia' muskmelons were irradiated at doses up to 1 K.Gy as a quarantine treatment,and the treatment had no effect on vitamin C content**(Lala-guna, 1998).** In general, irradiation doses of 2-3 K.Gy combined with refrigeration were useful for extending the shelf- life of strawberries **(Graham and Stevenson,1997).**During storage AA levels

Table(10): Effect of some post-harvest treatments on marketability (shelf life in days) of Montakhab El-kanater cv. Guava fruits stored at 8 ±1°C and 85 – 90RH for 20 days during 2005 and 2006 seasons.

Treatments	Storage period in days	
	2005 seasons.	2006 seasons.
Control	1.00 F	1.33 C
0.2 K . Gy	1.67 E	2.33 B
0.4 K . Gy	2.67 D	2.67 B
0.8 K . Gy	4.33 B	4.33 A
0.2 K . Gy*	2.67 D	3.00 B
0.4 K . Gy*	2.67 D	3.00 B
0.8 K . Gy*	4.33 B	4.33 A
Hot water	1.67 E	2.33 B
Fungicide (0.5 g /L)	3.00 D	3.00 B
Fungicide (1.0 g /L)	3.67 C	4.33 A
E.V.C. (25 %)	5.00 A	4.67 A
E.V.C. (50 %)	5.00 A	5.00 A

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy* : Irradiation with pre-cooling

significantly increased while DHA content decreased in irradiated strawberries.

Regarding hot water treatments,the obtained data are in lines with those of **Suresh et al.,(2001)** they investigated the effects of hot water and hot air treatments on the reduction of chilling injury and quality of Kensington Pribe mango fruits. Heat treatments included exposure to 38-40°C for 14 hr, hot water for 10 min at 46-48°C and hot air for 10 min at 46-48°C. Treated and untreated fruits were stored at 5°C.Heat treatments did not result in a substantial reduction in chilling injury development after 21 and 35 days of storage at 5°C.All heat treatments increased respiration rate,but ethylene production, physiological weight loss during storage and total soluble solids were increased only by some heat treatments.

In regard to ethanol vapor treatments, the obtained results are similar to those found by **Gonzalez et al., (2003)** who exposured Tommy Atkins mangos and papaya fruits to methyl jasmonate (MJ) vapours
(10–^{4}M) for 24h at 25°C reduced chilling injury during subsequent storage for 21 days at 25°C and after 5 days of shelf life 20°C.The chilling tolerance induced by MJ was positively correlated with the reduction in the percentage ion leakage of mango and papaya tissues. The overall quality of MJ treated fruits was also better than that of control fruits. MJ treatment increased the total soluble solids but did not affect titratable acidity or pH. MJ also did not change the normal climacteric rise respiration, water loss and softening rates MJ treatment may prevent chilling injury symptoms of mango without altering the ripening process.

Regarding the effect of fungicide treatments, the obtained data are in harmony with those of **Author et al.,(1998)**.They studied the effect of fungicides Thiabendazole(TBZ) or Imazalil (IMZ) applied at 1000 and 3000 ppm a,i at 25,40 and 50°F on lime fruits (Citrus aurantifolia)to reduce cilling injury (CI), decay and electrolyte leakage during cold storage at 3°C for 6

weeks. They found that fruits dipped in IMZ at 3000 ppm a,i at 25°F for 5 min and TBZ at 1000 ppm a,i at25°F for 2 min showed the lowest chilling injury.There was a positive correlation between CL and water loss.fruits showed the lowest chilling injury also had the lowest weight loss during 6 weeks of storage at 3°C.

2-Chemical determinations

2-1-Total soluble solids(T.S.S%)

Data presented in table (11)show the effect of irradiation doses(after or before-cooling),hot water, fungicide and ethanol vapor concentration (E.V.C.)on Total soluble solids % of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

It is clear that T.S.S of Montakhab El-Kanater were increased with the progress in cold storage time till 16 days and decreased after that,regardless of the used treatments.At the beginning of cold storage duration,no significant differences were obtained between the used treatments and control.

However,with the increase of cold storage durations and after 16 days in the first season, higher T.S.S (13.27%)was obtained with the use of 0.8 K.Gy irradiation dose after cooling followed by those treated with E.V.C 25%(13.20%), next (13.00%) with 0.8K.Gy irradiation dose before-cooling.

On the other hand, after 20 days of cold storage durations,significant differences were still evident between the other treatments and control.The higherT.S.S% values were recorded(14.60,14.60,14.60,14.20and 13.80%) with E.V.C 50% ,E.V.C 25%, fungicide 1.0gm/L.,irradiation dose 0.8K.Gy after cooling and irradiation dose 0.8K.Gy pre-cooling respectively and the lowest value with hot water treatment was recorded(11.80%).The increase in total soluble solids with increasing cold storage period could be attributed to the conversion of some complex

Table (11):Effect of some post -harvest treatments on total soluble solids (TSS%) of Montakhab El-kanater cv. guava

fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons**.**

Treatments	Storage period in days											
	2005 seasons						2006 seasons					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	9.20 A	10.20 A	11.20 A	12.20 A	12.60 A	-	8.80 A	9.60 A	11.40 AB	11.80 A-C	13.40 A	12.67 BC
0.2 K . Gy	9.20 A	10.00 A	10.80 A	11.80 A	12.33 A	12.20CD	8.47 A	9.40 A	11.60 A	11.93 A-C	12.80 A-D	12.60 BC
0.4 K . Gy	8.86 A	9.67 A	10.60 A	11.80 A	12.93 A	12.60 B-D	8.80 A	9.40 A	10.80 A-C	12.60 A	13.20 AB	13.07 A-C
0.8 K . Gy	9.00 A	10.47 A	10.60 A	12.00 A	13.27 A	14.20AB	8.60 A	9.20 A	10.80 A-C	12.27 AB	12.00 B-D	13.80 A
0.2 K . Gy*	8.40 A	9.60 A	11.00 A	11.60 A	12.27 A	12.80 B-D	8.47 A	9.40 A	11.80 A-C	12.00 A-C	12.60 A-D	13.20 AB
0.4 K . Gy*	9.07 A	9.60 A	10.40 A	11.80 A	12.60 A	12.80 B-D	8.73 A	9.60 A	11.40 AB	11.73 A-C	13.00 A-C	12.80 A-C
0.8 K . Gy*	9.00 A	9.60 A	10.40 A	12.00 A	13.00 A	13.80 A-C	8.60 A	9.60 A	10.60 A-C	11.20 C	12.20 A-D	13.60 AB
Hot water	9.00 A	10.40 A	11.20 A	12.00 A	12.80 A	11.80D	8.60 A	9.80 A	10.60 A-C	11.93 A-C	13.40 A	12.13 C
Fungicide (0.5 g L).	9.00 A	9.80 A	10.60 A	11.60 A	12.60 A	12.40 CD	8.40 A	9.87 A	10.20 C	11.80 A-C	12.40 A-D	13.20 C
Fungicide (1.0 g /L.)	9.40 A	9.80 A	10.20 A	11.60 A	12.80 A	14.60 A	8.80 A	9.80 A	10.80 A-C	11.67 A-C	13.00 A-C	13.60 AB
E.V.C. (25%)	8.80 A	9.60 A	10.20 A	11.80 A	13.20 A	14.60 A	8.60 A	9.60 A	10.40 BC	11.33 BC	11.80 CD	13.20 AB
E.V.C. (50%)	9.00 A	9.60 A	10.00 A	11.40 A	12.87 A	14.60 A	8.60 A	9.80 A	10.60 A-C	11.27 BC	11.60 D	13.20 AB

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

substances such as starch to simple substances like sugar and other solutes and consequently sugars content which presented and major content of Total soluble solids increased.

In the seconed season, and after 8 and 12 days low significant differences were obtained between the used treatments and control.However,with advanced in cold storage durations and after 20 days,higher T.S.S(13.80%)was obtained with irradiation dose 0.8K.Gy after cooling followed by those treated with irradiation dose 0.8K.Gy before-cooling (13.60%),1.0gm/L.fungicide(13.60%) and E.V.C 50% and 25% 13.20% whereas,the lowest value was recorded(12.13%)in hot water treated.

On the other hand,the reduction of T.S.S after 20 days of cold storage could be due to the exhausting of sugars in respiration process.

2-2-Titratable acidity(gm/100g fresh weight)

The results tubulated in table(12)demonstrate the effect of irradiation doses (after or before-cooling),hot water,fungicide and ethanol vapor concentration (E.V.C.)on titratable acidity of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

Generally,it could be noticed that fruit acidity was decreased with extending cold storage periods regardless of the used treatments, Also, fruit acidity decreased with the development in fruit ripening in all used treatments.This finding could be explained on the base that fruit acids were consumed in respiration process with advanced ripening.The variation in fruits acidity was noticed after 16 days of cold storage,but hot water treated fruits recorded higher value of fruit acidity(0.32%) compared to other treatments,but the lowest value(0.21%) was recorded with E.V.C 50% treatment followed by E.V.C 25%, 1.0gm/L. fungicide and 0.8K.Gy irradiation dose after or before-cooling recorded fruit acidity of 0.22, 0.23, 0.23 and 0.23%

Table (12):Effect of some post -harvest treatments on titratable acidity (T.A.%) of Montakhab El-kanater cv.
guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days											
	2005 seasons						2006 seasons					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	0.41 A	0.34 AB	0.27 AB	0.25 AB	0.34 A	-	0.32 A	0.29 A	0.29 A	0.20 C	0.30 A	0.38 A
0.2 K . Gy	0.40 A	0.35 AB	0.21 B	0.25 AB	0.28 A-C	0.30 A-C	0.31 A	0.28 A	0.25 A	0.23 A-C	0.26 AB	0.29 B
0.4 K . Gy	0.41 A	0.34 AB	0.28 AB	0.23 B	0.23 C	0.26 A-D	0.30 A	0.27 A	0.24 A	0.25 A-C	0.25 AB	0.25 BC
0.8 K . Gy	0.42 A	0.36 AB	0.31 AB	0.27 AB	0.23 C	0.21 CD	0.35 A	0.33 A	0.27 A	0.28 A	0.24 AB	0.23 B-E
0.2 K . Gy*	0.42 A	0.34 AB	0.29 AB	0.24 AB	0.26 A-C	0.32 AB	0.35 A	0.30 A	0.29 A	0.25 A-C	0.24 AB	0.26 BC
0.4 K . Gy*	0.41 A	0.35 AB	0.29 AB	0.23 B	0.25 BC	0.26 A-D	0.33 A	0.30 A	0.28 A	0.27 A	0.26 AB	0.24 B-C
0.8 K . Gy*	0.43 A	0.38 AB	0.32 A	0.27 AB	0.23 C	0.22 B-D	0.34 A	0.30 A	0.29 A	0.26 A-C	0.24 AB	0.22 C-E
Hot water	0.42 A	0.36 AB	0.33 A	0.29 A	0.32 AB	0.33 A	0.33 A	0.28 A	0.30 A	0.21 BC	0.26 AB	0.26 BC
Fungicide (0.5 g /L)	0.41 A	0.30 B	0.30 AB	0.28 AB	0.25 BC	0.24 A-D	0.31 A	0.29 A	0.25 A	0.26 A-C	0.25 AB	0.22 C-E
Fungicide (1.0 g /L)	0.40 A	0.33 B	0.32 A	0.25 AB	0.23 C	0.20 CD	0.32 A	0.29 A	0.27 A	0.24 A-C	0.21 B	0.19 DE
E.V.C.(25 %)	0.41 A	0.32 B	0.32 A	0.26 AB	0.22 C	0.17 D	0.35 A	0.30 A	0.25 A	0.26 AB	0.23 B	0.19 DE
E.V.C. (50%)	0.41 A	0.42 A	0.34 A	0.28 AB	0.21 C	0.17 D	0.31 A	0.29 A	0.28 A	0.25 A-C	0.23 B	0.18 E

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy* : Irradiation with pre-cooling

recpectively for the first season.After 20 days of cold storage, the high fruit acidity(0.33%)was obtained with hot water treated fruits compared with other treatments which recorded low acidity(0.17%)in the two E.V.C 50% and 25% treatments followed by 1.0gm/L. fungicide, 0.8K.Gy irradiation dose after cooling and 0.8K.G.y irradiation dose pre-cooling were recorded (0.20, 0.21 and 0.22)recpectively.

