

EFFECT OF ETHEPHON ON RIPENING PROCESS OF KELSEY PLUM FRUITS.

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ABSTRACT

The present study was carried out during 2010 and 2011 seasons to evaluate the effect of dipping Kelsey plum fruits in different concentrations of ethephon (250, 500, 750 and 1000 ppm) as post harvest treatment to hasten fruit ripening. The data showed clear that ethephon application increased both loss in fruit weight, decayed fruit and total loss in fruit weight than the control. Yet, higher concentration was superior in this respect furthermore these treatment reduced both fruit firmness and chlorophyll A, B but increased SSC, and total anthocyanin than the control. Also, that data presented that higher concentration (1000 and 750 ppm) gave a higher effect in this respect.

INTRODUCTION

The Kelsey plum (*Prunus salicina*) is one of the deciduous fruit trees which has low chilling requirements about (400-450 hr) effective chilling units (Gao Dongsheng *et al.*, 2001). Since, it is cultivated throughout the warmer parts of the world, e.g., in the China, America, Europe and the Caucasus. In Egypt, the cultivated area with plum trees was decreased during the last few years, since it reached about 2736 feddans with an annual fruit production about 2594 tons according to the last statistics of Ministry of Agriculture in Egypt (2013).

Plums are high in carbohydrates, low in fats and calories. Plums are an excellent source of vitamin A, calcium, magnesium, iron, potassium and fibers. Plums are free of sodium and cholesterol. Like most fruits, plums contain a substantial amount of vitamin C. The Kelsey plum trees not need pollination trees for fertilization. In Egypt climate, soil and temperature conditions are suitable for it growing trees and to obtained high economical production or yield. For that farmer take high attention to increase the cultivate area with Kelsey plum.

Ethephon, 2-chloroethylphosphonic acid, is a plant growth regulator with systemic properties. It penetrates the plant tissues, and decomposes into ethylene, which affects the growth processes. It is used to promote pre-harvest ripening in several fruits such as apples, currants, blackberries, blueberries, cranberries and cherries,. Furthermore, it is also used to accelerate post-harvest ripening in bananas, mangoes, and remove green colour in peel of citrus fruit; to facilitate harvesting by apcersion and loosening of the fruit in currants, gooseberries, cherries, and apples. The present investigation was carried out to study the effect of different concentrations of ethephon as post harvest treatments to improve peel colour and quality of Kelsey plum fruits in order to know the normal time and

the suitable concentration of ethephon to hasten fruit ripening help farmer (grower) to avoid un suitable conditions for storage and extend the market period.

MATERIALS AND METHODS

The present study was carried out during the seasons of 2010 and 2011 to evaluate the effect of ethephon application for enhancing ripening process of Kelsey plum fruits.

In this study, Kelsey plum fruits were obtained from a private orchard in kilo 85 Alex-Cairo desert roads near of Dena farm. About 100 kg of fruits were harvested at maturity stage when the color of fruits was green yellow skin, firmness in fruit about was 8.8lbinch according to (Manganaris.*et al.*2008) and immediately transported to the laboratory of Pomology Dept., Fac. Of Agric., Mansoura Univ. Fruits were sorted to discard any defective and mechanical damaged fruits. Therefore, uniform fruits in size and colour were washed with tap water and dried by using air of electric fan. Fruits were divided to five groups; one of each was dipped for 5 minutes in one of the following solution:

- 1- Control (dipping in Tap water).
- 2- Ethephon at 250 ppm.
- 3- Ethephon at 500 ppm.
- 4- Ethephon at 750 ppm.
- 5 - Ethephon at 1000 ppm.

After treatments, fruits were air dried using an electric fan and then were put in ventilated plastic bags and pallets bags, all bags with fruits were weighted and every 5 bags were put in ventilated carton box (50 X 30X12) cm. the total number of carton boxes were 20 for all treatments, each treatment consists for 4 carton boxes, each box contains 5 ventilation plastic bags and pallets bags. All boxes were held at room temperature at (29-30 °C and 90%RH) and cold temperature at (3+or-1 and R.H 90%H) to study the effect of dipping fruits in ethephon solution on ripening process of Kelsey plum. Stored fruits were examined at 4 days for room temperature and15 days under cold storage interval, 3 bags from each treatment were taken to determine the following parameters:

1-Loss in fruit weight percentage:

It was determined by weighting the plastic bag every 4 days for room temperature and 15 days for cool temperature and percent of weight loss for each bag was calculated in relation to it is initial weight according to the following equation:

$$\text{Weight loss \%} = \frac{\text{Initial weight- Weight at sample date}}{\text{Initial weight}} \times 100$$

2- Decay percentage:

It was determined by weighting decayed fruits for each sample during storage using the following equation:

$$\text{Decayed fruits \%} = \frac{\text{Weight of decayed fruits}}{\text{Initial fruit weight}} \times 100$$

3- Total loss in fruit weight:

It was calculated by determining loss in fruit weight and decayed fruits.

