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DECREASING THE POSTHARVEST DISORDERS OF LE-CONTE PEAR FRUITS.

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ABSTRACT

Mature Le-Conte Pear fruits (*Pyrus lecontei*, Rehd) were harvested at the third weak of August in 2003 & 2004 seasons. Three post-harvest treatments were applied on uniform fruits (wrapping, olive oil coating and control) and all fruits were stored at 0°C with 90-95% R.H. for 3 months.

Results in both seasons showed that olive oil coating treatment was the most effective in maintaining fruit quality and storability, fruit firmness significantly increased, weight loss decreased, colour changes were delayed, Disorders reduced and respiration rate was slower than wrapping and control treatments but no significant differences were observed in the content of T.S.S. and T.A. among treatments.

Key words: Le conte pear, fruits, wrapping, oil coating, cold storage, fruit quality, respiration rate, shelf life.

INTRODUCTION

"Le conte" (*Pyrus leconte*, Rehd), the most important pear cultivar in Egypt, it's orchards occupy about 7557 feddans with total fruit production of about 35441 tons according to the statistics of the Ministry of Agriculture, Egypt (2003). It is essential to know that pear fruits when picked at the optimal physiological age with the possible short post harvest handling then kept under the optimal storage conditions to slow biological and physiological changes, will all help in extending the shelf life and marketing timed of the fruits. Using permeable fruit coating to create a modified atmosphere in apples and pears improved retention of texture and titratable acids in cold storage and reduction of storage disorders, (Elson *et al.*, 1985). Coating can also retard water loss (Baldwin, 1994). Ismail (1997) used Semperfresh coating on Le conte fruits to increase storage period, fruit firmness, shelf life and reduce weight loss. Ju-ZhiGuo *et al.* (2001) reported that preclimactric Bartlett pears were dipped for 3 minutes in either maize or soybean oil emulsion immediately after harvest and stored at 0°C, both treatments inhibited disorders, oil-treated fruit exhibited normal colour change and had higher soluble solids and total acidity. Togrul and Arslan (2004) treated peach and pear fruits with soybean oil to extend shelf life of fruit and to preserve the fruit quality

This work aims to study the effect of olive oil as natural coating on fruit quality, to stop or reduce post harvest disorder of Le Conte pears at cold storage and shelf life (simulating the marketing periods).

MATERIALS AND METHODS

This work was carried out during two successive seasons (2003 & 2004) at Hort. Res. Inst. Giza, Egypt. In both seasons, Le-Conte pear fruits were harvested at commercial maturity stage from a private orchard at Zayid region, Ashmoun, Minofiya, Egypt, at the third week of August and directly transported to the laboratory. Uniform fruits were washed with tap water, air dried, then the fruits were divided into three groups, the first group was coated with olive oil as natural coating, fruits of second group were individually wrapped with fine tissue paper, and the last group kept untreated (as control). In all treatments, fruits were divided into three replicates, each replicate contained five carton boxes and each box contained 20 pears, then all treatments were stored at 0°C with 90-95% R.H.

For physical and chemical determinations, a sample consisting of 3 fruits was taken randomly from each replicate within each treatment at 15 days intervals.

Post harvest disorders (decayed and discolored fruits) were calculated, fruit weight loss was recorded, fruit colour was measured using Hunter colourimeter Model Dp9000, fruit firmness was estimated by Lfra texture analyzer using a penetrating needle of 1mm of diameter, 10 mm in distance, speed 2 mm per second and the peak of resistance was recorded per gram. Total soluble solids were determined by A`bbe refractometer in fruit juice and total acids % according to A.O.A.C. (1980).

Respiration rate: sample of fruits were taken from coated, wrapped fruits and the control, CO_2 was determined according to Cross method (1966). The respiration rate was calculated as ml CO_2/kg./hr as follows:

$$\frac{\text{(Concentration of } CO_2 \text{ for sample x 10) (free space volume of container in liters)}}{\text{Product fruit weight in kg.) (time container enclosed in hours)}}$$

Shelf life, a sample of ten fruits of each replicate was taken out at shelf life : a sample of ten fruits of each replicate was taken out at the end of storage at 0°C and left at room temperature (20-22°C) for six days, the percentage of decayed fruits were calculated and considered as an indicator for shelf life.