Data of the second season showed some differences than incompanison with the first one in titratable acidity with different treatments and no significant effect was moted till even the 16 days of cold storage.After 20 days of cold storage, the differences in titratable acidity with treatments of 0.2K.Gy irradiation dose after cooling, 0.2K.Gy irradiation dose before-cooling and hot water treatments exhibited the high fruits acidity(0.29, 0.26 and 0.26%) recpectively. But the lowest fruit acidity was recorded(0.18%)with E.V.C 50% followed by E.V.C 25% (0.19%) and 1.0gm/L. fungicide (0.19%) treatments recpectively. However, all the experimental treatments induced significant effects compared to control.

2-3-L-ascorbic acid content(mg/100g fresh weight)

Data demonstrated in table (13)show the effect of irradiation doses, hot water, fungicide and ethanol vapor concentration(E.V.C.)on L-ascorbic acid content of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

L-ascorbic acid content was decreased with the extension in time for the in treated or untreated fruits.This finding could be attributed to the conversion of L-ascorbic acid to dehydroascorbic acid and decreasing the active form of ascorbic.No significant differences were noticed between different treatments and control till 4 days of cold storage.However,after 8 days, control fruits exhibited the least value of L-ascorbic than all used treatments.After 12 days of cold storage hot water treated fruits contained less values of L-ascorbic than others. This finding is correlated with the

Table (13):Effect of some post -harvest treatments on L-ascorbic acid content (LAA mg 100 g fresh weight) of Montakhab El-kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days											
	2005 seasons						2006 seasons					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	394.1 A	319.0 B	212.6 E	145.2 F	119.7 F	-	320.4 A	285.9 A	219.7 C	178.6 CD	142.9 D	100.8 F
0.2 K . Gy	389.6 A	302.4 B	219.8 DE	190.7 DE	175.4 DE	138.1 DE	324.7 A	304.6 A	215.2 C	171.4 CD	151.3 CD	135.0 C-E
0.4 K . Gy	418.0 A	338.7 AB	242.4 CD	181.1 DE	146.1 EF	141.7 DE	344.8 A	284.3 A	202.8 C	180.9 CD	157.1 CD	142.6 CD
0.8 K . Gy	401.4 A	335.8 AB	284.1 B	232.7 BC	215.7 BC	185.7 C	420.4 A	302.3 A	257.1 AB	192.8 CD	185.7 BC	157.4 BC
0.2 K . Gy*	500.8 A	310.8 B	250.7 C	221.5 CD	143.5 EF	104.8 F	315.6 A	284.4 A	200.7 C	174.7 CD	154.4 CD	122.4 D-F
0.4 K . Gy*	385.9 A	307.0 B	264.3 BC	250.5 B	203.1 CD	153.4 D	311.8 A	266.7 A	200.0 C	164.4 D	151.0 CD	140.0 C-E
0.8 K . Gy*	433.5 A	328.7 B	316.4 A	259.4 B	221.6 BC	207.1 BC	320.0 A	285.6 A	264.3 AB	205.4 BC	199.8 B	171.5 B
Hot water	376.5 A	308.2 B	264.5 BC	169.0 EF	142.8 EF	119.4 EF	316.4 A	274.4 A	235.6 BC	164.5 D	135.4 D	114.3 EF
Fungicide (0.5 g /L)	384.1 A	305.4 B	243.9 CD	213.2 CD	168.6 DE	138.2 DE	317.6 A	299.9 A	286.4 A	240.4 AB	207.1 AB	180.5 AB
Fungicide (1.0 g /L)	400.6 A	319.0 B	280.9 B	260.4 B	224.4 BC	192.9 BC	321.5 A	274.4 A	266.2 AB	240.5 AB	221.4 AB	202.8 A
E.V.C.(25%)	376.5 A	325.7 B	314.0 A	268.3 B	242.2 B	212.3 AB	307.1 A	288.6 A	274.3 AB	235.4 AB	210.4 AB	199.9 A
E.V.C. (50%)	391.9 A	364.1 A	337.9 A	304.5 A	282.2 A	235.0 A	320.5 A	294.5 A	285.3 A	264.3 A	240.4 A	207.4 A

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C. : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

Table (9):Effect of some post -h

previously stated acidity and T.S.S values where this treatment recorded less fruit quality characters. However, after 20 days of cold storage, 0.2K.Gy irradiation dose after cooling treated fruits contained less values of L-ascorbic(104.8 mg/ 100gfresh weight) than others, high value of L-ascorbic acid(235.0 mg/100g fresh weight) was recorded with E.V.C 50% treated fruits followed by E.V.C 25% (212.3 mg/100g fresh weight), irradiation dose 0.8K.Gy before-cooling(207.1mg/100g fresh weight), 1.0 g /L.fungicide (192.9 mg / 100g fresh weight) and irradiation dose 0.8 K.Gy after cooling(185.7 mg/100g fresh weight).

Data of the second season showed some differences in L-ascorbic acid content fruits,where hot water treated fruits contained less values of L-ascorbic than other treatments(114.3 mg/100g fresh weight) after 20 days of cold storage, while, the high value of L-ascorbic recorded (207.4mg /100 g fresh weight) with E.V.C 50% treatment followed by 1.0g /L. fungicide (202.8 mg/100g fresh weight) and E.V.C 25% (199.9 mg/100gfresh weight) were recorded recpectively.

Moreover, treatment of fruits using irradiation dose level(0.8K.Gy) either after or before-cooling was 0.8k.Gy irradiation dose recorded 171.5 mg/100g fresh weight and 157.4 mg/100g fresh weight respectively.

2-4-Total sugars(gm/100gm fresh weight)

Data presented in table (14)show the effect of irradiation doses(after or before-cooling),hot water, fungicide and ethanol vapor concentration (E.V.C.) on total sugars of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

The same trend of results obtained with T.S.S% was also found with total sugar contents during the two studied seasons.No significant differences between different treatments or control were observed during all cold storage duration. However,an obvious increase in total sugars was

Table (14):Effect of some post -harvest treatments on total sugars of Montakhab El-kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons						2006 seasons					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	6.3 A	7.1 A	8.4 AB	9.0 AB	9.1 B	- F	5.3 A	6.8 AB	7.5 D	8.1 D	9.3 AB	9.4 C
0.2 K . Gy	5.8 A	6.5 A	7.4 C	8.4 B	9.3 B	9.31 DE	5.4 A	6.9 AB	7.9 B-D	8.7 B-D	9.2 AB	10.1 BC
0.4 K . Gy	5.9 A	7.3 A	7.6 BC	8.4 B	8.9 AB	9.5 DE	6.1 A	7.1 AB	8.3 A-C	9.2 AB	10.1 A	10.8 AB
0.8 K . Gy	6.2 A	7.4 A	7.9 A-C	8.9 AB	9.8 B	10.3 B-D	5.4 A	7.2 AB	8.8 A	9.7 A	9.7 AB	11.3 A
0.2 K . Gy*	6.3 A	7.3 A	8.0 A-C	8.3 B	9.3 B	9.9 B-E	5.3 A	7.1 AB	8.4 AB	8.8 BC	10.0 A	11.1 AB
0.4 K . Gy*	5.9 A	7.2 A	7.9 A-C	8.4 B	9.1 B	9.8 C-E	5.4 A	6.9 AB	7.8 B-D	8.5 CD	9.8 AB	10.9 AB
0.8 K . Gy*	6.2 A	7.3 A	8.2 A-C	9.0 AB	9.8 AB	10.2 B-E	6.0 A	7.3 A	8.4 AB	9.8 A	9.3 AB	11.2 AB
Hot water	5.8 A	7.3 A	8.1 A-C	8.7 AB	9.3 B	9.6 DE	5.5 A	6.7 AB	7.4 D	8.1 D	8.7 B	9.6 C
Fungicide (0.5 g /L)	6.0 A	6.9 A	7.9 A-C	8.6 B	9.1 B	9.2 E	5.3 A	7.1 AB	7.4 D	8.7 A-D	9.7 AB	10.5 A-C
Fungicide (1.0 g /L)	6.1 A	6.9 A	7.6 BC	8.9 AB	9.5 B	10.9 AB	5.7 A	6.6 AB	7.9 B-D	8.8 BC	9.7 AB	11.1 AB
E.V.C.(25%)	6.1 A	7.3 A	8.1 A-C	9.1 AB	9.8 AB	10.8 A-C	5.5 A	6.5 B	7.6 CD	8.5 CD	9.2 AB	10.2 A-C
E.V.C. (50%)	6.2 A	7.4 A	8.8 A	9.6 A	10.7 A	11.4 A	6.1 A	6.9 AB	7.8 B-D	8.7 B-D	9.3 AB	10.8 AB

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C. : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

noticed 20 days of cold storage, the reduction of sugars with development in storage periods was attributed to the consumption of these sugars in respiration process.However,in the first season and after 20 days of cold storage. The highest total sugars(11.4%) was recorded with E.V.C 50% treatment followed by 1.0gm/L. Fungicide (10.9%) ,E.V.C 25% (10.8%), irradiation dose 0.8K.Gy after cooling (10.3%) and irradiation dose 0.8K.Gy before-cooling (10.2%).Moreover,the lowest total sugars (9.2%) was observed with 0.5gm/L. fungicide followed by hot water treatment which recorded 9.6%.

On the other hand,in the second seasons,and after 20 days the higher total sugars was obtained with irradiation dose 0.8K.Gy after cooling (11.3%), followed by irradiation dose0.8K.Gy before - cooling (11.2%) and 1.0gm/L.fungicide(11.1%).

The lowest total sugars(9.6%) was recorded with hot water treated fruits.

2-5-Respiration rate(mgco_2/Kg fruit /hr .)

Data presented in table (15)show the effect of irradiation doses, hot water, fungicide and ethanol vapor concentration(E.V.C.)on respiration rate of Montakhab El-Kanater guava fruits stored at 8±1˚C and 85-90%RH during 2005 and 2006 seasons.

At the beginning of cold storage duration, a respiration rate was high and ranged from 14.11 to 24.56 mg co_2 /Kg / hr. However, minimum respiration rates was noticed with E.V.C 50% and fungicide 1.0 and 0.5g / L . On the contrary, high respiration rates were obtained with hot water, all irradiation doses after or before-cooling and control.After 4,8 and 12 days of cold storage respiration rate was decreased. However, minimum respiration rate was noticed with E.V.C 50% where it recorded 5.84, 7.25 and 10.88 mg co_2/Kg fruit/hr. in 4,8,and 12 days recpectively. While, high respiration rate was noticed with irradiation dose 0.4K.Gy before-cooling after 12 days of cold storage in the first season.On the other hand,at the

Table (15):Effect of some post -harvest treatments on the respiration rate (CO 2 mg / kg fruit h.) of Montakhab El- kanater cv. guava fruits stored at 8 ± 1°C and 85 – 90RH during 2005 and 2006 seasons.

