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EFFECT OF PREPACKAGE TREATMENTS AND PACKAGE KIND ON QUALITY AND SHELF LIFE OF SOME VARIETIES OF MINIMALLY PROCESSED APRICOTS.

BY

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ABSTRACT

The effect of an antioxidant dipping treatment (hydrogen peroxide (H_2O_2), or ascorbic acid (V.C.) at 2% for 2 min) and package type (polystyrene foam trays with over wrap with polyvinylchloride (shrink) film; polypropylene or polyethylene pouches) on the storage quality of minimally processed two apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0°C and 85-90% R.H have been investigated. In particular, weight loss percentage; texture; total soluble solids percentage (T.S.S.%); titratable acidity percentage; browning area (%); total microbial content (TC) and yeast and mold content (YM) were also evaluated.

As a consequence of prepackage (antioxidant) treatments; the Ascorbic acid (VC) dipping treatments were effective in slowing down apricot weight loss (%); TC and YM content and remained higher texture value until the ninth days of refrigeration in both seasons.

In regard to storage package type, the Polypropylene (P.P.) or Polyethylene (P.E.) pouches were effective in slowing down apricot weight loss (%), but it had lower texture value and higher in total Yeast and Mold content until the ninth days of refrigeration in both seasons.

Moreover, no significant differences were noticed between all prepackaging treatments or storage package type used in titratable acidity (%) and T.S.S. % values in the both seasons.

As it possible to see from browning area results, all used treatments did not give any browning area before 9 days of cold storage. After 12 days of cold storage, the control treatment exhibited the highest value of browning area (%). Meanwhile, ascorbic acid treatment recorded the least browning area (%). Samples packed in Polystyrene foam trays with over wrap shrink film recorded the highest browning area (%), while the least percentage was recorded by samples packed in Polyethylene pouches. Canino cultivar recorded the less browning area (%) than Ammar Montakhab in the both seasons.

The best results of minimally processed apricot were obtained from the dipping Canino cultivar for 2 min. in solution of ascorbic acid 2% (V.C.) and packed in polypropylene (P.P.) pouches then stored it at 0°C and 90-95 RH. More experiments are needed to adapt this method for reach a total Microbial, Yeast and Mold content at least levels during storage period.

INTRODUCTION

Despite growing interest and increased consumer selection of fresh, processed products (or minimally processed), little information is available on nutrient stability or on the effectiveness of postharvest treatments (e.g. modified atmosphere packaging and dipping) on their nutritive value retention during storage (Advenainen, 1996).

Apricot is a climacteric fruit presenting a moderate respiration (Hardenburg *et al.*, 1986) a very pronounced ethylene rise

(Amoros *et al.*, 1989) and a high sensibility to shriveling. The fruit is very sensitive and delicate and its evolution is very fast during the last stage of ripening on the tree or after harvesting. This rapid deterioration is a problem for apricot commercialization (Hanolopoulou and Mallidis, 1999). The factors determining the quality of fresh and processed apricots are the color, texture, flavor and aroma as well as internal breakdown. A very early harvest results in the development of fruits without their typical taste and aroma, while a late harvest results in rapid deterioration of fruit quality. For this reason harvest must take place when apricots are in preclimacteric stage, the production of ethylene has started and the metabolic changes for maturity take place during commercialization period (Pretel *et al.*, 1993).

Processing operations such as washing, scrubbing, peeling, trimming, cutting, shredding.., etc carried out during the initial stages of fresh-cut preparation cause mechanical injury to the plant tissues. Moreover, even prior to processing, produce manipulation may bring mechanical shocks resulting in cracks and bruises, which can elicit physiological and biochemical responses in the wounded tissue as well as in unwounded distant cells (Saltveit, 1997).

Fresh-cut products are normally packaged in film bags where the atmosphere within the packages becomes modified passively by the fruit respiration. The most affected microbial growth by storing fresh-cut peppers under MAP conditions, were yeasts and lactic acid bacteria, which showed the lowest values at day 7. The effect of vacuum packaging on microbial growth was overshadowed by the effect of temperatures (Garg *et al.*, 1990). Research on minimally processed Swiss chard (Gil *et al.*, 1998) showed that its antioxidant content was lower under storage in modified atmosphere (7% O_2 and 10% CO_2) packaging (MAP), than in intact or minimally processed product stored in air, after 8 days of refrigeration. The effect of cutting and storage in air and MAP on the AA content of potato strips obtained from five potato cultivars was evaluated by Tudela *et al.* (2002). The AA content of fresh-cut potatoes was retained in air storage after 6 days at 4°C while it was reduced in MAP storage. Rocculi *et al.* (2004) found that dipped apple slices packed in MA composed of decreased O_2 and increased CO_2 levels in the package head space (both at 5%) together with N_2O and/or Ar (the remaining 90%) maintained their fresh quality for 12 days of cold storage.

Hydrogen peroxide is a colorless liquid which is soluble in water. It does not appear in the European Communities Regulations 1997 on Control of Additives for use in Foodstuffs; however it is found naturally in many foods as a result of microbial metabolism. Its antimicrobial properties have been known for many years and it has been widely used as sterility for aseptic packaging. In the USA hydrogen peroxide is an approved bactericide for some dairy products and is used for disinfecting fruit and vegetables (Juven and Pierson, 1996). Its activity is due to its oxidizing effects on bacteria and it also bleaches mushrooms during the soaking period.

A primary concept for delaying enzymatic browning is the use of chemical compounds to quell effects of the browning enzyme either by inhibiting the enzyme, preventing formation of crucial intermediates, or by excluding or removing substrates of browning enzyme. In the past, many in the produce industry used a solution of chemical preservatives including sodium metabisulfite. Recently, a popular chemical for delaying or slowing browning of produce include treatment with various concentrations of sodium erythorbate and its stereoisomer ascorbic acid, this ingredient is approved for use on foods by the FDA as a chemical preservative and is GRAS (Generally Recognized As Safe) (Lee and Whitaker, 1995).

Cocci *et al.* (2006) and Rocculi, *et al.* (2004) on apples reported that, the fruit dipping in solution of ascorbic acid at 1% caused a gradual increase in total soluble solids content over the whole storage period, reaching about the same level as the control after 8 days cold storage.

As for fresh-cut strawberries and persimmons were concerned, the two products responded differently to the wounding stress in regard to the oxidation of ascorbic acid (AA), but in both cases, the post-cutting life based on visual quality ended before significant losses of total AA occurred (Wright and Kader, 1997). The effect of an antioxidant (ascorbic acid) agent in slowing down browning has been reported by Ahvenainen, 1996. In later research, changes in total polyphenol (TP), AA and antioxidant activity together with other quality characteristics were monitored on minimally processed Cactus pear fruit during 9 days of refrigerated storage (Piga, *et al.*, 2003). Results showed that AA and antioxidant activity remained unchanged, while TP decreased after 6 days of cold storage.

The objective of this study was to study the effect of prepackaging treatments and storage package types on the storage quality of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0°C.

MATERIALS AND METHODS

This study was carried out during two successive seasons of 2006 and 2007 on two apricot cultivars (Ammar Montakhab and Canino) grown at El-Fayoum Governorate.

Fruits were picked during the maturity stage (green color covering ½ to ¾ fruit surface). Fruits of each cultivar were transported to the fruit handling Laboratory at Giza where they sorted. Sound and healthy fruits were chosen, washed and cut, and then the seeds were removed and divided into three principal groups.

Groups were randomly assigned to each of the treatment-combinations. Fruit samples were dipped for 2 min. in the following solutions, Hydrogen peroxide (H_2O_2), or Ascorbic acid (V.C.) at 2%. After dipping, excess solutions were left to drain for 5 min. Untreated group (no dipping) samples were considered as a control. About 500 g of fruit samples of each treatments and control were packed in Polystyrene foam trays with over wrap shrink film (polyvinylchloride (P.V.C.) film (16±2μ m. in thickness) or 20 μ. Polypropylene pouches or 20 μ. Polyethylene pouches and all were stored at 0°C and 85-90% R.H. Fifteen replicate were prepared for each type treatment in two cultivars. Three replicates from each treatment were taken and examined every 3 days for quality parameters.