All obtained data were subjected to analysis of variance according to Snedecor and Cochran (1980). Differences among means were compared using Duncan Multiple Ranges test (Duncan, 1955) at 5% level.

RESULTS AND DISCUSSION

1- Fruit physical composition:

1.1. Post harvest fruit disorders:

Results in Table (1) showed that the post harvest disorders significantly increased by extending the storage period during storage at 0°C in both seasons for all treatments, meanwhile, fruits treated with olive oil coating showed much lower values (6.76-7.04) than other treatments. Similar results were observed by

Meheriuk and Sholberg (1990), they found that fruit coatings reduced the incidence of disorderes. Korsal *et al.* (1994) revealed that Semperfresh coating on apples and pear fruits reduced fruit loss due to senescence and superficial scald than control. Ismail (1997) reported that the incidences of storage disorders was lower in coated fruits than control.

Table (1): Effect of post-harvest treatment on post-harvest disorders and weight loss of Le-Conte pears during storage at 0°C in (2003 & 2004 seasons).

Season	1st season							
Storage periods (days) Treatment	0	15	30	45	60	75	90	M
	Post-harvest disorders %							
Control	0.0	2.8	5.8	12.0	24.0	38.0	50.2	18.97A
Wrapping	0.0	2.3	4.6	11.5	20.0	28.5	32.0	14.1B
Olive oil coating	0.0	0.0	0.0	3.2	8.1	16.0	20.0	6.76C
M	0.0G	1.7F	3.46E	9.9D	17.37C	27.5B	34.07A	
L.S.D. 0.05	T = 0.45			P = 0.68			T x P = 1.18	
	Weight loss %							
Control	0.0	2.1	3.9	4.8	5.8	6.8	7.7	4.43A
Wrapping	0.0	1.9	3.5	4.1	4.8	5.5	6.2	3.71B
Olive oil coating	0.0	1.8	2.8	3.5	4.1	4.8	5.4	3.20C
M	0.0G	1.9F	3.33E	4.13D	4.9C	5.7B	6.43A	
L.S.D. 0.05	T = 0.1			P = 0.15			T x P = 0.26	
	2nd season Post-harvest disorders %							
Control	0.0	2.6	6.0	12.5	25.0	40.0	51.5	19.66A
Wrapping	0.0	2.4	4.0	12.0	22.5	29.5	35.0	15.06B
Olive oil coating	0.0	0.0	0.0	3.5	8.3	16.5	21.0	7.04C
M	0.0G	1.67F	3.33E	9.33D	18.6C	28.67B	35.83A	
L.S.D. 0.05	T= 0.41			P = 0.63			T x P = 1.09	
	Weight loss %							
Control	0.0	1.9	3.3	4.1	4.9	5.8	6.7	3.81A
Wrapping	0.0	1.6	2.9	3.6	4.5	4.6	5.3	3.07B
Olive oil coating	0.0	1.4	2.3	2.9	3.4	4.0	4.5	2.64C
M	0.0G	1.6F	2.8E	3.5D	4.27C	4.47B	5.5A	
L.S.D. 0.05	T= 0.29			P = 0.44			T x P = 1.76	

T = Treatment P = Storage periods TxP=The interaction between T and B

1.2. The percentage of weight loss:

Data presented in Table (1) showed that the weight loss percentage significantly increased by prolonging the storage periods during storage at 0°C for 3 months in both seasons. Pears treated with olive oil coating induced a remarkable reduction in fruit weight loss as compared with wrapping or control in both seasons. Similar results were observed by Ismail (1997) found that the percentage of weight loss was significantly less in Semperfresh treated fruits. Mehaisen and El-Sharkawy (2005) found that coated guava fruits with olive oil coating reduced weight loss.