Treatments	Storage period in days											
	2005 seasons						2006 seasons					
	0	4	8	12	16	20	0	4	8	12	16	20
Control	24.56 A	10.54 A	16.15 A	22.48 A	28.40 A	-	28.42 AB	12.28 A	16.87 A	22.86 A	26.75 A	30.96 A
0.2 K . Gy	22.98 A	11.26 A	14.77 AB	20.92 A	26.24 AB	26.11 B	29.78 A	11.44 A	15.18 AB	22.02 A	27.00 A	27.20 B
0.4 K . Gy	22.51 A	10.12 A	14.00 AB	21.67 A	24.20 BC	27.20 B	29.64 A	12.46 A	16.10 A	23.20 A	25.14 B	26.66 B
0.8 K . Gy	24.10 A	10.92 A	13.43 B	16.77 B	20.08 DE	22.27 C	28.32 AB	13.04 A	14.20 BC	15.14 D	20.00 C	21.99 DE
0.2 K . Gy*	21.78 A	11.74 A	15.30 AB	22.74 A	25.13A-C	27.00 B	25.61 AB	12.44 A	15.94 A	23.00 A	25.14 B	27.00 B
0.4 K . Gy*	22.94 A	10.44 A	15.80 AB	23.10 A	22.10 C-E	25.60 B	27.44 AB	12.86 A	16.14 A	22.16 A	25.00 B	25.68 BC
0.8 K . Gy*	23.15 A	10.10 A	14.20 AB	18.14 B	20.15 DE	21.78 CD	28.03 AB	12.60 A	14.10 BC	17.56 BC	20.14 C	24.14 CD
Hot water	22.12 A	11.05 A	16.20 A	21.10 A	28.17 A	33.15 A	29.37 A	13.10 A	16.00 A	19.14 B	25.40 B	31.16 A
Fungicide(0.5 g /L)	16.53 B	11.26 A	14.50 AB	18.00 B	23.34 B-D	26.77 B	28.46 AB	11.89 A	13.86 BC	16.20 CD	20.11 C	23.86 CD
Fungicide (1.0 g /L)	16.53 B	10.84 A	15.09 AB	18.20 B	23.10 B-D	25.11 B	24.67 B	12.10 A	13.25 C	14.75 D	18.70 D	20.90 E
E.V.C.(25%)	17.36 B	7.20 B	9.85 C	14.32 C	19.20 E	20.10 DE	18.00 C	7.80 B	8.44 D	11.09 E	14.68 E	20.97 E
E.V.C. (50%)	14.11 B	5.84 B	7.25 D	10.88 D	15.19 F	18.22 E	17.86 C	6.93 B	8.68 D	9.44 E	13.20 F	17.40 F

Values followed by the same letter (s) are not significantly different at 5% level

E.V.C. : Ethanol vapor concentration

K . Gy* : Irradiation with pre-cooling

end (after 20 days)of cold storage duration in the first season, respiration rate was high and ranged from 18.22 to 33.15 mg co_2/Kg/hr. However, minimum respiration rate was noticed with E.V.C 50%(18.22 mg co_2/Kg fruit/hr.)followed by E.V.C25 % 20.10 mg co_2/Kg fruit/ hr., irradiation dose 0.8K.Gy before-cooling 21.78 co_2/Kg fruit/hr. and irradiation dose 0.8K.Gy after cooling 22.27mg co_2/Kgfruit/hr.were recorded . But the high respiration rate was noticed with hot water33.15 mg co_2/Kg fruit/ hr.followe by irradiation dose 0.4K.Gy after cooling 27.20 mg co_2/Kg fruit/ hr.,irradiation dose 0.2K.Gy befor cooling 27.00 mg co_2/ Kg fruit/hr. 0.5gm/L.fungicide 26.77mg co_2/Kg frui/hr.,irradiation dose 0.4K.Gy before cooling25.60 co_2/Kg fruit/hr. and1.0gm/L.fungicide 25.11 mg co_2 /Kg fruit/hr.The same trend of results was also found in the second season.

The obtained results are in agrement with**,** those of **El-Sayed (1978)** who found that hot water dipping at 60°C for 2 min., as pre- irradiation treatment of green mature tomato fruits was found to be effective in controlling rots during the storage period. Moreover, this phsical treatment could minimize gamma irradiation dose required for shelf- life extension of tomato fruits.Heat treatment combined with 100 Krad dose could extend tomato shelf- life for 13 days without significant effect in fruit quality.Regarding hot water treatments,the obtained data are in lines with **Lay- yee Michel et al.,(1997)**who found that 'Fuyu' persimmon (Diospyros Kaki L.)fruit hot-water treated at temperatures ranging from 47 to 54ºC. for durations from 2.5 to 120 min(depending on temperature), with air and water-treated fruit(20ºC for 120 or 60 min, respectively)as controls. Eollowing treatment,fruits were stored at 0ºC in air for 6.5 weeks then held at 20ºC for 5 days and assessed for quality. Whereas a number of hot-water treatments caused damage in the form of skin or flesh browning, no damage was observed with certain treatments which showed potential as disinfestation treatments(47ºC for 90 and 120 min,50ºC for 30 and 45 min,52ºC for 20 and 30 min,and 54ºC for 20 min).These treatments also reduced incidence and severity of chilling injury observed in fruits

following cold storage,relative to that found in controls.Results suggest that hot-water treatment shows potential for both disinfestation and maintaining quality of persimmon fruit during cold storage.

In case of using vapor treatment, the obtained results are similar to those found by **Wang and Adams (1982)** who found that ethanol vapor was able to protect fruit system for ethylene production since a considerable reduction in ethylene was only obtained by the chilled fruits without ethanol vapor exposure**.** Regarding the effect of fungicide treatments, the obtained data are in harmony with **Sharma (1990)** who reported that hot water treatment combined with 200ppm carbendazim at 50°C for 4 min was an effective substitute for cold water dips containing 1000ppm of fungicide for the control of brown rot of apples.Also **Bryk (1991)**studied the effect of dipping apple in solutions of 900ppm fungicide before cold storage on reducing fruit rotting caused by deferent fungus.

B-Persimmon fruits

1-Physical properties

1-1-Discarded persimmon fruits(%).

Data demonstrated in table (16)show the effect of irradiation doses, hot water,fungicide and ethanol vapor concentration (E.V.C.) on discarded fruits% of Hachiya cv. persimmon fruits stored at 0 ± 2˚C and 90- 95 % RH during 2005 and 2006 seasons.

It could be easily noticed that,discarded fruits% increased with extension of in cold storage durations regardless of the used treatments.It is clear that all treatments increased persimmon storage life than the control.Significant reduction of discarded fruits was observed in most cases.For example,after 28 days of cold storage the least discarded fruits% was recorded by those fruits treated with irradiation doses 1.5 and 2.5 K.Gy after or before-cooling and 25% and 50% ethanol vapor concentration (E.V.C).On the contrary, the highest discarded fruits was

recorded by hot water (9.20%) followed by irradiation dose 3.5K.Gy

Table (16):Effect of some post -harvest treatments on discarded fruit % of Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage									
	2005 seasons.					2006 seasons.				
	7	14	21	28	35	7	14	21	28	35
Control	-	-	7.92 A	16.92 A	25.40 A	-	-	4.46 A	13.80 A	23.80 A
1.5 K . Gy	-	-	0.0 D	0.0 E	5.16 D	-	-	0.0 C	5.06 D	9.54 E
2.5 K . Gy	-	-	0.0 D	0.0 E	0.0 E	-	-	0.0 C	0.0 E	0.0 G
3.5 K . Gy	-	-	0.0 D	7.25 BC	13.62 C	-	-	0.0 C	5.94 CD	13.00 CD
1.5 K . Gy *	-	-	0.0 D	0.0 E	0.0 E	-	-	0.0 C	0.0 E	6.16 F
2.5 K . Gy *	-	-	0.0 D	0.0 E	0.0 E	-	-	0.0 C	0.0 E	0.0 G
3.5 K . Gy *	-	-	0.0 D	8.14 BC	18.87 B	-	-	0.0 C	6.71 C	16.43 B
Hot water	-	-	5.20 B	9.20 B	15.00 C	-	-	3.20 B	9.20 B	14.20 BC
Fungicide (0.5 g /L)	-	-	1.75 C	6.81 C	14.20 C	-	-	0.0 C	5.81 CD	10.14 DE
Fungicide(1.0 g /L)	-	-	0.0 D	2.98 D	4.47 D	-	-	0.0 C	0.0 E	0.0 G
E.V.C.(25%)	-	-	0.0 D	0.0 E	4.09 D	-	-	0.0 C	0.0 E	0.0 G
E.V.C.(50%)	-	-	0.0 D	0.0 E	0.0 E	-	-	0.0 C	0.0 E	0.0 G

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

before-cooling (8.14%),irradiation dose 3.5K.Gy after cooling (7.25%) and fungicide 0.5gm/L.(6.81%) for the first seasons,whereas the highest discarded fruit % was obtained with control.Moreover,with advanced in cold storage time and after 35 days in cold storage,still those fruits that were treated with E.V.C 50%, irradiation doses 1.5 and 2.5K.Gy before - cooling and 2.5K.Gy after cooling recorded the least discarded fruits% followed by E.V.C 25% and fungicide 1.0gm/L.were recorded 4.09 and 4.47 recpectively.While,the highest discarded fruits% was exhibited with irradiation dose 3.5K.Gy before-cooling (18.87%) followed by hot water and fungicide 0.5gm/L.were recorded 15.00% and 14.20% recpectively However,after 35 days of cold storage, the untreated fruits were discarded due to it is recorded percentage of decay reached above 50% .While E.V.C 50%,irradiation doses 1.5 and 2.5K.Gy before-cooling and irradiation dose 2.5K.Gy after cooling treatments recorded no discarded fruits%. The high significant effect in this respect was in E.V.C 50%,irradiation doses 1.5 and 2.5 before- cooling and irradiation dose 2.5K.Gy.The same trend of
results was also found in the second season.

It could be concluded that Hachiya cv. "persimmon" fruits could be stored well for 28 days after being treated (post harvest treatment)with the two E.V.C and irradiation doses 2.5K.Gy after or before-cooling.

1-2-Fruit weight loss(%).

Data presented in table (17)show the development of weight loss% of Hachiya cv. persimmon fruits as affected by irradiation doses, hotwater, fungicide and ethanol vapor concentration (E.V.C.) and stored at 0 ± 2˚C and 90- 95 % RH during 2005 and 2006 seasons.