The following data were recorded:

1-Weight loss percentage was calculated as the difference between fruit weight at the initial of storage and fruit weight at the inspection date.

2-Texture was estimated by measuring resistance of fruit flesh to penetrating needle of a texture analyzer instrument (Lfra texture analyzer) for a fixed distance of 5 mm. inside fruit flesh and firmness is exp-ressed in Newton's (N).

3-Percentage of total soluble solids (T.S.S. %) of the flesh was estimated by a'bbe digital refractometer, according to A.O.A.C., (1990).

4-Acidity percentage: of the flesh was determined as malic acid by titration with a solution of 0.1 N., NaOH, according to A.O.A.C., (1990).

5-Browning area percentage: For evaluation of browning levels on the apricot surface, a computer vision system technique was used, as described by Rocculi *et al.* (2004). All images were obtained under the same condition, using RGB scale, apricot images were evaluated. Browning areas were selected and calculated browning area percentage in total at each storage time.

6-Microbial enumeration:

The microbial contents of fruit samples were determined according to the methods described in the DIFCO manual (DIFCO, 1984). One gram of fruit sample was mixed with 9 ml sterilized distilled water and used for microbial assay. Serial dilutions were then made to reach to10^5 and one ml samples of these dilutions were spread on either acidified potato dextrose agar or nutrient agar in order to enumerate for yeast & mold and total microbial counts, respectively. Duplicated plates of these cultures were enumerated and expressed as colony forming units (CFU/g fruit).

All data parameters studied were analyzed as Factorial Completely Randomized Design in factorial arrangement with four replications. All data were subjected to statistical analysis as described by Snedecor and Cochran (1980). The differences between means were differentiated using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

1- Weight loss percentage:

Results present in Figs. (1 & 2) showed the effect of some storage package types and prepackaging treatments on weight loss% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0°C and 90-95 RH in 2007and 2008 seasons.

In general a gradual increase in weight loss was shown towards the end of the storage period (9 days). However, the least weight loss percentage was recorded by dipping for 2 min. in solution of Ascorbic acid 2% (V.C.) followed by Hydrogen peroxide 2% (H_2O_2) treatment, while untreated group (control) exhibited the highest weight loss value in the both studied seasons (Fig. 3).

As for the effect of storage package type, samples packed in polypropylene (P.P.) or polyethylene (P.E.) pouches recorded less weight loss percentage than those packed in polystyrene foam trays with over wrap shrink film in both cultivars and seasons (Fig. 4).

As for the interaction between the prepackaging treatments and storage package type, it is obvious that control fruits recorded the highest weight loss% of minimally processed apricot cultivars (Ammar Montakhab and Canino), while, fruits dipped in solution of Ascorbic acid 2% and packed in Polypropylene (P.P.) appeared the least values, after 9 days of cold storage at 0°C and 90-95 RH in both seasons.

In this regard, Rocculi, *et al.* (2004) reported that weight loss percentage significantly increased with the progress of storage periods of minimally processed apples packed in non-conventional modified atmosphere. Dipping apple slices in an aqueous solution of 0.5% of Ascorbic acid (2%) and sealing in polypropylene (P.P.) boxes was more effective in reducing the weight loss percentage than other used treatments. These results could be attributed to reduction in water loss resulted from transpiration.

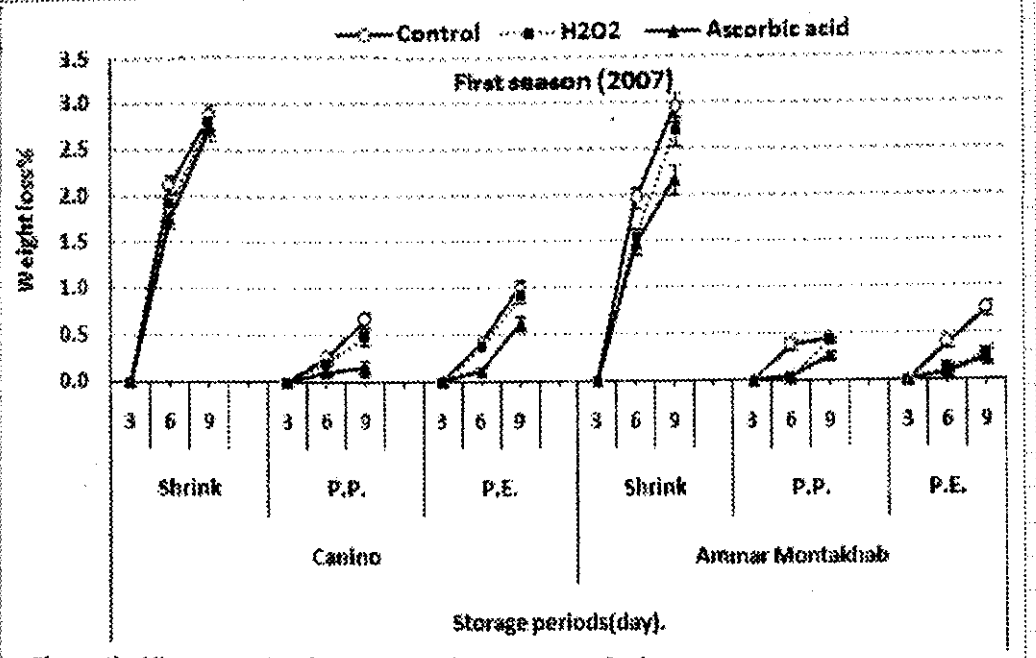
2- Texture (Newton):

Concerning the texture, data in Figs (5 & 6) indicated that, a gradual decrease in texture was shown towards the end of the storage period. However, significant differences were detected between all prepackaging treatments and storage package type during different storage period in both seasons. Control fruits recorded the less texture of minimally processed apricot cultivars (Ammar Montakhab and Canino), while, dipping fruits in ascorbic acid solution (2%) and packed in polypropylene (P.P.) gave the highest values under all period of cold storage at 0°C and 90-95 RH in the both seasons.

As for the specific effect of the prepackaging treatments, the highest texture was recorded by fruit dipping for 2 min. in ascorbic acid solution at (2%) followed by Hydrogen peroxide (2%) treatment, while untreated group (control) exhibited the least texture value of minimally processed apricot cultivars (Ammar Montakhab and Canino) freshcut stored at 0°C and 90-95 RH in both seasons (Fig. 7).

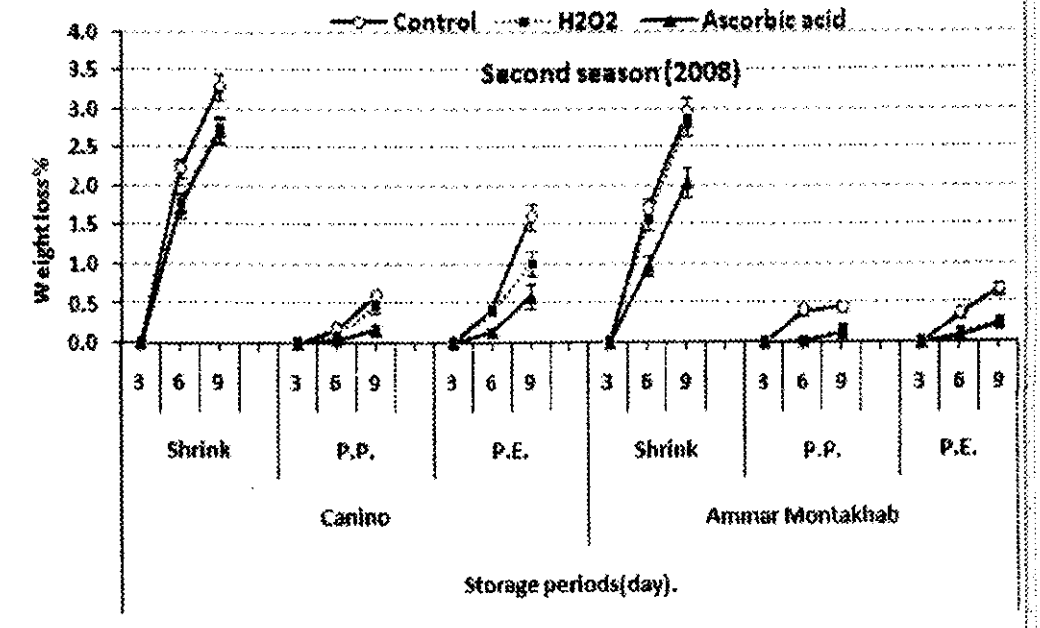
In regard to the specific effect of storage package type, fruits packed in polypropylene (P.P.) or polyethylene (P.E.) pouches recorded less texture value than those packed in polystyrene foam trays with over wrap shrink film in both cultivars and seasons Fig. (8).