1.3. Fruit colour:

Figure (1) indicated that pear fruits coated with olive oil delayed the change in colour during cold storage and exhibited normal colour change than wrapped fruits and control. The obtained data were in harmony with the results of Lim and Khoo, (1990) and Mohamed *et al.* (1994) as they used palm oil emulsion as surface coating treatments on guava fruits to extend the storage life of fruits by maintaining fruit quality. Similar results were obtained by McGuier and Hallman (1995) revealed that coated fruits with cellulose or carnauba – based emulsions maintained fruit colour.

Ju-ZiGuo *et al.* (2001) reported that pear fruits treated with either maize or soybean oil after harvest and stored at 0°C for 15 weeks maintained fruit colour and exhibited normal colour change. Merwe *et al.* (2002) revealed that Semperfresh coating on pears resulted in greener skin colour without loss of fruit quality. Mehaisen and El-Sharkawy (2005) found that olive oil coating on guava fruits reduced fruit discolouration.

1.4. Fruit firmness:

Data in Table (2) showed that flesh firmness of pear fruits significantly decreased by extending storage period with all treatments during storage at 0°C in both seasons. Pear fruits coated with olive oil showed higher firmness than wrapping and control, these results are in agreement with those of Ismail (1997) he found that coating Le Conte pears with Semperfresh significantly increased firmness. Similar results were observed by Merwe *et al.* (2002), Mehaisen and El-Sharkawy (2005) reported that Guava fruits coated with olive oil were firmer than uncoated ones. Which may be due to the effect of coating in inhibiting respiration rate (Fig. 2).

2- Fruit chemical changes (T.S.S. & T.A) during cold storage:

Data in Table (2) showed that changes in T.S.S. and T.A. had no significant differences among treatments, meanwhile, fruits coated with olive oil had a lower value of T.S.S.% and a higher value of T.A.% than wrapping and control. These data were in line with those obtained by Koksal *et al.* (1994), Ismail (1997), Ju-ZhiGuo *et al.* (2001) and Togrul and Arslan (2004).

3- Respiration rate:

Data in Fig. (2) showed that wrapping and coating Le conte pears reduced respiration rate during storage at 0°C. where coated fruits had a slow respiration rate than others. These results are in agreement with those reported by Meheriuk and Sholberg (1990) revealed that coated pears had lower respiration rates Chikazumi *et al.* (1995) they concluded that corn oil as surface coating on citrus hassaku fruits reduced fruit respiration compared with control fruits. Ju-ZhGuo *et al.* (2001) reported that coating pear fruits with either maize or soybean oil delayed and reduced internal ethylene accumulation.

Table (2): Effect of post-harvest treatment on firmness (gm/cm^2), total soluble solids (%) and total acidity (%) of Le-Conte pears during storage at 0°C in (2003 & 2004 seasons).