There was an obvious increase in weight loss% with extention in cold storage duration regardless of the used treatments.However,there was a significant effect of most treatments on reducing the rate of weight loss especially with E.V.C 50% and 25%,fungicide 1.0g /L.and all irradiation
doses(1.5,2.5 and 3.5K.Gy) either before and after cooling compared to

Table (17):Effect of some post -harvest treatments on fruit weight loss % of Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage									
	2005 seasons.					2006 seasons.				
	7	14	21	28	35	7	14	21	28	35
Control	0.90 BC	1.78 CD	4.46 A	6.20 A	7.90 A	1.00 B	2.35 A	4.53 A	4.94 B	6.34 A
1.5 K . Gy	0.86 B-D	1.64 D-F	2.74 D	4.11 DE	5.75 CD	0.96 B	1.85 BC	3.62 B	4.42 C	5.16 CD
2.5 K . Gy	0.80 CD	18.4 BC	2.82 D	4.32 D	5.40 DE	1.06 B	2.00 B	3.54 B	4.35 C	5.42 B-D
3.5 K . Gy	0.95 B	2.00 B	3.20 CD	5.32 B	6.49 B	0.96B	19.2 BC	3.54 B	5.10 B	6.11 AB
1.5 K . Gy *	0.88 B-D	1.84 BC	3.11 CD	4.56 CD	5.10 DE	1.00 B	1.88 BC	3.26 B	4.10 CD	5.40 CD
2.5 K . Gy *	0.86 B-D	1.62 D-F	3.17 CD	3.60 EF	4.82 EF	0.96 B	1.78 B-D	3.10 BC	3.65 D	4.84 D
3.5 K . Gy *	0.92 BC	1.56 EF	3.00 CD	5.54 B	6.12 BC	0.90 B	1.90 BC	3.06 BC	4.22 C	5.84 A-C
Hot water	1.20 A	2.64 A	3.20 CD	5.10 BC	6.72 B	1.40 AB	2.61 A	4.44 A	5.73 A	6.45 A
Fungicide (0.5 g /L)	0.85 B-D	1.81 B-D	3.45 BC	5.32 B	6.42 BC	0.96 B	1.89 BC	3.74 B	5.00 B	6.10 AB
Fungicide(1.0 g /L)	0.85 BD	1.70 C-E	3.74 B	5.42 B	6.16 BC	3.58 A	1.96 B	3.65 B	5.10 B	6.20 A
E.V.C.(25%)	0.80 CD	1.49 F	2.20 E	3.45 F	4.88 EF	0.80 B	1.52 D	2.32 D	4.10 CD	5.06 D
E.V.C.(50%)	0.75 D	1.56 EF	2.15 E	3.20 F	4.32 F	0.88 B	1.60CD	2.58 CD	3.98 CD	4.90 D

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

hot water, fungicide 0.5g/L.and untreated fruits (control). After 28 days of cold storage the least weight loss percentage was recorded by the two E.V.C 25 and 50% and irradiatio doses 1.5 and 2.5K.Gy before or after cooling(0.0).While the highest values in the irradiation doses 3.5K.Gy before cooling (5.54%)followed by fungicide 1.0gm/L.(5.42%),irradiation dose 3.5 K. Gy after cooling (5.32%), fungicide 0.5gm/L.(5.32%), and the hot water (5.10%) at the same days of cold storage.On the other hand, after 35 days of cold storage the least weight loss was recorded with E.V.C 50%,irradiation doses 2.5K.Gy before- cooling(4.82%), E.V.C 25% (4.88%),irradiation doses 1.5K.Gy before- cooling(5.10%),irradiation doses 2.5K.Gy after cooling(5.40%) and irradiation dose 1.5 K. Gy after cooling (5.75%) but there was a highly increase in fruit weight loss% by hot water treatment (6.72%) next irradiation dose 3.5K.Gy after-cooling treatment was recorded (6.49%), fungicide 0.5 gm/L. (6.42%), fungicide 1.0 gm/L. (6.16%) and irradiation dose 3.5 K. Gy befor cooling (6.12%)at the same days of cold storage. The same trend of results was also found in the second season.

1-3-Fruits firmness(Lb./inch^2)

Data presented in table (18)show the effect of different treatments on flesh firmness of Hachiya cv. persimmon fruits stored at 0 ± 2˚C and 90- 95 % RH during 2005 and 2006 seasons.

Generally, it could be noticed that fruit firmness decreased with advanced cold storage durations regardless of the used treatments However,it is clear that all used treatments significantely decreased fruit flesh softening during all cold storage durations compared to control.

At the beginning of cold storage experiment, there were no differences between different treatments or untreated fruits (control) After 21 days of cold storage, (first season). The highest fruit firmness(5.92 Lb./inch^2)was recorded with those fruit treated by E.V.C 50% followed 25% E.V.C, 0.5 gm/L.fungicide ,hot water and 2.5K.Gy irradiation doses

Table (18):Effect of some post -harvest treatments on fruit firmness (Ib/inch2) of Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	9.08 A	7.08 A	5.08 B	3.58 E	2.42 B	1.83 D	8.42 A	7.08 A	5.00 D	4.08 E	3.00 C	2.08 G
1.5 K . Gy	9.17 A	6.75 A	6.08 A	5.08 C	4.25 A	3.92 AB	8.42 A	7.33 A	6.42 A	5.50 A-C	4.25 B	3.42 DE
2.5 K . Gy	8.41 A	7.17 A	5.92 A	5.33 BC	4.88 A	4.00 AB	8.50 A	7.08 A	6.17 A-C	5.42 A-C	4.25 B	3.58 C-E
3.5 K . Gy	8.58 A	7.08 A	6.08 A	3.92 DE	2.50 B	1.58 D	8.08 A	7.00 A	5.83 BC	4.33 E	3.00 C	2.83 F
1.5 K . Gy *	8.66 A	7.25 A	6.08 A	5.08 C	5.00 A	4.17 AB	8.67 A	7.17 A	6.08 A-C	5.67 AB	4.67 B	3.25 EF
2.5 K . Gy *	9.08 A	7.50 A	6.25 A	5.42 A-C	4.83 A	4.15 AB	8.25 A	7.42 A	5.75 C	5.08 B-D	4.17 B	3.92 C
3.5 K . Gy *	9.00 A	6.92 A	6.00 A	4.33 D	2.08 A	1.92 D	8.67 A	7.17 A	6.16 A-C	4.50 DE	3.58 C	2.17 G
Hot water	8.58 A	7.42 A	6.00 A	5.58 A-C	4.08 A	3.00 C	8.33 A	7.33 A	5.92 A-C	4.50 DE	3.17 C	5.67 A
Fungicide (0.5 g /L)	8.92 A	6.92 A	5.83 A	5.58 A-C	4.50 A	3.50 BC	8.50 A	6.83 A	6.42 A	5.08 B-D	4.50 B	3.92 C
Fungicide (1.0 g /L)	9.25 A	6.67 A	6.17 A	5.42 A-C	4.58 A	3.50 BC	8.33 A	7.25 A	5.83 BC	5.00 CD	4.33 B	3.83 CD
E.V.C.(25%)	8.83 A	7.33 A	6.08 A	5.75 AB	4.83 A	4.00 AB	8.50 A	6.75 A	6.33 AB	6.00 A	5.83 A	5.33 AB
E.V.C.(50%)	9.08 A	6.75 A	6.33 A	5.92 A	5.00 A	4.42 A	8.25 A	6.83 A	6.08 A-C	6.00 A	5.75 A	5.08 B

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

before or after cooling recorded 5.75, 5.58,5.58,5.42 and 4.33 Lb./inch^2 respectively.On the other hand, after 28 days of cold storage,the highest fruit firmness(5.00Lb./inch^2)was recorded by 50% E.V.C, irradiation dose 1.5K.Gy before-cooling(5.00 Lb./inch^2)and irradiation dose 2.5 K.Gy after cooling(4.88 Lb./inch^2).On the other hand, the lowest fruit firmness(2.08 Lb./ inch^2) was obtained with irradiation dose before-cooling followed by irradiation dose 3.5K.Gy after cooling (2.50 Lb./inch^2).Moreover, after 35 days of cold storage the best treatment in this respect was E.V.C 50% but the lowest treatment was with irradiation dose3.5K.Gy after cooling.

In the second season and after 28 days of cold storage the best values of fruit firmness (5.83 Lb./inch^2)was obtained with E.V.C 25% but the lowest fruit firmness(3.00 Lb./inch^2) was recorded by using irradiation dose 3.5K.Gy after cooling.While, the highest values of fruit firmness (5.67 Lb./ inch^2) with hot water treatment after 35 days of cold storage.

1-4-Shelf-life(marketability)

Results of table (19) show the effect of different treatments on shelf life(in days) of Hachiya cv. persimmo fruits stored at 0 ± 2˚C and 90- 95 % RH during 2005 and 2006 seasons.

It could be concluded that, as days of cold storage was increased shelf life in days was decreased.However,the high shelf life(7.67 and 6.33 days) was obtained with the fruits treated with 50% E.V.C and 25% E.V.C followed by irradiation dose 2.5K.Gy after or before-cooling (5.33 and 5.00 days) days respectively.It is clear that, the treated fruits significantly differed between them and all with untreated fruits(control).However,the fruits treated with irradiation dose 3.5K.Gy after or before-cooling had less marketing life(2.33 day) than other treatments.This finding generally, could be attributed to the favorable effect of ionizing radiation (3.5 K.Gy) which induced an increase in respiration rate of fruits. This action was accompanied by an improvementin the senescence of fruits.

No differences were noticed during the second season of study.

The obtained data are in agrement with those of **Kushad and Myron (1989)** who investigated the effect of ionizing irradiation on fruit firmness of Staymen apples. They reported that irradiation at 60 K rad resulted in a loss of fruit firmness and reduced in fruit quality overall. There was no difference in quality between unirradiated and irradiated fruits with the use of radiation dose level of 30 K rad dose. The results suggest that irradiation dose not increased the storage life, in addition, a dose of 30 K rad is generally low for effective quarantine treatment.

Regarding hot water treatments, the obtained data are in lines with **Oosthuyse (1996)**who treated mango fruit with hydro heating at 50 or 55°C for 5 or 7 min., after treatment fruits were stored at 11°C for 28 days and ripened at 20°C. Fruits treated for 5 or 7 min. at 50°C had the best flavour. After treatment for 5 min, skin colouration increased with the increase in bath temperature, but it decreased with the increase in bath temperature following treatment for 7 min. The percentage of good quality fruit present on ripening was greatest following treatment for 5 or 7 min at
50°C. Hydro heating at 50°C for 5 min is recommended.

In regard to ethanol vapor treatments, the obtained results are similar to those found by **Cote et al.,1993 and Abd El-Samad,(1998).** It seems that ethanol vapor has a direct or indirect protective role for cell membrane as well as ethylene production system. Besides in reducing respiration and protecting ethylene producing system ethanol vapor role in protecting cell membrane is another suggested role for ethanol in reducing fruit sensitivity to chilling injury**.**

Regarding the effect of fungicide treatments, the obtained data are in harmony with those of **McDonald et al.,(1991)** who applied 1000 ppm TBZ or IMZ at 24 or 53°C to grapefruit.fruits to reduce fruit suceptibility to chilling injury and decay.They noticed that fruits dipped in fungicides had less chilling injury than fruits dipped in water alone. They added that IMZ was

Table(19):Effect of some post-harvest treatments on marketability

shelf -life in days of Hachiya cv. Persimmon fruits stored at 0 ± 2°C and 90 – 95 RH f for 35 days during 2005 and 2006 seasons.

Treatments	Days in cold storage	
	2005 seasons.	2006 seasons.
Control	2.00 F	2.33 E
1.5 K . Gy	5.00 C	6.00 BC
2.5 K . Gy	5.33 BC	6.33 B
3.5 K . Gy	2.33 EF	2.67 E
1.5 K . Gy*	5.00 C	6.00 BC
2.5 K . Gy*	5.00 C	6.33 B
3.5 K . Gy*	2.33 EF	2.67 E
Hot water	3.33 DE	2.33 E
Fungicide (0.5 g /L.)	3.67 D	3.67 D
Fungicide (1.0 g /L.)	3.67 D	5.33 C
E.V.C. (25 %)	6.33 B	6.33 B
E.V.C. (50%)	7.67 A	7.33 A

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy* : Irradiation with pre-cooling

more effective in reducing cilling injury than TBZ.Fungicides reduced decay principally stem-end rot and *(Penicillium)* at both temperatures.

2-Chemical determinations

2-1-Total soluble solids(T.S.S%)

Data presented in table (20)show the effect of irradiation doses(after and pre-cooling), hot water, fungicide and ethanol vapor concentration (E.V.C.)on Total soluble solids % of Hachiya cv. persimmon fruits stored at 0 ± 2˚C and 90-95 % RH during 2005 and 2006 seasons.

It is clear that total soluble solids were increased with the extention of in cold storage period, regardless of the used treatments.At the beginning and the ending of cold storage duration,no significant differences were obtained between the used treatments and control.