These results are in agreement with the findings of Cocci *et al.* (2006) and Rocculi, *et al.* (2004) on apples, they reported that, the dipping samples in solution of Ascorbic acid 1% resulted in an increase in the apple slice antioxidant activity and its texture.



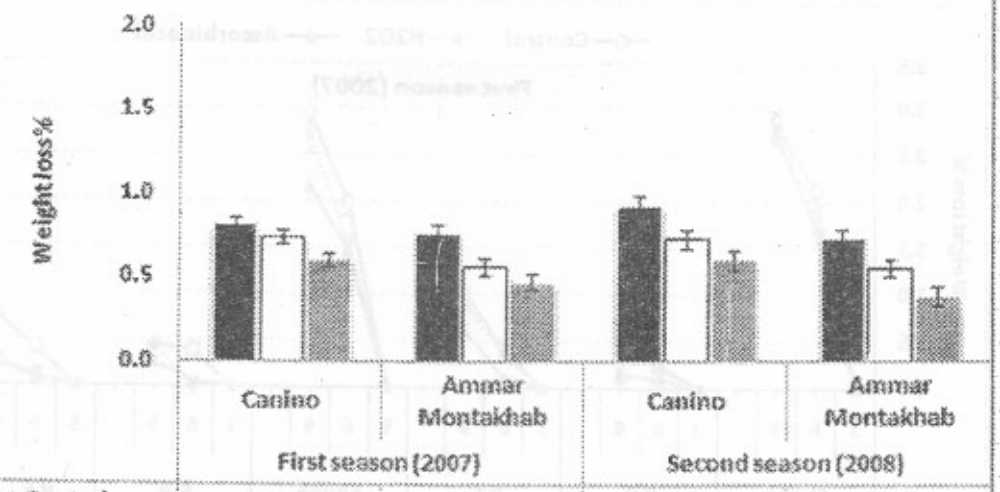
The vertical lines at each point represent the mean ± standard error.

Fig.(1): Effect of prepackaging treatments and package kind on weight loss% of *minimally* processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in first season .



The vertical lines at each point represent the mean ± standard error.

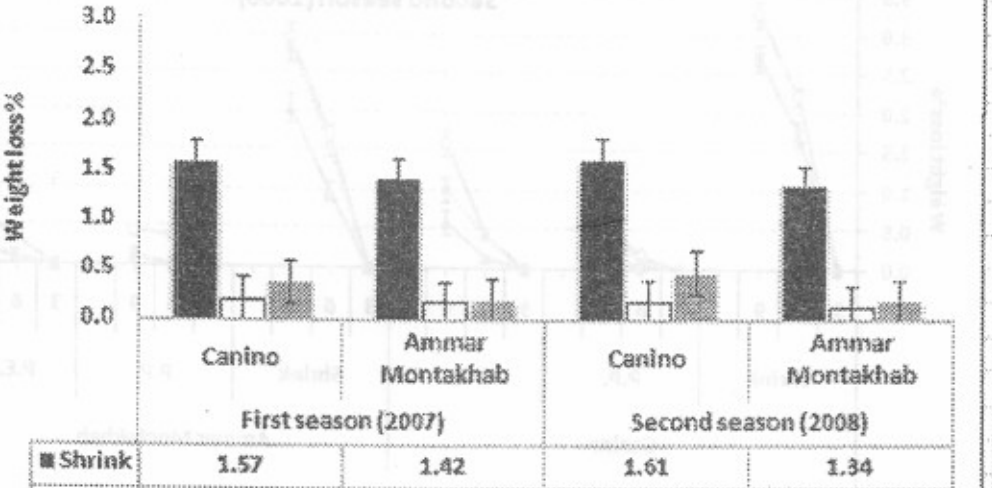
Fig.(2): Effect of prepackaging treatments and package kind on weight loss% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in second season .



■ Control	0.81	0.76	0.93	0.73
□ H2O2	0.74	0.56	0.72	0.55
※ Ascorbic acid	0.60	0.47	0.60	0.39

The vertical lines at each column represent the mean ± standard error.

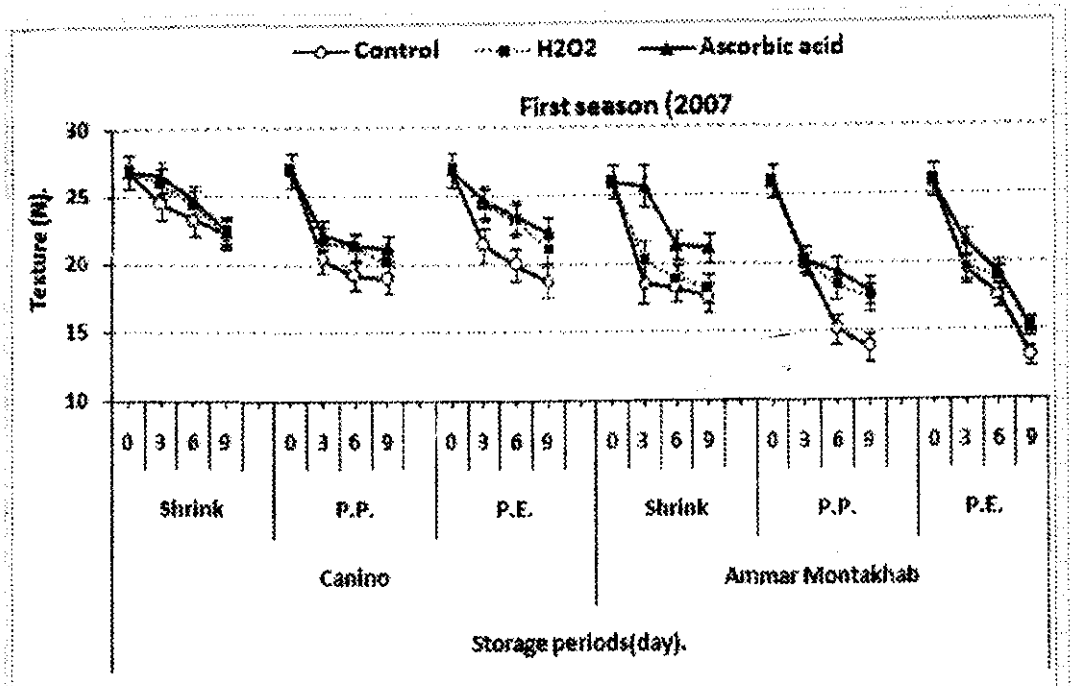
Fig.(3): Effect of some prepackaging treatments on weight loss% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.