Season	1st season							
Storage periods (days) Treatment	0	15	30	45	60	75	90	M
	Firmness (gm/cm^2)							
Control	488	448	411	337	272	223	205	340.6C
Wrapping	488	462	437	380	325	257	239	370B
Olive oil coating	488	471	454	425	399	288	248	396A
M	488A	460E	434C	381D	332E	256F	231G	
L.S.D. 0.05	T = 0.26			P = 3.45			T x P = 5.97	
	T.S.S. (%)							
Control	13.0	13.1	13.3	13.4	13.5	13.7	14.0	13.43A
Wrapping	13.0	13.0	13.1	13.2	13.3	13.4	13.8	13.26A
Olive oil coating	12.9	12.9	13.0	13.1	13.3	13.4	13.6	13.17A
M	12.97B	13.0B	13.13B	13.23AB	13.37AB	13.5AB	13.8A	
L.S.D. 0.05	T = 0.35			P = 0.53			T x P = 0.92	
	T.A. (%)							
Control	0.28	0.27	0.26	0.26	0.25	0.24	0.23	0.255B
Wrapping	0.28	0.28	0.27	0.27	0.26	0.25	0.24	0.264A
Olive oil coating	0.28	0.28	0.27	0.27	0.26	0.26	0.25	0.267A
M	0.28A	0.277A	0.267B	0.267B	0.257BC	0.250	0.240D	
L.S.D. 0.05	T = 0.06			P = 0.01			T x P = 0.017	
	2nd season Firmness (gm/cm^2)							
Control	462	426	390	320	256	210	196	324C
Wrapping	462	436	414	360	310	240	226	350B
Olive oil coating	462	448	430	405	474	274	236	376A
M	462A	437B	411C	365D	313E	241F	219G	
L.S.D. 0.05	T= 2.85			P = 4.36			T x P = 7.55	
	T.S.S. (%)							
Control	13.1	13.1	13.3	13.4	13.5	13.6	13.8	13.4A
Wrapping	13.1	13.1	13.2	13.5	13.6	13.7	13.8	13.43A
Olive oil coating	13.0	13.0	13.2	13.3	13.4	13.5	13.6	13.29A
M	13.07D	13.07D	13.23CD	13.4BC	13.5A-C	13.6AB	13.73A	
L.S.D. 0.05	T= 0.19			P = 0.29			T x P = 0.5	
	T.A. (%)							
Control	0.26	0.25	0.24	0.24	0.23	0.22	0.21	0.237B
Wrapping	0.26	0.25	0.25	0.24	0.24	0.23	0.22	0.241AB
Olive oil coating	0.26	0.26	0.25	0.25	0.24	0.24	0.23	0.247A
M	0.260A	0.253AB	0.250AB	0.247B	0.237C	0.230C	0.220D	
L.S.D. 0.05	T= 0.007			P = 0.009			T x P = 0.017	

Means followed by the same letter (S) are not significantly different at 5% level.
T = Treatment P = Storage periods TxP=The interaction between T and B

4- Shelf life:

Data in Fig. (3) cleared that pear coatings extended shelf life by reducing decayed fruits (%), weight loss (%) and respiration rate than either wrapped or control ones. Similar results were observed by Ismail (1997), Merwe *et al.* (2002) and Toqrul and Arslan (2004).

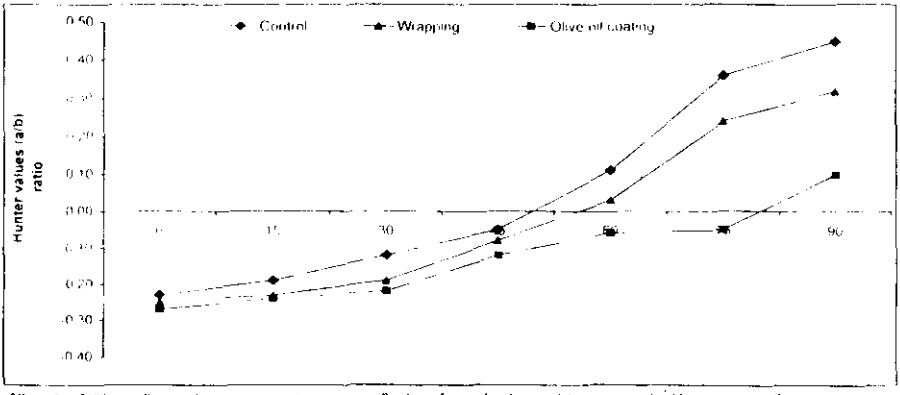

Fig. (1): Effect of post-harvest treatments on fruit colour during cold storage (0 °C) average of two seasons.