However,with advanced cold storage duration and after 28 days in the first season higher T.S.S (21.80%)was obtained with 3.5 K.Gy irradiation dose before-cooling followed by those treated with hot water(21.53%), next (21.40%) with 1.5K.Gy irradiation dose before-cooling.

On the other hand, after 35 days of cold storage duration,no significant differences were obtained between the other treatments and control.the higher T.S.S% values were recorded (23.20, 23.0, 23.0,22.60 and 22.40% with hot water, E.V.C 25%, irradiation dose 2.5K.Gy after cooling, fungicide 1.0 gm /L.and fungicide 0.5 gm /L. respectively. Whereas,the lowest value obtained with irradiation dose 1.5K.Gy treatment (21.40%) The increase in total soluble solids with increasing cold storage duration was attributed to the conversion of some complex substances such as starch to simple substances like sugar and other solutes and consequently sugars content which presented and major contant of T.S.S%, increased.

In the seconed season, at the beginning and the ending of cold storage

Table (20):Effect of some post -harvest treatments on total soluble solids (TSS%) of Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	16.27 A	16.80 A	18.20 A	19.80 A	20.40 A	21.80 A	14.40 A	15.40 A	17.60 A	18.40 A	19.00 A	20.60 A
1.5 K . Gy	16.07 A	17.27 A	17.87 A	19.40 A	20.40 A	21.40 A	14.80 A	15.80 A	16.60 A	17.40 A	19.20 A	19.80 A
2.5 K . Gy	16.20 A	17.00 A	18.07 A	20.20 A	21.00 A	23.00 A	14.80 A	15.40 A	17.00 A	18.20 A	20.00 A	21.60 A
3.5 K . Gy	15.67 A	16.67 A	17.60 A	19.60 A	20.60 A	21.80 A	14.20 A	15.20 A	17.20 A	18.40 A	19.80 A	20.40 A
1.5 K . Gy *	16.60 A	16.20 A	17.80 A	20.33 A	21.40 A	21.80 A	15.00 A	15.80 A	16.80 A	18.20 A	20.00 A	20.80 A
2.5 K . Gy *	15.80 A	16.80 A	18.40 A	19.81 A	20.80 A	21.60 A	14.80 A	16.00 A	17.40 A	18.40 A	19.20 A	21.20 A
3.5 K . Gy *	16.40 A	17.20 A	18.40 A	19.60 A	21.80 A	21.60 A	15.00 A	16.80 A	16.60 A	18.60 A	19.80 A	21.47 A
Hot water	16.20 A	16.40 A	18.60 A	19.60 A	21.53 A	23.20 A	15.20 A	15.60 A	16.40 A	17.80 A	20.00 A	21.20 A
Fungicide (0.5 g /L)	15.60 A	16.60A	18.20 A	19.40 A	20.60 A	22.40 A	14.40 A	15.60 A	17.00 A	18.20 A	20.20 A	21.00 A
Fungicide (1.0 g /L)	15.40 A	16.80 A	17.80 A	20.00 A	20.40 A	22.60 A	15.00 A	15.80 A	17.00 A	18.60 A	19.20 A	20.40 A
E.V.C.(25%)	16.80 A	17.20 A	18.60 A	20.20 A	20.80 A	23.00 A	15.20 A	15.33 A	16.80 A	18.40 A	19.80 A	20.60 A
E.V.C.(50%)	16.20 A	17.00 A	17.80 A	20.00 A	20.80 A	22.20 A	14.60 A	15.40 A	17.00 A	18.60 A	19.40 A	21.40 A

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

duration,no significant differences were obtained between the used treatments and control.However, with advanced cold storage duration and after 28 days higher T.S.S (20.20%) was obtained with fungicide 0.5 gm/L. followed by those treated with irradiation dose 1.5K.Gy before-cooling(20.00%),next irradiation dose 2.5 K.Gy after cooling(20.00%) and next hot water 20.00%.After 35 days higher T.S.S (21.60%)was obtained with irradiation dose 2.5K.Gy after cooling followed by those treated with irradiation dose 3.5K.Gy before-cooling (21.47%) and next E.V.C 50% (21.40%).

On the other hand,the reduction of T.S.S after 35 days of cold storage could be due to the exhausting of sugars in respiration process.

2-2-Titratable acidity(gm/100g fresh weight)

The results shown in table (21) demonstrate the effect of irradiation doses(after or before-cooling),hot water, fungicide and ethanol vapor concentration (E.V.C.)on titratable acidity of Hachiya cv. persimmon fruits stored at 0±2˚C and 90-95% RH during 2005 and 2006 seasons.

Generally,it could be noticed that fruit acidity was decreased with advanced cold storage periods regardless of the used treatments which means progress in fruit ripening stage in all used treatments.This finding could be attributed to that fruit acids consumed in respiration process with advancement in ripening.No significant differences were found between the control and all other treatments from the beginning even at the end of cold storage duration.The differences in fruit acidity were noticed after 35 days of cold storage,but fungicide 0.5g/L. treated fruits recorded 0.110 gm/100g fresh weight and irradiation dose 3.5K.Gy recorded 0.110 gm/100g fresh weight high values of fruit acidity than other treatments,but the lowest value recorded was 0.090 gm/100g fresh weight in hot water treatment within the first season of study.

Table (21):Effect of some post -harvest treatments on titratable acidity (T.A.%) o Hachiya cv. Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	0.195 A	0.181 A	0.150 A	0.127 A	0.115 A	0.109 A	0.224 A	0.208 A	0.183 A	0.145 A	0.120 A	0.102 A
1.5 K . Gy	0.186 A	0.176 A	0.156 A	0.129 A	0.110 A	0.095 A	0.230 A	0.206 A	0.184 A	0.157 A	0.124 A	0.110 A
2.5 K . Gy	0.192 A	0.180 A	0.160 A	0.125 A	0.116 A	0.098 A	0.229 A	0.211 A	0.179 A	0.146 A	0.120 A	0.112 A
3.5 K . Gy	0.198 A	0.180 A	0.152 A	0.130 A	0.115 A	0.100 A	0.227 A	0.207 A	0.178 A	0.152 A	0.128 A	0.106 A
1.5 K . Gy *	0.192 A	0.180 A	0.150 A	0.130 A	0.117 A	0.097 A	0.230 A	0.207 A	0.177 A	0.142 A	0.136 A	0.101 A
2.5 K . Gy *	0.192 A	0.176 A	0.156 A	0.128 A	0.112 A	0.093 A	0.242 A	0.201 A	0.182 A	0.153 A	0.132 A	0.113 A
3.5 K . Gy *	0.187 A	0.170 A	0.161 A	0.132 A	0.120 A	0.110 A	0.233 A	0.211 A	0.186 A	0.152 A	0.121 A	0.118 A
Hot water	0.185 A	0.170 A	0.154 A	0.128 A	0.112 A	0.090 A	0.243 A	0.217 A	0.177 A	0.145 A	0.136 A	0.117 A
Fungicide (0.5 g /L)	0.185 A	0.172 A	0.154 A	0.130 A	0.112 A	0.110 A	0.217 A	0.206 A	0.177 A	0.154 A	0.120 A	0.108 A
Fungicide (1.0 g /L)	0.189 A	0.175 A	0.160 A	0.127 A	0.120 A	0.102 A	0.218 A	0.207 A	0.182 A	0.153 A	0.125 A	0.121 A
E.V.C.(25%)	0.191 A	0.180 A	0.150 A	0.136 A	0.117 A	0.100 A	0.236 A	0.214 A	0.174 A	0.142 A	0.130 A	0.112 A
E.V.C.(50%)	0.180 A	0.172 A	0.155 A	0.128 A	0.112 A	0.105 A	0.247 A	0.211 A	0.182 A	0.140 A	0.122 A	0.115 A

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

Data of the second season showed some differences in titratable acidity with different treatments, no significant difference was observed till the 35 days of cold storage.Fungicide 1.0g /L. treatments exhibited the high fruits acidity where recorded 0.121 gm/100g fresh weight, but the lowest treated irradiation dose 1.5K.Gy before-cooling was recorded 0.101 gm/ 100g fresh weight followed by irradiation dose 3.5K.Gy after cooling which recorded 0.106 gm/100g fresh weight.However,a significant treatments effect was noticed compared to control values .

2-3-tannins content(gm/100g fresh weight)

Data presented in table (22)show the effect of irradiation doses, hot water, fungicide and ethanol vapor concentration(E.V.C.)on tannins content of Hachiya cv.persimmon fruits stored at 0±2˚C and 90-95% RH during 2005 and 2006 seasons.

Tannins content was decreased with treated or untreated fruits with advanced cold storage duration.No significant differences were noticed between different treatments and control till 14 days of cold storage.However,after 21 days, control fruits exhibited the least value of total tannins than all treatments.After 28 days of cold storage, hot water treated fruits contained less values of total tannins than others. This finding is correlated with that previously mentioned about acidity and T.S.S where this treatment recorded less fruit quality characters.However, after 35 days of cold storage hot water treated fruits contained less values of tannins content than others which was recorded(6.91gm/100g fresh weight).Whereas, high value of tannins content (13.45 gm/100g fresh weight was recorded by E.V.C 50% treated fruits followed by E.V.C 25%,irradiation dose 1.5K.Gy before-cooling and irradiation dose 2.5 K.Gy after cooling which were recorded 11.70 gm/100g fresh weight, 11.10 gm/100g fresh weight and 10.86 gm/100g fresh weight recpectively.

Table (22):Effect of some post -harvest treatments on tannins content mg / 100 g fresh weight of Hachiya cv.Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	27.20 A	21.56 A	15.60 B	11.32 C	9.12 C	7.30 C	29.40 A	24.14 A	18.56 C	14.20 C	9.20 C	6.50 C
1.5 K . Gy	27.96 A	21.63 A	18.10 A	15.44 AB	13.45 AB	10.16 A-C	30.24 A	24.10 A	20.80 A-C	17.00 B	13.84 AB	10.93 AB
2.5 K . Gy	26.60 A	21.69 A	18.20 A	15.56 AB	14.07 AB	10.86 A-C	28.64 A	23.96 A	20.16 BC	17.20 B	14.10 AB	11.20 AB
3.5 K . Gy	27.31 A	20.89 A	18.74 A	13.20 BC	11.04 BC	8.62 BC	29.10 A	23.88 A	19.24 BC	14.20 C	12.30 A-C	8.22 BC
1.5 K . Gy *	25.70 A	21.54 A	19.00 A	16.10 AB	13.20 AB	11.10 A-C	29.41 A	23.90 A	19.10 C	16.20 B	14.64 A	11.20 AB
2.5 K . Gy *	28.53 A	20.44 A	19.30 A	15.90 AB	14.00 AB	10.54 A-C	30.67 A	24.84 A	19.64 BC	17.88 B	14.00 A	10.86 AB
3.5 K . Gy *	26.10 A	22.40 A	18.76 A	14.26 BC	10.20 BC	8.00 BC	30.82 A	24.66 A	19.84 BC	12.56 C	10.14 AB	7.42 BC
Hot water	27.34 A	22.00 A	19.00 A	13.13 BC	10.12 BC	6.91 C	28.67 A	24.84 A	19.20 C	13.44 C	10.10 BC	7.11 BC
Fungicide (0.5 g /L)	26.82 A	20.94 A	19.30 A	13.81 BC	11.89 BC	8.24 BC	29.10 A	24.33 A	20.00 BC	17.20 B	13.22 A-C	9.44 A-C
Fungicide (1.0 g /L)	26.39 A	21.47 A	18.20 A	14.22 BC	11.43 BC	8.65 BC	29.10 A	25.20 A	20.00 BC	17.00 B	14.50A	10.00 A-C
E.V.C.(25%)	25.67 A	20.80 A	18.80 A	16.44 AB	14.20 AB	11.70 AB	29.00 A	25.10 A	21.75 AB	19.51 A	16.32 A	12.74 A
E.V.C.(50%)	27.02 A	22.53 A	19.41 A	18.20 A	16.09 A	13.45 A	28.80 A	25.10 A	22.84	20.06 A	16.00 A	11.44 AB

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

Data of the second season showed some differences in total tannins content where hot water and irradiation dose 3.5K.Gy before and after cooling induced less values of total tannins than others which recorded 7.11 gm/100g fresh weight,7.42 gm/100g fresh weight and 8.22 gm/100g fresh weight recpectively after 35 days of cold storage. While,the high value of total tannins was 12.74 with E.V.C 25% treated followed by E.V.C 50%,irradiation dose 1.5K.Gy before-cooling and irradiation dose 2.5K.Gy after cooling recorded 11.44 gm/100g fresh weight, 11.20 gm/100g fresh weight and 11.20 gm/100g fresh weight recpectively.