■ Shrink	1.57	1.42	1.61	1.34
□ P.P.	0.20	0.17	0.18	0.13
※ P.E.	0.37	0.20	0.47	0.19

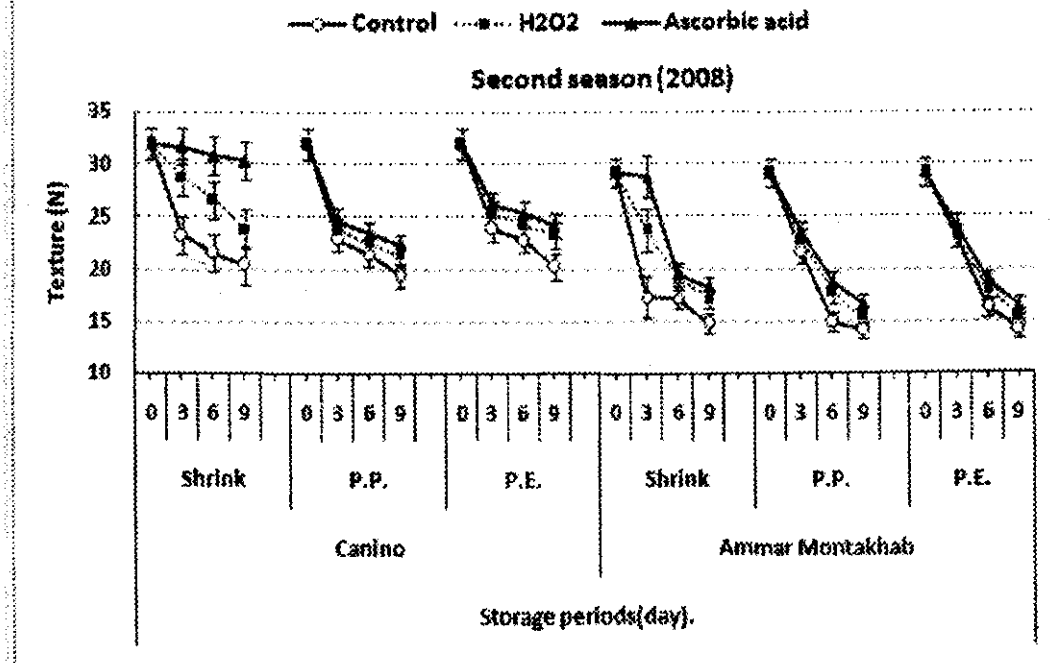
The vertical lines at each column represent the mean ± standard error.

Fig.(4): Effect of some storage package kind on weight loss% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.



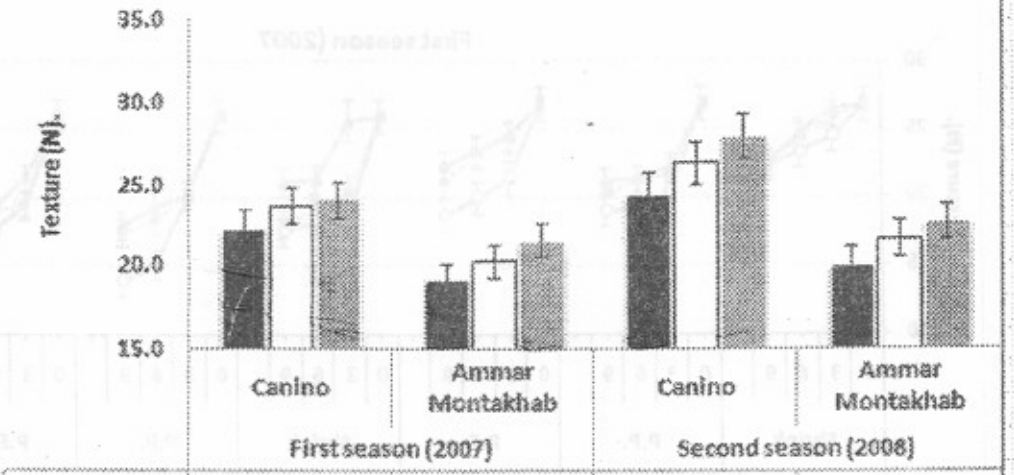
The vertical lines at each point represent the mean ± standard error.

Fig.(5): Effect of prepackaging treatments and package kind on texture (N) of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in first season .



The vertical lines at each point represent the mean ± standard error.

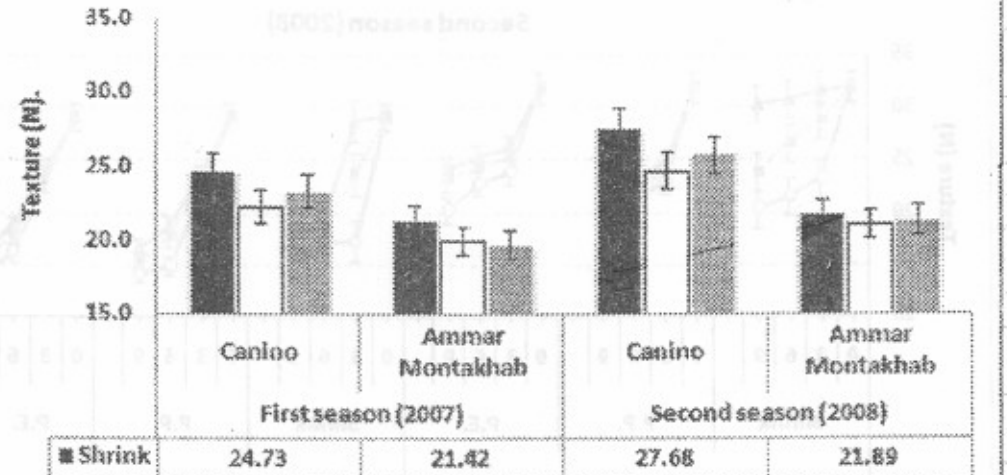
Fig.(6): Effect of prepackaging treatments and package kind on texture (N) of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in second season .



■ Control	22.41	19.23	24.25	20.02
□ H2O2	23.76	20.36	26.22	21.60
※ Ascorbic acid	24.13	21.58	27.83	22.62

The vertical lines at each column represent the mean ± standard error.

Fig.(7): Effect of some prepackaging treatments on texture (N) of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.



■ Shrink	24.73	21.42	27.68	21.89
□ P.P.	22.27	19.98	24.76	21.02
※ P.E.	23.30	19.76	25.86	21.33

The vertical lines at each column represent the mean ± standard error.

Fig.(8): Effect of some storage package kind on texture (N) of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.

3- T.S.S.%:

Figs (9 & 10) illustrate that T.S.S. % increased gradually throughout the course of the investigation. It reached the highest percentage on the last sampling date. However, significant differences were detected between the two cultivars under investigation, Canino fruits recorded less T.S.S.% than Ammar Montakhab in both seasons of minimally processed apricot cultivars fresh-cut stored at 0°C and 90-95 RH.

As for the effect of the prepackaging treatments (Fig. 11) and storage package type (Fig. 12), data indicate that no significant differences between all prepackaging treatments or used storage package type in this investigation on T.S.S.% values in the both seasons of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0°C and 90-95 RH.

These results are in agreement with the findings of Cocci *et al.* (2006) and Rocculi, *et al.* (2004) on apples. They reported that, the fruit dipping in solution of ascorbic acid at 1% caused a gradual increase in this parameter over the whole storage period, reaching about the same level as the control after 8 days cold storage.

4- Titratable Acidity Percentage (T.A.%):

Figs (13 & 14) indicate that titratable acidity percentage decreased throughout the storage period. It reached the lowest percentage on the last sampling date. On the other hand, no significant differences were detected between the two cultivars under this investigation (Canino and Ammar Montakhab) of minimally processed apricot cultivars fresh-cut stored at 0°C and 90-95 RH in both seasons.

As for the effect of the prepackaging treatments (Fig. 15) and storage package type (Fig. 16), data indicated that no significant differences between all prepackaging treatments or used storage package type in this investigation on T.A.% values of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0°C and 90-95 RH in both seasons.