4- Fruit firmness

It was determined by using a hand Effegi-penetrometers supplemented with a plunger of 8 mm diameter and estimated as lb/inch.

5- Change in fruit pigments:

0.5 gm of skin fruits was extracted by 10 ml methanol for 24 hr under laboratory temperature after adding tract amount from sodium bicarbonate then both chlorophyll and carotenoids were determined by using spectrophometer at the wave length 452.5, 650 and 660 nm for chlorophyll A, B and carotenoids respectively and the total carotenoids were estimated by

the following equations:-

Chl.A= 16.5 E665 – 8.3 E650

Chl.B= 33.8 E650 – 12.5 E665

Carotene= 4.2 E452.5 – 0.0264chl.A – 0.496chl.B

Carotene mg/100g f.w= Carotenexvolume of solutionX100/Weight of sample X 100

6-Total anthocyanins content:

Weight of 0.5 gm of skin fruits was extracted by 10 ml of acidified alcohol solution, for 24 hr under laboratory temperature .The extract was measured at 535 nm wave lengths by using spectrophometer according to the methods of (Hsia *et al.*, 1965) .The content of total anthocyanin in plum skin was calculated using the following equations:

$$\text{Total anthocyanins Content mg /100 gm} = \frac{\text{Absorbance X Volume made up of the extracts used for color measurement} \times \text{MI of the extract used} \times \text{Weight of sample}}{\text{Total absorbance}} \times 98.2(E)$$

The (E) value for 1% solution at 535 is equal to 98.2. Therefore, the absorbance of solution containing 1mg is equal to 98.2.

5- Soluble solids content (SSC %):

It was measured by using Carlzeiss hand refractometer .

6- Total titratable acidity:

Ten ml of fruit juice were titrated with 0.1 N sodium hydroxide solution using phenol phthalein as indicator. Total acidity was expressed as gm malic acid /100 ml juice according to A.O.A.C (1980)

Statistical analysis:

All the obtained data for the present study were statistically analyzed according to analysis of variance (ANOVA) for experiment in randomized complete block design according to Gomez and Gomez,(1984) and (L.S.D) at 5 % used to compare the variances between the treatments .

RESULT AND DISCUSSION

This study was carried out to evaluate the effect of dipping Kelsey plum fruits in different ethephon solutions on ripening process of Kelsey plum fruits under room temperature and cold storage, the obtained results are presented as follows:

- Loss in fruit weight percentage:

Data from Table (1) presented that loss in fruit weight gradually increased as storage period advanced either under room temperature or at cold storage. Thus, all applied treatments increased the loss in fruit weight than the control. Since the percentage of loss in fruit weight of the untreated fruits was 2.49 after 30 days of cold storage as mean of both seasons. Dipping Kelsey plum fruits in ethephon at 250 ppm significantly increased the loss in fruit weight since it averaged about 2.77 as a mean of the two seasons after 30 day of cold storage.

On the other hand, treated Kelsey plum fruits with ethephon 1000 ppm produced a higher percentage of loss in fruit weight than the other treatments used and reached about 4.15 after 12 days during the storage at room temperature, while reached about 3.37 after 30 days of cold storage as a mean of the two seasons.

Table (1): Effect of postharvest treatments on weight loss percentage of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature				Cold storage		
	Storage period in days				Storage period in days		
	4	8	12	mean	15	30	mean
Control	1.59	2.68	3.19	1.86	1.31	2.49	1.26
Ethephon 250ppm	2.57	3.19	3.56	2.33	1.70	2.77	1.48
Ethephon 500ppm	2.83	3.30	3.67	2.44	2.19	2.86	1.68
Ethephon 750ppm	2.93	3.59	4.04	2.64	2.58	2.87	1.82
Ethephon 1000ppm	3.37	3.65	4.15	2.79	3.04	3.37	2.13
mean	2.66	3.28	3.72	-	2.16	2.87	-
L.S.D	Ttreatments = 0.144				Ttreatments = 0.140		
	Sstorage period = 0.145				Sstorage period = 0.140		

Moreover, the loss in fruit weight from harvested horticultural crops is a major cause of deterioration in storage and results not only in loss in salable weight but also in less attractive produce of poorer texture and lower quality. This loss is due to the water loss, through transpiration, while some weight loss is due to loss of carbon in respiration but this is only a minor part of the total loss. The high storage temperature causes a high respiration rate which lead to a fruit weight loss. The results of the present study and associated discussion are supported by the findings of (Hardenburg *et al.*, 1990)

2- Decay percentage :

It is clear from Table (2) that all treatments significantly increased the percent of decayed fruits than the control fruits after 12 days at room temperature or 30 days of cold storage during both seasons.