On the other hand, the best treatment was the use of ionizing radiation at the different dose levels whether before or after –cooling. With 3.5k.Gy dose the result was 7.42 gm/100g fresh weight while, irradiation dose 3.5K.Gy before-cooling and (8.22 gm/100g fresh weight irradiation dose 3.5K.Gy after cooling and hot water treatment.

2-4-Total sugars(gm/100g fresh weight)

Data presented in table (23)show the effect of irradiation doses(befor or after-cooling), hot water, fungicide and ethanol vapor concentration (E.V.C.)on total sugars of Hachiya cv. persimmon fruits stored at 0±2˚C and 90-95% RH during 2005 and 2006 seasons.

The same trend of results obtained in T.S.S was also achieved in total sugar contents during the two studied seasons.No significant differences between different treatments or control were observed during all cold storage duration. However, an obvious increase in total sugars was noticed till 35 days of cold storage and declined after that,the reduction of sugars with advanced storage periods could be attributed to the consumption of these sugars in respiration process.However,in the first season, and after 35 days of cold storage,the highest total sugars attained byusing E.V.C 25% was 19.9% followed by irradiation dose 2.5K.Gy after cooling, E.V.C 50% and hot water. The values were recored 19.7%,19.4% and 19.3% recpectively while the

Table (23):Effect of some post -harvest treatments on total sugers of Hachiya cv. Persimmon in cold storage at 0±2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	12.9 A	13.6 A	14.3 BC	16.8 A	17.3 AB	18.9A-D	11.4 A	12.8 A	13.8 A	14.2B-D	15.9B-D	16.8B-D
1.5 K . Gy	13.2 A	13.7 A	14.7A-C	15.3 BC	16.5 BC	18.2B-D	12.2 A	12.8 A	13.5 A	13.8 CD	15.1 E	17.1B-D
2.5 K . Gy	12.7 A	13.2 A	14.8A-C	15.2 C	16.0 C	19.7 AB	12.4 A	12.6 A	13.9 A	14.6A-C	16.4 AB	17.8A-C
3.5 K . Gy	12.5 A	12.6 A	15.3A-C	15.9A-C	17.1A-C	18.2B-D	11.8 A	12.9 A	14.1 A	14.9 AB	15.4C-E	16.7 CD
1.5 K . Gy *	12.8 A	13.1 A	14.2 C	15.1 C	16.6 BC	17.9 CD	11.5 A	13.1 A	`14.1 A	14.3B-D	15.4C-E	17.2A-D
2.5 K . Gy *	13.1 A	13.5 A	14.5A-C	15.3 BC	17.1A-C	17.6 DE	12.1 A	12.8 A	13.9 A	13.6 D	15.2 DE	16.6 D
3.5 K . Gy *	13.1 A	13.9 A	15.6 AB	16.0A-C	16.8A-C	18.2B-D	12.0 A	13.1 A	13.8 A	14.3B-D	16.0 BC	17.3A-D
Hot water	13.1 A	12.9 A	15.4 AB	16.8 A	17.9 A	19.3A-C	11.8 A	12.6 A	13.9 A	15.3 A	16.7 A	18.3 A
Fungicide (0.5 g /L)	12.8 A	12.6 A	14.3 BC	15.3 BC	16.5 BC	16.4 E	12.3 A	13.1 A	14.1 A	15.4 A	15.9B-D	17.6A-D
Fungicide (1.0 g /L)	12.8 A	12.4 A	15.1A-C	16.1A-C	17.4 AB	18.3B-D	12.1 A	13.2 A	14.1 A	14.8 AB	15.2C-E	16.8B-D
E.V.C.(25%)	13.3 A	13.1 A	14.8A-C	16.7 AB	17.2 AB	19.9 A	11.6 A	13.8 A	14.3 A	14.9 AB	15.2 DE	16.9B-D
E.V.C.(50%)	12.8 A	13.1 A	15.2A-C	16.8 A	17.3 AB	19.4A-C	12.3 A	13.4 A	14.3 A	15.1 AB	16.4 AB	17.9 AB

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

lowest total sugars was 0.5g /L. by using fungicide and recorded 16.4% followed by irradiation dose 2.5K.Gy before-cooling (17.6%).

On the other hand,in the second seasons,and after 35 days the higher total sugars was found by using hot water followed by E.V.C 50% , irradiation dose 2.5K.Gy after cooling and irradiation dose 3.5 K.Gy before-cooling were recorded 17.9%,17.8% and 17.3% recpectively.

The lowest total sugars recorded was 16.6% with irradiation dose 2.5 K.Gy before-cooling treated.

2-5-Respiration rate(mg co_2/Kg fruit /hr.)

Data tubulated in table (24)show the effect of irradiation doses, hot water, fungicide and ethanol vapor concentration(E.V.C.)on respiration rate of Hachiya cv. persimmon fruits stored at 0±2˚C and 90-95% RH during 2005 and 2006 seasons.

At the beginning of cold storage duration, respiration rate was high and ranged from 5.60 to 11.90 mg co_2/Kg/hr.,However,minimum respiration rates was noticed with E.V.C 50% and E.V.C 25%. On the contrary, high respiration rates were obtained with fungicide 1.0gm/L.,all irradiation doses after or before-cooling and control.After 7 days of cold storage, respiration rate was decreased. However, minimum respiration rate was noticed with E.V.C 50% where it recorded 2.09 mg co_2/Kg fruit /hr. While, high respiration rate was noticed with irradiation dose 2.5K.Gy before-cooling after 7 days of cold storage in the first season. After 14,21,28 and 35 days of cold storage respiration rate was increased.On the other hand,at the end of cold storage duration (35 days in the first season) respiration rate was high and ranged from 3.90 to 7.69 mg co_2/Kg/hr.However,minimum respiration rate was noticed with E.V.C 50% which recorded 3.90 mg co_2/Kg fruit /hr.followed by E.V.C 25%,irradiation dose 1.5K.Gy before-cooling and irradiation dose 1.5K.Gy after cooling recorded 4.32,5.10 and 5.10 mg co_2/Kg fruit /hr. recpectively.But the high respiration rate was noticed with control and

Table (24):Effect of some post -harvest treatments on the respiration rate (CO 2 mg / kg fruit h.) of Hachiya Persimmon in cold storage at 0 ± 2°C and 90 – 95RH during 2005 and 2006 seasons.

Treatments	Days in cold storage											
	2005 seasons.						2006 seasons.					
	0	7	14	21	28	35	0	7	14	21	28	35
Control	11.32 A	3.11 A	4.10 A	4.86 A	6.100 A	7.69 A	11.42 A	3.10 A	4.20 A	5.08 A	6.43 A	7.11 A
1.5 K . Gy	10.72 A	3.08 A	3.20 BC	3.94 B	4.64 B	5.10 B	11.88 A	3.20 A	3.81 AB	4.21 AB	4.85 BC	5.32 B-D
2.5 K . Gy	11.78 A	3.13 A	3.50 AB	3.62 BC	4.44 BC	5.14 B	11.40 A	3.42 A	3.65 AB	4.45 AB	4.80 BC	5.12 CD
3.5 K . Gy	10.70 A	3.12 A	4.10A	5.44 A	6.20 A	7.12 A	12.10 A	3.70 A	3.94 A	4.92 AB	5.32 A-C	6.42 A-C
1.5 K . Gy *	11.20 A	3.08 A	3.73 AB	4.00 B	4.70 B	5.10 B	11.30 A	3.44 A	3.51 AB	4.09 AB	4.32 B-D	5.44 B-D
2.5 K . Gy *	10.70 A	3.24 A	3.55 AB	4.11 B	4.70 B	5.29 B	12.06 A	3.23 A	3.72 AB	4.10 AB	4.56 B-D	5.00 CD
3.5 K . Gy *	11.00 A	3.00 A	3.61 AB	5.36 A	5.98 A	6.82 A	12.00 A	3.10 A	4.00 A	4.98 AB	5.64 AB	6.65 AB
Hot water	11.20 A	2.98 A	3.58 AB	5.24 A	6.20 A	7.64 A	11.42 A	3.25 A	4.25 A	5.10 A	6.21 A	7.02 A
Fungicide (0.5 g /L)	10.74 A	3.06 A	3.62 AB	4.12 B	4.80 B	5.25 B	11.42 A	3.36 A	4.00 A	4.12 AB	5.50 AB	6.12 A-C
Fungicide (1.0 g /L)	11.90 A	3.00 A	3.60 AB	4.10 B	5.00 B	5.22 B	12.10 A	3.45 A	4.00 A	4.64 AB	5.47 AB	6.20 A-C
E.V.C.(25%)	6.20 B	2.38 B	2.98 BC	3.60 BC	4.00 BC	4.32 B	7.11 B	2.64 AB	3.01 BC	3.64 B	3.98 CD	5.10 CD
E.V.C. (50%)	5.60 B	2.09 B	2.64 C	3.09 C	3.50 C	3.90 B	6.00 B	2.11 B	2.42 C	3.60 B	3.26 D	4.10 D

Values followed by the same letter (s) are not significantly different at 5% level
E.V.C. : Ethanol vapor concentration
K . Gy * : Irradiation with pre-cooling

hot water recorded 7.69 mg co_2/Kg fruit /hr. and 7.64 mg co_2/Kg fruit /hr.

The same trend of results was also found in the second season.

The obtained results are in agrement with those of **Farooqi et al., (1987)** who found that irradiated Kinnow mandarins with gamma rays at doses of 1,2 or 3 K.Gy developed skin injure during subsequent storage in perforated cardboard boxes held at room temperature(20-25 °C)for 5 weeks. Irradiation increased respiration and ethylene production during storage but had no - significant effect on fruit chemical composition (ascorbic acid ,citric acid,and reducing and non- reducing sugars).

Regarding hot water treatments, the obtained data are in lines with **(Woolf et al., 1995)**on mango **(McCollum et al 1993)** on persimmon. **(Lay-Yee et al.,1997**and **Woolf et al.,1997)** found that Post-harvest heat treatment applied prior to low temperature storage can reduce the incidence of chilling injury in cold-sensitive fruits, such as avocado. Also, **Bhadra and Sen(1999)** found that harvest Custard apple fruits and treated them with hot-water at 52°C, whereas control fruits were dipped in distilled water at 28- 32°F TSS**,**total sugar and reducing sugar contents increased as storage progressed, whereas titratable acidity and ascorbic acid content decreased.

With regard to, ethanol vapor treatments of fruits, the obtained results are similar to those found by **Pesis et al., (1997)** who treated Tommy Atkins and Keitt mango fruits by ethanol vapor before cold storage. Ethanol vapor reduced CI symptoms that developed at 5°C .