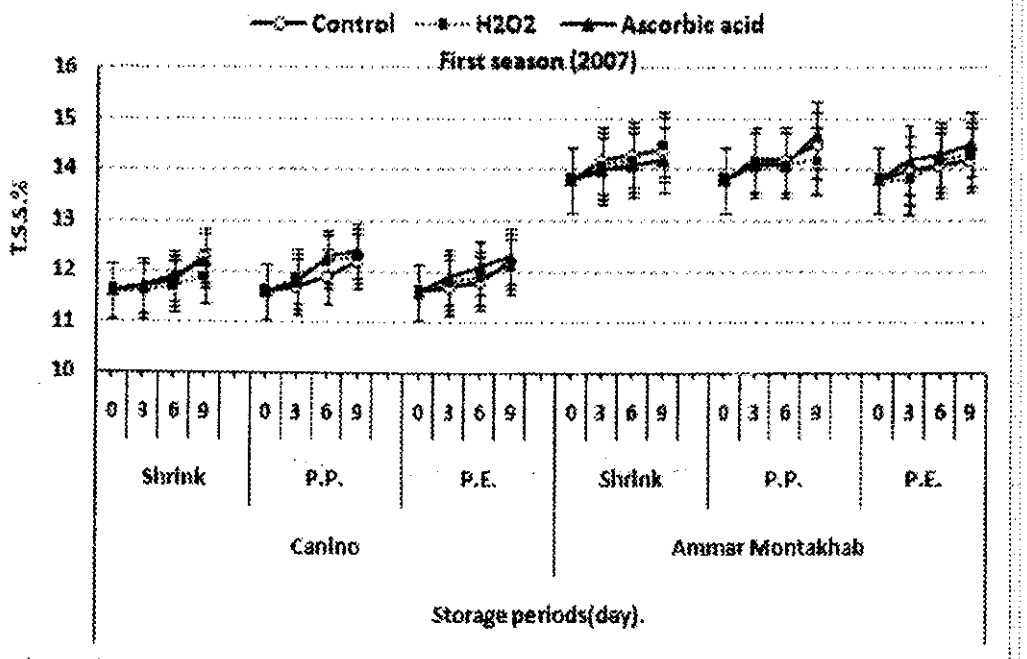
5- Browning area (%):

Tables (1 and 2) indicate that, browning area (%) increased steadily during cold storage period. However, significant differences were detected between the two cultivars under investigation, Canino cultivar recorded less browning area (%) than Ammar Montakhab of minimally processed apricot cultivars fresh-cut stored at 0°C and 90-95 RH in both seasons.

As for the effect of prepackaging treatments regardless of storage package type, all tested treatments did not give any browning area before 9 days of storage. On the contrary, after 12 days of cold storage, the control treatment exhibited the highest value of browning area percentage (24.67 & 26.67%) in the two seasons, respectively. The least browning area percentage (6 & 7.5%) was recorded by ascorbic acid treatment in the both seasons, respectively. Significant differences between all used treatments were detected in the two seasons.

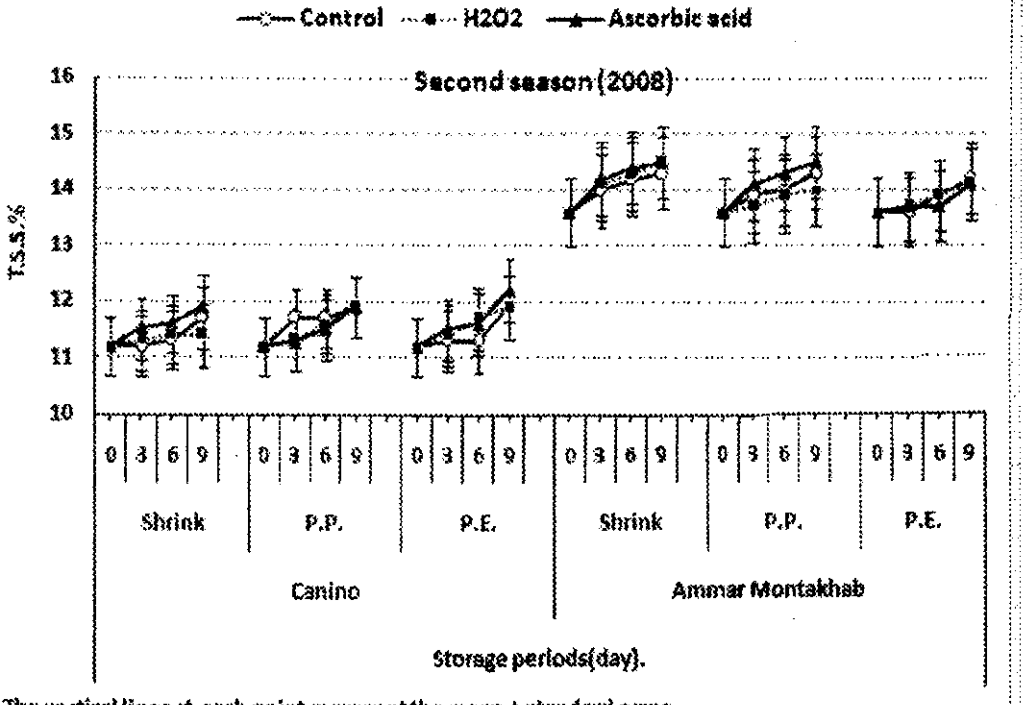
Considering the effect of package type regardless of prepackaging treatments, significant differences were detected between the three studied package type in the second season, while no significant differences were detected between shrink film and polypropylene package type in the first one. After 12 days of cold storage, samples packed in polystyrene foam trays with over wrap shrink film recorded the highest browning area percentage (13.5 & 16.33 %), while the least percentage was recorded by samples packed in polyethylene pouches (11.17 & 11.5%) in the two seasons, respectively.

As it possible to see from browning area results, the prepackage treatments adopted in our experimental conditions were effective in slowing down apricot browning. The effect of an antioxidant (Ascorbic Acid) agent in slowing down browning has been reported in previous investigations (Lee and Whitaker,1995; Ahvenainen, 1996; Wright and Kader, 1997 and Piga, *et al.*; 2003).



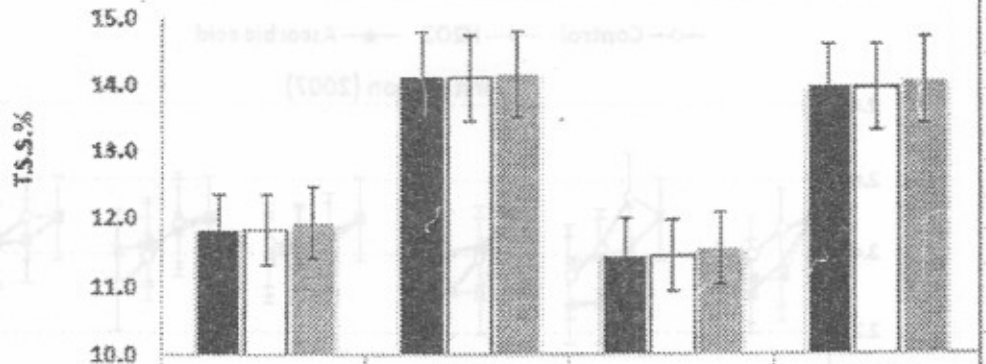
The vertical lines at each point represent the mean ± standard error.

Fig.(9): Effect of prepackaging treatments and package kind on T.S.S.% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in first season .



The vertical lines at each point represent the mean ± standard error.

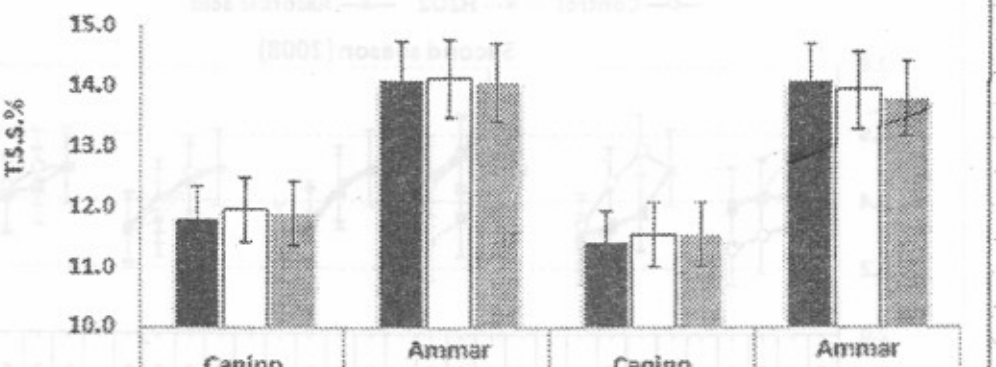
Fig.(10): Effect of prepackaging treatments and package kind on T.S.S.% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in second season .