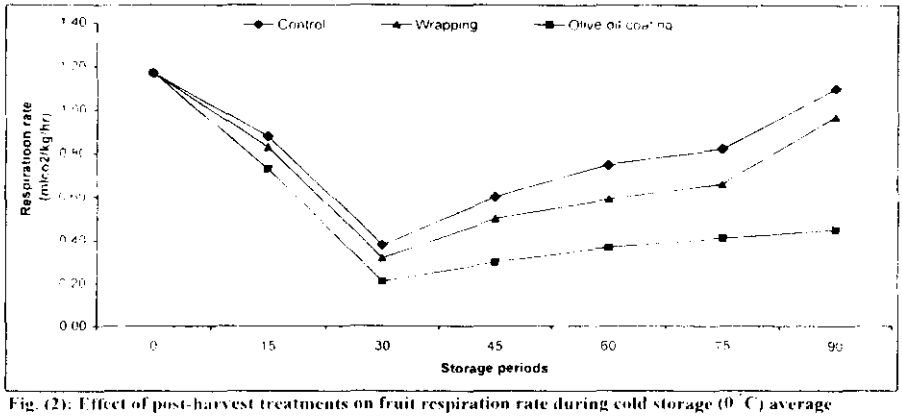

Fig. (2): Effect of post-harvest treatments on fruit respiration rate during cold storage (0 °C) average of two seasons.

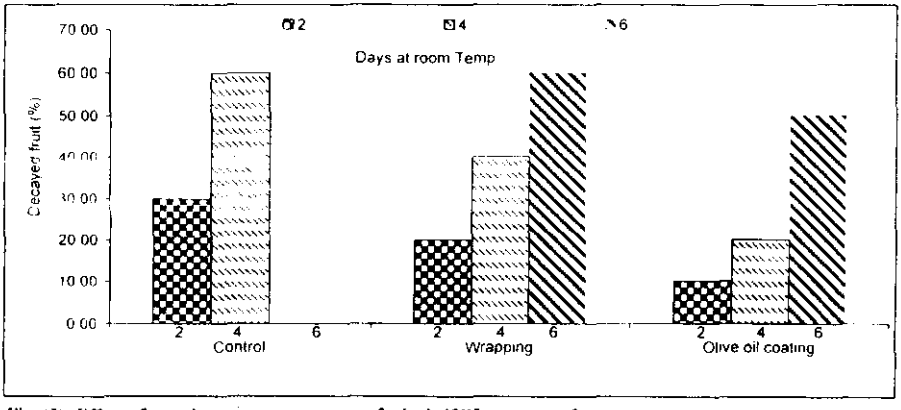

Fig. (3): Effect of post-harvest treatments on fruit shelf life average of two seasons.

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تقليل أضرار ما بعد الجمع لثمار الكمثرى الليكونت

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أجريت هذه الدراسة خلال موسمى ٢٠٠٣ ، ٢٠٠٤ بقسم تداول الفاكهة بمعهد بحوث البساتين بالجيزة على ثمار كمثرى الليكونت.

جمعت الثمار (من حديقة خاصة بمنطقة زايد/ أشمون / منوفية) فى الاسبوع الثالث من شهر أغسطس عندما وصلت إلى اكتمال النمو ونقلت مباشرة إلى المعمل حيث تم فرز الثمار وغسلها بماء الصنبور وتركت لتجف ثم قسمت إلى ثلاث مجموعات :

- ثمار المجموعة الأولى تركت بدون معاملة (مقارنة).
- ثمار المجموعة الثانية تم لفها بورق ناعم (حرير).
- ثمار المجموعة الثالثة غلفت بطبقة رقيقة جدا من زيت الزيتون.

ثم تم تعبئة كل المعاملات فى عبوات كرتون مبطنة بورق ناعم وخزنت على درجة حرارة الصفر المئوى لمدة ثلاثة أشهر.

أوضحت نتائج هذه الدراسة أن المعاملة بزيت الزيتون (منتج طبيعى) حسنت صفات جودة الثمار، حيث كانت الثمار أكثر صلابة وقللت من التغير فى اللون، ونسبة التالف والفقد فى الوزن ومعدل التنفس. وأطالت عمر الرف للثمار يليها معاملة اللف بالورق مقارنة بالثمار الغير معاملة ولم يلاحظ أى فروق معنوية بين المعاملات فى نسبة كل من المواد الصلبة الذائبة الكلية والحموضة.