Regarding the effect of fungicide treatments, the obtained data are in harmony with **Sharma et al.,(1997)** who studied the development of storage scab in Golden Delicious and Red Delicious apple fruits. The fruits were dipped in fungicidal suspension for 5 minutes. Test fungicides were Bilertanal (0.075%), Captan (0.2%) and Carbendazim **(**0.05%). Observation was recorded on the incidence of scab and fruit and fruit rotting after 45-60 and 90 days. Postharvest fungicidal dip treatment of

apple fruits significantly reduced the incidence of scab in storage. Bitertonal (0.075%)gave complete control of this disease up to 90 days and was followed by Carbendazim dip treatment.

5-SUMMARY AND CONCLUSSION

Two different experiments were carried out during 2005 and 2006 seasons, the **first** was on pre harvest treatments while **second** was on post harvest treatments. Pre harvest treatments including hand or chemical flower thinning of " Montakhab El-Kanater" guavas and " Hachiya " persimmons. Also, the effect of fruit maturity on yield and quality of " Montakhab ElKanater " guavas and " Hachiya " persimmons was also tested.

The second part of this study was carried out during 2005 and 2006 seasons on " Montakhab ElKanater " guava fruits and "Hachiya" persimmon fruits in a private orchard at Badr center , Behira Government , the fruits were picked at maturity stage (mature green for guavas and yellowish color for persimmons). The fruits were immediately transported to the laboratory of Horticulture Dept. Faculty of Agric., Ain shams University. Maturity stage was during the period 2– 8 August of guava fruits and during The period 19 – 26 November of persimmon friuts of the two years (2005 and 2006 respectively) **.**

All treatments in this study were arranged in complete randomized block deign.The obtained data were subjected to analysis of variance using the general linear module procedure of **SAS (1985) ,** where appropriate treatment means were separated using Duncan's multiple range test and all percentages were transferred to angles before statistical analysis.

The obtained data could be summarized as follows:-

I-Pre-harvest treatments

A-Flower thinning

1-On Montakhab El-Kanater guavas

1-1-Yield attributes

1- Fruit set% increased with all treatments (hand or chemical flower thinning) compared to control.

2- Generally,it could be concluded that fruit set with Montakhab El-Kanater guavas greatly increased from6.32%with control to 9.92-11.60% with chemically thinned flowers.

3- The great effect on fruit abscission was obtained with 4% urea Treatment which recorded the least fruit abscission%(12.10 & 11.77%).

4-Total yield data of"Montakhab El-Kanater"guavas showed that all flower thinning treatments increased total yield per tree than control.

5- Additionally,ethrel at 200 ppm treatment was also effective in improvment tree yield of"Montakhab El-Kanater" trees. It is clear that,hand or chemical flower thinning increased tree yield from 38.70 Kg/tree for untreated trees to 44.6-56.4Kg/tree for different thinning treatments.

6-These findings could be attributed to that flower thinning either handly or chemically improved fruit set and consequently improved tree yield.

7- The higher fruit weights(186.6 & 181.1g)were obtained with 4% urea flower thinning treatments for the two studied seasons.

8- Fruit length and diameter(fruit dimension) was clearly affected With thinning treatments than with control.

9- Fruit diameter improved from 3.8-4.1cm for unthinned trees to 4.6-5.7cm for different thinning treatments.

1-2-Fruit quality

1- Maturation in "Montakhab El-Kanater" guavas was advanced with hand or chemical flower thinning by about 2-15 days than unthinned trees.

2- urea and ethrel treatments were similar in their effects during second season.Hand thinning slightly affected fruit maturation by about 2-4 days only than control.

3- Fruit firmness data exhibited a slight effects to different treatments where control fruits recorded 8.60-8.80 Ib./ $inch^2$ opposite 8.60-9.20 Ib./$inch^2$ for different treatments during the studied seasons.

4- urea 4% treatment produced fruit guava fruits than other treatments for both studied seasons.

5- Regarding fruit chemical components, total soluble solids and total acidity slighty affected with different flower thinning treatments. Total soluble solids ranged from 9.2-9.4% for unthinned fruits compared to 9.0 – 9.8% for different treatments with slight significant differences.

6- L-ascorbic acid greatly decreased with hand or chemical flower thinning than control. The decrease of L-ascorbic acid with hand or chemical flower thinning could be attributed to the increase of fruit weight and consequently decrease chemical components as L-ascorbic acid.

7- The significant effect of hand or chemical flower thinning on total msugars% of guava fruits was only noticed with 200ppm ethrel and urea 2%.

2-On Hachiya persimmons

2-1-Yield attributes

1- All flower thinning treatments increased fruit set in "Hachiya" persimmons than control.

2- However,urea 4% and ethrel 200ppm treatments recorded the higher fruit set % (3.63 & 3.44% respectively).

3- Hand thinning was also effective in increasing fruit set% which considered more safty than chemical thinners but labor expensive.

4- Generally,fruit abscission in"Hachiya" persimmons in unthinned trees reached to 22.8-23.1% against 16.2-20.4% for different treatments.

5- However,chemical flower thinning was more effective than hand thinning in increasing total yield.
6- Tree yield increased from 31.7- 33.5Kg/tree for unthinned trees to 35.7-46.2Kg/tree for hand or chemical flower thinning treatments.
7- Urea 4% treatment recorded the high tree yield(45.6 & 46.2Kg / tree) in both studied season.
8- Average fruit weight increased from 124.1-125.7g in unthinned trees to 130.4-146.6g in thinned trees.
9- Fruit dimensions(length & diameter) showed a clear increase as a result of flower thinning compared to control.
10-No significant differences were detected between different chemically flower thinning treatments compared with hand thinning in average fruit length.
11-Moreover,no significant differences were obtained between hand thinning or control in average fruit length.
12-However,average fruit diameter greatly affected with hand or chemical flower thinning than fruit length.
13-The great effect on fruit diameter was obtained with 4% urea.
14- The increase in fruit dimensions (length & diameter)greatly correlated with the increase in fruit weight.

2-2-Fruit quality

1-Maturity stage of"Hachiya" persimmons greatly affected with hand or chemical flower thinning, where all treatments advanced fruit maturity by about 15-20 days than control.
2-However,urea at 2 or4% were more effective than ethrel in advanced fruit maturity.
3-Generally,it could be noticed that fruit maturity greatly affected with environmental conditions from year to another.
4-However,urea and ethrel as a chemical flower thinning agents produced firm fruits than hand thinning.

5-The great effect on fruit firmness was obtained with 4% urea which recorded 9.61 and 9.76 Ib./inch^2 for both studied seasons.

6-Total soluble solids and total sugars were increased with hand or chemical flower thinning with slight differences between different treatments.

7-On contrary,total acidity and total tannins contents were decreased with all thinning treatments compared with control.

B-Maturity stage

1-On Montakhab El-Kanater guavas

1-Average fruit yield(Kg/tree)was high with picking fruits at 130 days after full bloom (A.F.B.) which considered the optimum time for maturation of "Montakhab El-Kanater" guavas.

2-However,early picking of fruits(120 days A.F.B.)or late(140 days A.F.B.) significantly decreased tree yield.

3-The optimum maturation stage either in guavas or other fruits is more important in producing good yield and quality.

4-Average fruit weight as previously discussed in average yield, tended similar trend where the higher fruit weight of"Montakhab El-Kanater"guavas was obtained with the fruits picked after 130 days A.F.B.significant differences were obtained between the three times of maturation in first season.

5-Shelf life of fruits greatly affected with fruit maturity where early harvest (120 days A.F.B.)produced fruits with less shelf life.Late harvest(140 days A.F.B.)greatly decreased fruit shelf- life due to the fruits become more ripe and respirat more than optimum harvested fruits.

6-Fruit firmness was decreased with delaying of fruit harvest due to advanced in fruit maturity and the storage components conversion from bound forms to free forms espicially pectic substances which responsible about fruit firmness.

7-Regarding chemical characters its,a slight change in T.S.S,acidity and total sugars were obtained with different harvest times.

8-On the other hand,L-ascorbic acid greatly decreased with delaying of fruit harvest,where the higher values were obtained with early fruit harvest

2-On Hachiya persimmons

1-Optimum harvest of "Hachiya" fruits,(180 days after full bloom) produced higher yield,fruit weight and long shelf life.

2-On contrary,harvest of fruits after 180 days A.F.B. produced less firm fruits and Total soluble solids contents.

3-Tannins and acidity was decreased with advanced in fruit maturation, on contrary,total sugars was increased with advanced in fruit maturation.

II-Post harves treatments

A-" Montakhab El-Kanater" guava fruits

1-Physical properties

1-1-Discarded guava fruits(%).

1-It could be noticed that,discarded fruits% increased with advanced in cold storage durations regardless of the used treatments.

2-After 12 days of cold storage the least discarded fruits% was recorded by those fruits treated with 0.8K.Gy irradiation dose after cooling, 0.2 and 0.8K.Gy before-cooling ,0.5gm /L. and 1.0gm /L. fungicied and 25% and50% ethanol vapor concentration (E.V.C) followed by irradiation dose at 0.2 and 0.4K.Gy after cooling, 0.2 K.Gy before-cooling and hot water.

3-The high significant effect in this respect was observed in the fruits That treated with E.V.C 50% where the decay fruits% reached

0.0,2.23,and 6.67 after 12,16 and 20 days in the first season respectively compared with control and other treatments in the same days.

4-It could be concluded that Montakhab El-Kanater "Guava" fruits could be stored will for 16 days after treated as a post harvest treatment with E.V.C 50%.This treatment considered as a safe environmental treatment.

1-2-Fruit weight loss(%).

1-There was an evident increase in weight loss% with advanced in cold storage duration regardless of the used treatments.

2-there was a significant effect to most treatments on reducing the rate of weight loss especially with E.V.C 50% treatment compared with irradiation, fungicide, hot water and untreated fruits (control).

3-After 12,16 and 20 days of cold storage the least weight loss percentage was recorded by E.V.C 50% (1.42,3.54 and 4.83 %) respectively followed by E.V.C 25% (1.75,3.63 and 5.19 %)at the same days of cold storage,followed by fungicide with the two used concentration, irradiation dose 0.8K.Gy after or befor-cooling at the same days of cold storage.

4-there was a sharp increase in fruit weihgt loss% by hot water treatment which recorded 4.78,7.14 and 8.68 after 12,16 and 20 days respectively.

1-3-Fruits firmness(Lb./inch^2)

1-It could be easily noticed that fruit firmness decreased with advanced in cold storage durations regardless of the used treatments.

2-All used treatments significantely decreased the losses in fruit flesh (softening) during all cold storage durations compared with control.

3-At the beginning of cold storage experiment,there were no differences between different treatments or untreated fruits (control). However, After 16 days of cold storage the highest fruit firmness (5.50 Lb./inch^2)was recorded by those fruits treated by hot water followed by 50% E.V.C (5.42 Lb./inch^2) , 25 % E.V.C (5.08 Lb./inch^2), 1.0gm/L.fungicide(5.08 Lb./inch^2), 0.8K.Gy irradiation dose after cooling (4.92 Lb./inch^2) and 0.8K.Gy irradiation dose befor cooling (4.58 Lb./inch^2) before-cooling.

4-The lowest fruit firmness (1.42 Lb./inch^2) was recorded by hot water treatment.

1-4-Shelf-life(marketability)

1-As days of cold storage was increased shelf life in days was decreased.

2-The high shelf life(5.00 and 5.00 days) were found with the fruits treated with 50% E.V.C and 25% E.V.C followed by irradiation dose 0.8K.Gy after or before- cooling and 1.0gm/L.fungicide were recorded 4.33,4.33 and 3.67 days respectively in the first season.