■ Control	11.84	14.13	11.47	13.93
□ H2O2	11.85	14.08	11.46	13.92
※ Ascorbic acid	11.95	14.13	11.55	14.03

The vertical lines at each column represent the mean ± standard error.

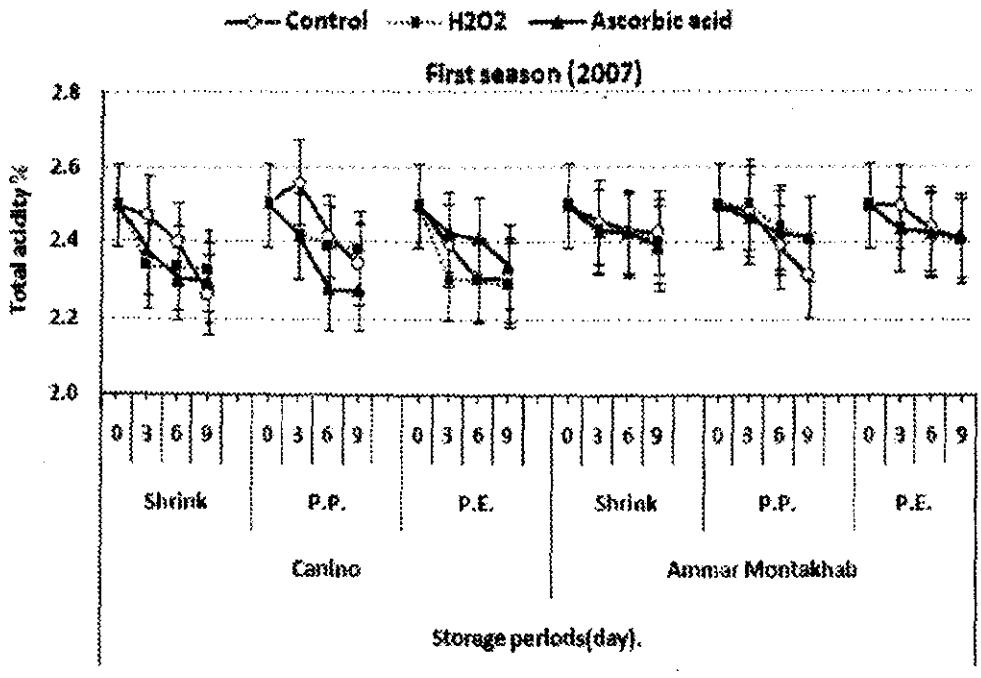
Fig.(11): Effect of some prepackaging treatments on T.S.S.% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.



■ Shrink	11.80	14.12	11.41	14.11
□ P.P.	11.96	14.14	11.53	13.96
※ P.E.	11.88	14.08	11.53	13.81

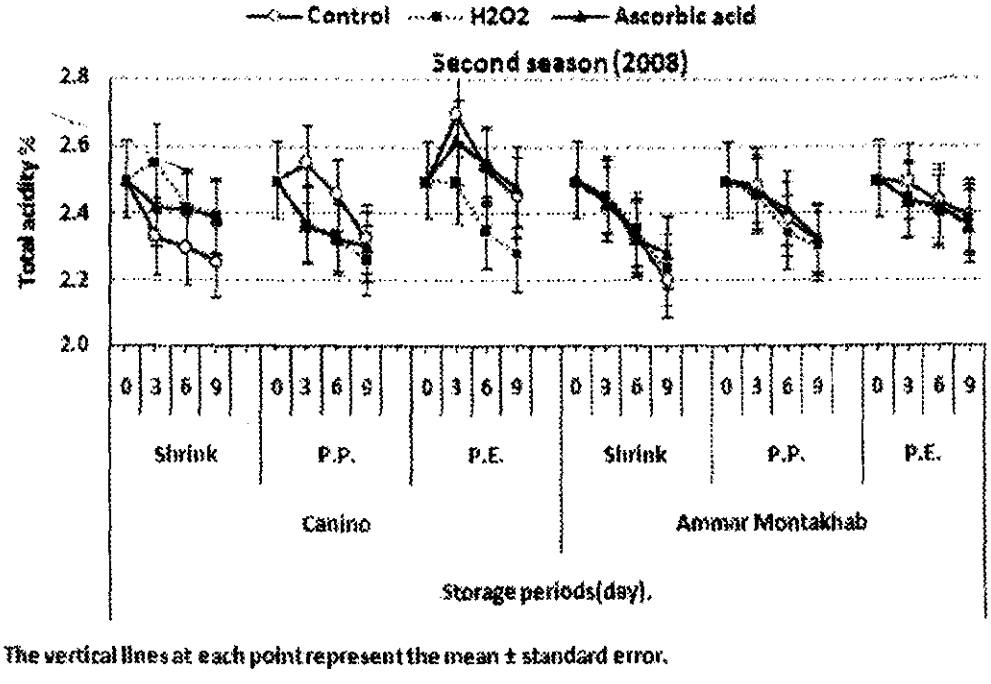
The vertical lines at each column represent the mean ± standard error.

Fig.(12): Effect of some storage package kind on T.S.S.% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008. seasons.



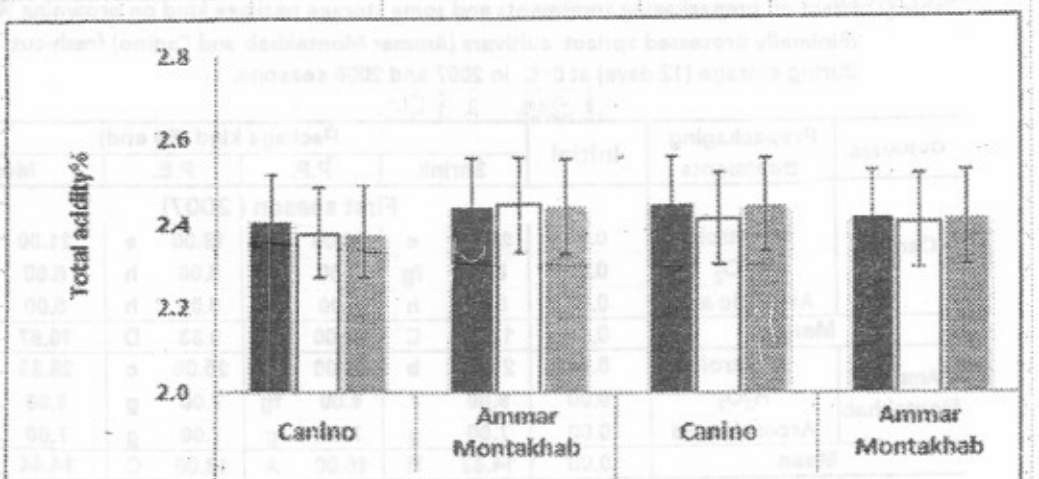
The vertical lines at each point represent the mean ± standard error.

Fig.(13): Effect of prepackaging treatments and package kind on total acidity% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in first season .



The vertical lines at each point represent the mean ± standard error.

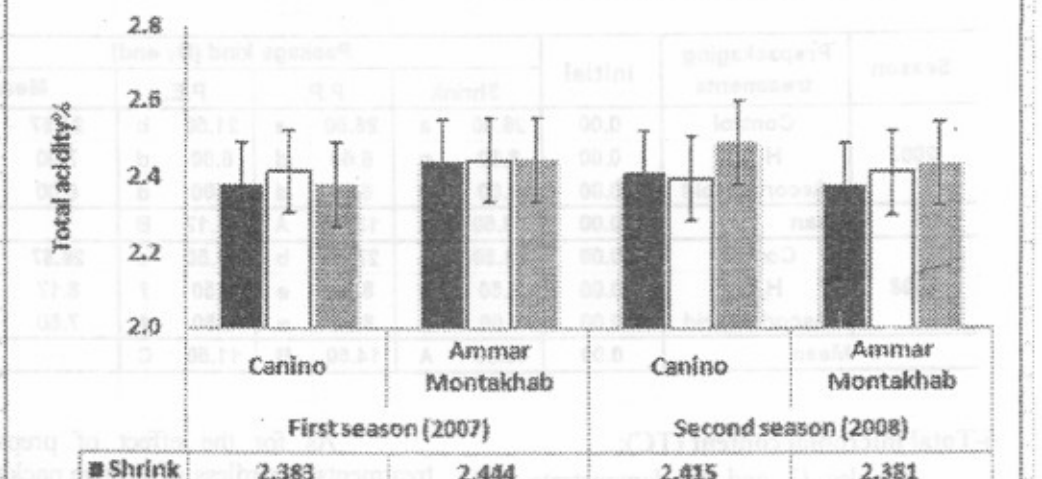
Fig.(14): Effect of prepackaging treatments and package kind on total acidity% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in second season .



■ Control	2.413	2.446	2.450	2.416
□ H2O2	2.382	2.448	2.413	2.406
※ Ascorbic acid	2.385	2.445	2.447	2.413

The vertical lines at each column represent the mean ± standard error.

Fig.(15): Effect of some prepackaging treatments on total acidity% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.



■ Shrink	2.383	2.444	2.415	2.381
□ P.P.	2.415	2.446	2.399	2.416
※ P.E.	2.381	2.449	2.496	2.438

The vertical lines at each column represent the mean ± standard error.

Fig.(16): Effect of some storage package kind on total acidity% of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0° C in 2007 and 2008 seasons.

Table (1):Effect of prepackaging treatments and some storage package kind on prowning % of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut during storage (12 days) at 0 C in 2007 and 2008 seasons.

Cultivars	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
		First season (2007)								
Canino	Control	0.00	25.00	c	20.00	d	18.00	e	21.00	b
	H_2O_2	0.00	8.00	fg	5.00	h	5.00	h	6.00	e
	Ascorbic acid	0.00	5.00	h	5.00	h	5.00	h	5.00	f
Mean		0.00	12.67	C	10.00	D	9.33	D	10.67	B
Ammar Montakhab	Control	0.00	27.00	b	33.00	a	25.00	c	28.33	a
	H_2O_2	0.00	9.00	f	6.00	fg	7.00	g	8.00	c
	Ascorbic acid	0.00	7.00	g	7.00	g	7.00	g	7.00	d
Mean		0.00	14.33	B	16.00	A	13.00	C	14.44	A
		Second season (2008)								
Canino	Control	0.00	30.00	b	20.00	d	15.00	e	21.67	b
	H_2O_2	0.00	10.00	f	8.00	g	5.00	h	7.67	de
	Ascorbic acid	0.00	8.00	g	8.00	g	5.00	h	7.00	e
Mean		0.00	16.00	B	12.00	D	8.33	E	12.11	B
Ammar Montakhab	Control	0.00	33.00	a	34.00	a	28.00	c	31.67	a
	H_2O_2	0.00	9.00	fg	9.00	fg	8.00	g	8.67	c
	Ascorbic acid	0.00	8.00	g	8.00	g	8.00	g	8.00	cd
Mean		0.00	16.67	AB	17.00	A	14.67	C	16.11	A

Table (2): Effect of prepackaging treatments and storage package kind on prowning % of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut stored at 0 C in 2007 and 2008 seasons.

Season	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
2007	Control	0.00	26.00	a	26.50	a	21.50	b	24.67	A
	H_2O_2	0.00	8.50	c	6.50	d	6.00	d	7.00	B
	Ascorbic acid	0.00	6.00	d	6.00	d	6.00	d	6.00	C
Mean		0.00	13.50	A	13.00	A	11.17	B		
2008	Control	0.00	31.50	a	27.00	b	21.50	c	26.67	A
	H_2O_2	0.00	9.50	d	8.50	e	6.50	f	8.17	B
	Ascorbic acid	0.00	8.00	e	8.00	e	6.50	f	7.50	C
Mean		0.00	16.33	A	14.50	B	11.50	C		

6-Total microbial content (TC):

Tables (3 and 4) demonstrate that total microbial content increased steadily during cold storage period. However, significant differences were detected between the two cultivars under investigation, Ammar Montakhab cultivar recorded the less total microbial content than Canino of minimally processed apricot cultivars fresh-cut stored at 0°C and 90-95 RH in both seasons.

As for the effect of prepackaging treatments regardless of storage package type, the control treatment exhibited the highest value of total microbial content after 9 days of cold storage (46.6 & 49.26 $*10^5$CFU/g sample) in the two seasons, respectively. The least total microbial content (37.45 & 36.45 $*10^5$CFU/g sample) was recorded by ascorbic acid treatment in the both seasons, respectively. Significant differences between all tested treatments were detected in the two seasons.

Table (3):Effect of prepackaging treatments and some storage package type on total microbial content (*10^5CFU)/g. fruit of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut during storage (9 days) at 0◦ C in 2007 and 2008 seasons.

Cultivars	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
		First season (2007)								
Canino	Control	15.00	56.00	a	48.67	c	52.23	b	52.30	a
	H_2O_2	15.00	44.67	ef	46.33	d	44.67	ef	45.22	b
	Ascorbic acid	15.00	43.67	f	43.67	f	41.33	g	42.89	c
Mean		15.00	48.11	A	46.22	B	46.08	B	46.80	A
Ammar Montakhab	Control	13.00	36.00	i	41.67	g	45.00	e	40.89	d
	H_2O_2	13.00	27.00	k	38.00	h	38.00	h	34.33	e
	Ascorbic acid	13.00	25.00	l	37.00	hi	34.00	j	32.00	f
Mean		13.00	29.33	D	38.89	C	39.00	C	35.74	B
		Second season (2008)								
Canino	Control	14.67	54.33	b	48.67	d	50.67	c	51.22	a
	H_2O_2	14.67	51.67	c	45.67	e	46.33	e	47.89	b
	Ascorbic acid	14.67	40.67	h	43.33	f	38.67	i	40.89	c
Mean		14.67	48.89	A	45.89	B	45.22	B	46.67	A
Ammar Montakhab	Control	14.00	60.00	a	39.00	i	43.00	fg	47.33	b
	H_2O_2	14.00	33.00	k	32.00	kl	42.00	g	35.67	d
	Ascorbic acid	14.00	31.00	l	29.00	m	36.00	j	32.00	e
Mean		14.00	41.33	C	33.33	E	40.33	D	38.33	B

Table (4): Effect of prepackaging treatments and storage package kind on total microbial content (*10^5CFU)/g. fruit of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut during storage (9 days) at 0◦ C in 2007 and 2008 seasons.

Season	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
2007	Control	14.00	46.00	b	45.17	b	48.62	a	46.60	A
	H_2O_2	14.00	35.84	f	42.17	c	41.34	c	39.78	B
	Ascorbic acid	14.00	34.34	g	40.34	d	37.67	e	37.45	C
Mean		14.00	36.72	B	42.56	A	42.54	A		
2008	Control	14.34	57.17	a	43.84	c	46.84	b	49.28	A
	H_2O_2	14.34	42.34	d	38.84	e	44.17	c	41.78	B
	Ascorbic acid	14.34	35.84	g	36.17	g	37.34	f	36.45	C
Mean		14.34	45.11	A	39.61	C	42.78	B		

Considering the effect of package type regardless of prepackaging treatments, significant differences were detected between the three studied package types in the second season, while no significant differences were detected between Polypropylene and Polyethylene package type at the end of cold storage (9 days) in the first season.

7-Yeast and Mold content (YM):

As shown in Tables (5 and 6), total Yeast and Mold content decreased steadily during cold storage period. Moreover, no significant differences were detected between the two cultivars under investigation in the first season only, Canino cultivar recorded the less total Yeast and Mold content ($13.59*10^5$ CFU/g sample) than Ammar Montakhab ($14.11*10^5$ CFU/g sample) in the second season of minimally processed apricot cultivars fresh-cut stored at 0°C and 90-95 RH.