3-The treated fruits significantly differed between them and untreated fruits(control)in their shelf life. However,the fruits treated with hot water had less marketability (1.67 day)than other treatments,this finding generally,could be explained by the increase of hot water treated fruits in their respiration rate which lead to senescence hastening of fruit.

2-Chemical determinations

2-1-Total soluble solids(T.S.S%)

1-It is clear that T.S.S % of Montakhab El-Kanater guavas were

increased with advanced in cold storage till 16 days and decreased after that,regardless of the used treatments.

2-At the beginning of cold storage duration, no significant differences were obtained between the used treatments and control.

3-With advanced in cold storage durations and after 16 days in the first season,higher T.S.S(13.27%)was obtained with 0.8 K.Gy irradiation dose after cooling followed by those treated with E.V.C 25% (13.20%), and (13.00%)for 0.8K.Gy irradiation dose before-cooling.

4-On the other hand,after 20 days of cold storage durations, significant differences were still appeared between the other treatments and control.The higher T.S.S% values were recorded 14.60,14.60,14.60, 14.20 and 13.80% with E.V.C 50% ,E.V.C 25%, fungicide 1.0gm/L.,irradiation dose 0.8K.Gy after cooling and irradiation dose 0.8K.Gy pre-cooling , respectively.

5-On the other hand,the reduction of T.S.S % after 20 days of cold storage could be due to the exhausting of sugars in respiration process.

2-2-Titratable acidity(gm/100gm fresh weight)

1-It could be noticed that fruit acidity was decreased with advanced in cold storage periods regardless of the used treatments.

2-The variations in fruit acidity were noticed after 16 days of cold storage, but hot water treated fruits recorded high value of fruit acidity(0.32%)than other treatments.

3-After 20 days of cold storage,the high fruit acidity(0.33%)was obtained with hot water treated fruits compared with other treatments which recorded low acidity (0.17%)in the two E.V.C 50% and 25% treatments followed by 1.0gm/L. fungicide, 0.8K.Gy irradiation dose after cooling and 0.8K.G.y irradiation dose pre-cooling were recorded (0.20, 0.21 and 0.22) recpectively.

4- Hot water treatments exhibited the high fruits acidity and the lowest fruit acidity (0.18%) were recorded with E.V.C 50% followed by E.V.C 25%(0.19%) and 1.0gm/L. fungicide (0.19%) treatments, recpectively.

2-3-L-ascorbic acid content(mg/100gm fresh weight)

1-L-ascorbic acid content was decreased with advanced in treated or untreated fruits. This finding could be attributed to the conversion of L-ascorbic acid to dehydroascorbic acid and decreasing the active form of ascorbic.

2-No significant differences were noticed between different treatments and control till 4 days of cold storage.

3-After 12 days of cold storage, hot water treated fruits contained less values of L-ascorbic than others.

4-After 20 days of cold storage, 0.2K.Gy irradiation dose after cooling treated fruits contained less values of L-ascorbic (104.8 mg/ 100gm fresh weight) than others, high value of L-ascorbic acid(235.0 mg/ 100gm fresh weight) was recorded with E.V.C 50% treated fruits followed by E.V.C 25%(212.3 mg/100gm fresh weight), irradiation dose 0.8K.Gy before-cooling (207.1mg/100gm fresh weight), 1.0 gm/L.fungicide(192.9mg/100gm fresh weight) and irradiation dose 0.8 K.Gy after cooling(185.7 mg/100gm fresh weight).

5-The best treatment of all irradiation doses either after or before-cooling were 0.8k.Gy irradiation dose which recorded(171.5 mg/100gm fresh weight) and 157.4 mg/100gm fresh weight respectively.

2-4-Total sugars(gm/100gm fresh weight)

1-No significant differences between different treatments or control were observed during all cold storage durations.

2-An evident increase in total sugars was noticed till 20 days of cold storage, the reduction of sugars with advanced in storage periods attributed to the consumption of these sugars in respiration process.

3-The lowest total sugars (9.2%) was observed with 0.5gm /L. fungicide followed by hot water treatment which recorded 9.6%.

4-After 20 days, the higher total sugars was obtained with irradiation dose 0.8K.Gy after cooling(11.3%),followed by irradiation dose 0.8K.Gy before - cooling (11.2%)and 1.0 gm/L.fungicide(11.1%).

2-5-Respiration rate(mgCO_2/Kg fruit/hr.)

1- At the beginning of cold storage duration, the respiration rate was high and ranged from 14.11 to 24.56 mg co_2/Kg/hr.

2-Minimum respiration rates was noticed with E.V.C 50% and fungicide 1.0 and 0.5gm/L, on contrary, high respiration rates were obtained with hot water,all irradiation doses after or before-cooling and control.

3-At the end(after 20 days) of cold storage duration in the first seaso, respiration rate was high and renged from 18.22 to 33.15 mg co_2/Kg/hr. However, minimum respiration rate was noticed with E.V.C 50%(18.22 mg co_2/Kg fruit/hr.), followed by E.V.C 25% (20.10 mg co_2/Kg fruit/ hr.), irradiation dose 0.8K.Gy before-cooling (21.78 mg co_2/Kg fruit/hr.)and irradiation dose 0.8K.Gy after cooling (22.27 co_2/Kg fruit/hr.).

4-The high respiration rate was noticed with hot water (33.15 mg co_2 / Kg fruit/hr.) followed by irradiation dose 0.4K.Gy after cooling (27.20 mg co_2/Kg fruit/hr.), irradiation dose 0.2K.Gy befor cooling (27.00 co_2/ Kg fruit /hr.) and 0.5gm/L.fungicide (26.77 mg co_2 /Kg fruit/ hr.

B-"Hachiya" Persimmon fruits

1-Physical properties

1-1-Discarded persimmon fruits(%).

1-Discarded fruits% increased with advanced in cold storage

durations regardless of the used treatments.

2-It is clear that, all treatments increased persimmon storage life than the control.

3-With advanced in cold storage time and after 35 days in cold storage,still those fruits that were treated with E.V.C 50%, irradiation doses 1.5 and 2.5K.Gy before cooling and 2.5K.Gy after cooling recorded non discarded fruits% followed by E.V.C 25% and fungicide 1.0gm/L.were recorded 4.09 and 4.47 recpectively.While,the highest discarded fruits% was exhibited with irradiation dose 3.5K.Gy before-cooling (18.87%) followed by hot water and fungicide 0.5gm/L.were recorded15.00% and 14.20% recpectively.

1-2-Fruit weight loss(%).

1-An evident increase in weight loss% was obtained with advanced in cold storage durations regardless of the used treatments.

2-After 28 days of cold storage, the least weight loss percentage was recorded by the two concentration of E.V.C 25 % and 50 % and irradiation doses 1.5 and 2.5K.Gy before or after cooling.Whil the higher values in the irradiation doses 3.5K.Gy before cooling followed by fungicide 1.0 gm/L., irradiation doses 3.5K.Gy after cooling and fungicide 0.5gm/L. without significant differens between them.

3- At the end of cold storage, the least weight loss were recorded with E.V.C 50%(4.32%) , irradiation doses 2.5K.Gy before- cooling (4.82%)and E.V.C 25%(4.88%) . whereus, high fruit weight loss% recorded by hot water treatment (6.72) and irradiation dose 3.5K.Gy

After colling (6.49%) and fungicide 0.5 gm/L.(6.42%)at the same days of cold storage.

1-3-Fruits firmness(Lb./inch^2)

1-Generally, it could be easily noticed that fruit firmness decreased with advanced in cold storage durations.

2-At the beginning of cold storage experiment,there were no differences between different treatments or untreated fruits (control).

3-After 35 days of cold storage, the best treatment in this respect was E.V.C 50% but the lowest treatment was irradiation dose 3.5K.Gy after cooling.

1-4-Shelf-life(marketability)

1-It could be showed that, as days of cold storage was increased shelf life in days was decreased.However,the high shelf life(7.67 and 6.33 days)were obtained with the fruits treated with 50% E.V.C and 25% E.V.C followed by irradiation dose 2.5K.Gy after or before-cooling (5.33 and 5.00 days) days, respectively.

2-The fruits treated with irradiation dose 3.5K.Gy after or before-cooling had less marketability(2.33day)than other treatments.

2-Chemical determinations

2-1-Total soluble solids(T.S.S%)

1-It is clear that, total soluble solids were increased with advanced in cold storage, regardless of the used treatments.

2-With advanced in cold storage durations and after 28 days in the first season higher T.S.S (21.80%)was obtained with 3.5 K.Gy irradiation dose before-cooling followed by those treated with hot water (21.53%), (21.40%) and 1.5K.Gy irradiation dose before-cooling (21.40 %).

3-At the end of cold storage,no significant differences were obtained between the other treatments and control.T he higher T.S.S% values were recorded (23.20, 23.0, 23.0,22.60 and 22.40% with hot water, E.V.C 25%, irradiation dose 2.5K.Gy after cooling, fungicide 1.0 gm /L.and fungicide 0.5 gm /L. respectively. Whereas, the lowest value obtained with irradiation dose 1.5K.Gy treatment.

2-2-Titratable acidity(gm/100gmfresh weight)

1-Generally,it could be noticed that fruit acidity was decreased with advanced in cold storage periods regardless of the used treatments.

2-No significant differences between the control and all other treatments from the beginning till ending of cold storage duration.

3-The differences in fruit acidity were noticed after 35 days of cold storage, fungicide 0.5gm/L. treated fruits and irradiation dose 3.5K.Gy were recorded high values of fruit acidity than other treatments.Whereas,the the lowest value recorded in hot water treatment.

2-3-Tannins content(gm/100gm fresh weight)

1-Tannins content was decreased with treated or untreated fruits with advanced in cold storage durations.

2-After 28 days of cold storage, hot water treated fruits contained less values of total tannins than others.

3-Whereas, high value of tannins content was recorded by E.V.C 50% treated fruits.

4-At the end of cold storage, the high value of total tannins with E.V.C 25% treated followed by E.V.C 50%, irradiation dose 1.5K.Gy before-cooling and irradiation dose 2.5K.Gy after cooling

2-4-Total sugars(gm/100gm fresh weight)

1-No significant differences between different treatments or control were observed during all cold storage durations.

2-With advanced in cold storage periods the decrease in total sugars attributed to the consumption of these sugars in respiration process.

3-After 35 days of cold storage,the highest total sugars was recorded by E.V.C 25% followed by irradiation dose 2.5K.Gy after cooling E.V.C 50% and hot water while the lowest total sugars was obtained by 0.5gm/L.fungicide and followed by irradiation dose 2.5K.Gy before-cooling.

2-5-Respiration rate(mg co_2/Kg fruit/hr.)

1-At the beginning of cold storage durations, respiration rate was high and minimum respiration rates was noticed with E.V.C 50% and E.V.C 25%.

2-At the end of cold storage durations (35 days) the least value of respiration rate was noticed with E.V.C 50% followed by E.V.C 25%,irradiation dose 1.5K.Gy before – cooling and irradiation dose 1.5K.Gy after cooling.whereas,the high respiration rate was noticed with control and hot water.

CONCLUSIONS

From the obtained data , it could be **concluded** that all flower thinning treatments increased fruit set,total yield,average fruit weight and decreased fruit abscission.However,a great effect on fruit quality and chemical compositions were also found with flower thinning treatments. Chemical flower thinning was more effective than hand thinning in improving yield and quality in "Montakhab El-Kanater" guavas and "Haciya" persimmons. However, medium maturaty(130 and 180 days for guava and persimmon respect.)were produced fruit with high quality. All supplementary refrigeration treatments improved fruit quality during cold storage but ethanol vapor either 25 or 50 % were more effective than other treatments.

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