Table (5):Effect of prepackaging treatments and some storage package kind on Yeast and Mold content (*10^5CFU)/g. fruit of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut during storage (9 days) at 0◦ C in 2007 and 2008 seasons.

Cultivars	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
		First season (2007)								
Canino	Control	27.00	19.00	b	17.33	c	14.00	ef	16.78	b
	H_2O_2	27.00	14.67	de	15.33	d	13.33	f	14.44	c
	Ascorbic acid	27.00	9.00	h	14.67	de	13.00	fg	12.22	d
Mean		27.00	14.22	C	15.78	B	13.44	D	14.48	A
Ammar Montakhab	Control	52.00	17.00	c	23.00	a	15.00	de	18.33	a
	H_2O_2	52.00	12.00	g	17.00	c	13.00	fg	14.00	c
	Ascorbic acid	52.00	12.00	g	13.00	fg	12.00	g	12.33	d
Mean		52.00	13.67	CD	17.67	A	13.33	D	14.89	A
		Second season (2008)								
Canino	Control	26.67	14.67	cd	16.67	b	14.67	cd	15.34	b
	H_2O_2	26.67	12.00	f	14.67	cd	14.00	cde	13.56	c
	Ascorbic acid	26.67	9.00	g	13.67	de	13.00	ef	11.89	d
Mean		26.67	11.89	D	15.00	B	13.89	C	13.59	B
Ammar Montakhab	Control	55.00	15.00	c	22.00	a	13.00	ef	16.67	a
	H_2O_2	55.00	9.00	g	21.00	a	12.00	f	14.00	c
	Ascorbic acid	55.00	8.00	g	15.00	c	12.00	e	11.67	d
Mean		55.00	10.67	E	19.33	A	12.33	D	14.11	A

Table (6):Effect of prepackaging treatments and storage packagekind on Yeast and Mold content (*10^5CFU)/g. fruit of minimally processed apricot cultivars (Ammar Montakhab and Canino) fresh-cut during storage (9 days) at 0◦ C in 2007 and 2008 seasons.

Season	Prepackaging treatments	Initial	Package kind (By end)							
			Shrink		P.P.		P.E.		Mean	
2007	Control	39.50	18.00	b	20.17	a	14.50	d	17.56	A
	H_2O_2	39.50	13.34	ef	16.17	c	13.17	ef	14.22	B
	Ascorbic acid	39.50	10.50	g	13.84	de	12.50	f	12.28	C
Mean		39.50	13.95	B	16.72	A	13.39	C		
2008	Control	40.84	14.84	c	19.34	a	13.84	de	16.00	A
	H_2O_2	40.84	10.50	g	17.84	b	13.00	ef	13.78	B
	Ascorbic acid	40.84	8.50	h	14.34	cd	12.50	f	11.78	C
Mean		40.84	11.28	C	17.17	A	13.11	B		

As for the effect of prepackaging treatments regardless of storage package type, the control treatment exhibited the highest value of total Yeast and Mold content after 9 days of cold storage (17.56 & 16.00 *10^5 CFU/g sample) followed by H_2O_2 treatment (14.22 & 13.78 *10^5 CFU/g sample) in two seasons, respectively. The least Yeast and Mold content (12.28 & 11.78*10^5 CFU/g sample) was recorded by Ascorbic acid treatment in both seasons, respectively. Significant differences between all tested treatments were detected in the two seasons.

Considering the effect of package type regardless of prepackaging treatments, significant differences were detected between the three studied package types in the two seasons. Polypropylene exhibited the highest value of total Yeast and Mold content after 9 days of cold storage (16.72 & 17.17*10^5 CFU/g sample) in two seasons, respectively.

CONCLUSION

Conclusively, the best results of minimally processed apricot were obtained from the dipping Canino cultivar for 2 min. in solution of ascorbic acid 2% (V.C.) and packed in polypropylene (P.P.) pouches then stored it at 0°C and 90-95 RH. More experiments are needed to adapt this method for reach a, total Microbial; Yeast and Mold content at least levels during storage period.

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تأثير معاملات ما قبل التعبئة ونوع العبوة على جودة و فترة الصلاحية لبعض أصناف المشمش المجهزة تجهيزاً بسيطاً

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تم دراسة تأثير معاملات الغمر لمدة دقيقتين فى محاليل مضادات الأكسدة (٢ ٪ فوق اكسيد الأيدروجين أو ٢ ٪ حمض الاسكوربيك) والتعبئة فى صوانى من الفوم والمغلفة بإحكام بافلام من البولى فنيل كلورايد (شيرنك) أو أكياس من البولى بروبلين أو أكياس من البولى إثيلين على جودة ثمار المشمش المجهزة صنفى الكانينو وعمار منتخب اثناء التخزين على درجة حرارة الصفر ورطوبة نسبية ٨٥: ٩٠٪.

وتمثلت الصفات التى تم تقييمها فى نسبة الفقد فى الوزن ، صلابة انسجة الثمار ، نسبة المواد الصلبة الذائبة الكلية ، نسبة الحوضة ، ونسبة تلون الانسجة باللون البنى ، والمحتوى من الميكروبات الكلية و المحتوى من الخميرة والفطريات.

فيما يخص معاملات ما قبل التعبئة ، تفوقت معاملة الغمر فى محلول ٢ ٪ من حمض الاسكوربيك فى خفض نسبة الفقد فى الوزن ، والمحتوى من الميكروبات الكلية وكذلك المحتوى من الخميرة والفطريات مع المحافظة على تماسك الانسجة الداخلية للثمار المجهزة وحتى اليوم التاسع من التخزين المبرد فى كلا موسمى الدراسة.

وفيما يتعلق بنوع العبوة ، تفوقت عبوات البولى بروبلين والبولى إثيلين فى خفض نسبة الفقد فى الوزن ولكنها كانت الاقل فى المحافظة على تماسك الانسجة الداخلية لثمار المشمش المجهزة والأكثر احتواءً على الخميروالفطريات وذلك حتى اليوم التاسع من التخزين المبرد فى كلا موسمى الدراسة.

لم تسجل اى فروق معنوية بين جميع معاملات ماقبل التعبئة أو نوع العبوات المستخدمة بالنسبة لقيم الحوضة الكلية أو المواد الصلبة الذائبة الكلية فى كلا موسمى الدراسة.

أما من ناحية تلون الانسجة باللون البنى اثناء التخزين فقد اظهرت النتائج عدم ظهور اى مساحات من اللون البنى على الانسجة فى جميع المعاملات تحت الدراسة وحتى اليوم التاسع من التخزين المبرد.

سجلت معاملة الكنترول أكبر مساحة بنية اللون بينما معاملة الغمر فى محلول حمض الاسكوبيك كانت الاقل فى مساحة تلون الانسجة باللون البنى وذلك بعد ١٢ يوم من التخزين المبرد . أيضاً سجلت العينات المعبئة فى صوانى من الفوم والمغلفة بإحكام بافلام من البولى فنيل كلورايد (شيرنك) أكبر مساحة انسجة ملونة باللون البنى بينما العينات المعبئة فى أكياس من البولى إثيلين فقد سجلت أقل مساحة أنسجة ملونة باللون البنى ، وكان انسجة صنف الكانينو هى الاقل فى مساحة تلونها باللون البنى عن الصنف عمار منتخب فى كلا موسمى الدراسة.

وخلاصة القول أن ثمار المشمش المجهزة من صنف الكانينو والتى تم غمرها فى محلول ٢ ٪ من حمض الاسكوربيك والمعبأة فى أكياس من البولى بروبلين والمخزنة على درجة الصفر المئوى هى الافضل تحت ظروف التجربة.

والمطلوب المزيد من الابحاث على استخدام مضادات الأكسدة ومواد التعبئة والتغليف للوصول بالمحتوى الميكروبى والفطرى إلى ادنى مستوياته أثناء فترات التخزين المختلفة