Yet, dipping "Kelsey" plum fruits in ethephon at 750 or 1000 ppm significantly increased decay percentage during storage period and after 12 days at room temperature than the other treatments used or the control. Since, ethephon application at 1000 ppm was effective in this respect since, it presented 12.25 decayed fruits, while fruits treated with ethephon at 750 ppm existing 11.47 decayed fruits after 12 days at room temperature as a mean of both seasons. Thus, the control presented 9.60 decayed fruits as a mean of the two seasons of study.

Table (2): Effect of postharvest treatments on Decay percentage of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature				Cold storage		
	Storage period in days				Storage period in days		
	4	8	12	mean	15	30	mean
Control	8.01	8.55	9.60	6.53	8.25	8.65	5.63
Ethephon 250ppm	4.35	9.00	9.95	5.82	8.28	9.11	5.79
Ethephon 500ppm	8.67	9.72	10.1	7.12	9.38	10.40	6.59
Ethephon 750ppm	9.82	10.50	11.47	7.94	10.4	11.25	7.21
Ethephon 1000ppm	10.37	11.17	12.25	8.43	11.15	11.72	7.62
mean	8.24	9.83	10.67	-	9.43	10.22	-
L.S.D	Ttreatments = 0.356				Ttreatments = 0.329		
	Sstorage period = 0.356				Sstorage period = 0.329		

Furthermore, ethephon application at 250 ppm reduced the percent of decayed fruits, since it averaged 9.95 during the two seasons respectively, than those treated with ethephon at 500 ppm or the control after 12 days at room temperature.

Fruits which stored at cold storage for 30 days showed a reduction in decayed fruits than the fruits which stored at room temperature in both seasons. Yet, fruits treated with ethephon at 750 and 1000 ppm gave a lower decayed fruit percent than the other treatments or the control stored at room temperature. Since, the percentage of decayed fruits due to ethephon application at 750 averaged 11.25 and reached 11.72 when treated with ethephon 1000 ppm after 30 days cold storage as a mean of two seasons.

3- Total loss in weight percentage:

Total loss in fruit weight is mainly due to the loss in fruit weight and decayed percentages are presented in Table (3) .It is clear that dipping "Kelsey" plum fruits in ethephon at 750 or 1000 ppm significantly increased the percent of total loss in fruit weight at the both seasons than the other treatments or the control. Since, ethephon application at 750 or 1000 ppm presented a losses about 15.52 and 16.40 respectively, after 12 days at room temperature. Whereas, the total loss percentage reached about 14.12 and 15.09 after 30 days under cold storage as a mean of two seasons.

These results may be due to that ethephon at 750 and 1000 ppm significantly increased the loss weight and decayed fruits through storage period than dipping in 250 or 500 ppm of ethephon or the control under room temperature or cold storage.

Table (3): Effect of postharvest treatments on Total loss percentage of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature				Cold storage		
	Storage period in days				Storage period in days		
	4	8	12	mean	15	30	mean
Control	9.59	11.23	12.79	8.40	9.56	11.14	6.9
Ethephon 250ppm	6.92	12.31	13.51	8.18	9.98	11.87	7.28
Ethephon 500ppm	11.50	13.03	13.77	9.57	11.57	13.27	8.28
Ethephon 750ppm	12.75	14.09	15.52	10.59	12.98	14.12	9.03
Ethephon 1000ppm	13.74	14.82	16.40	11.24	14.19	15.09	9.75
mean	10.9	13.09	14.39	-	11.65	13.10	-
L.S.D	Ttreatments = 0.393				Ttreatments = 0.416		
	Sstorage period = 0.393				Sstorage period = 0.416		

Furthermore, dipping Kelsey plum fruits in ethephon at 500 ppm gave a lower percentage of total loss in fruit weight than dipping fruits in ethephon 750 or 1000 ppm through storage period. Since, the loss percentage averaged about 13.77 after 12 days at room temperature whereas, the loss percentage reached 13.27 after 30 days of cold storage as mean of both seasons under study.

4- Changes in Fruit firmness (lb/inch) :

Data from Table (4) show clearly that, fruits firmness was reduced as storage period advanced under room temperature or at cold storage. In this respect the data also showed that all treatments significantly reduced changes in fruit firmness than the control at room temperature or under cold storage through the two seasons. However, the reduction in fruit firmness was higher during room temperature compared with the fruits under cold storage. That is not astonishing since, the temperature was higher at room temperature, and thus so the respiration rate was almost higher than under cold condition.

Table (4):Effect of postharvest treatments on firmness (lb/inch) percentage of Kelsey plum fruits (mean of two seasons)..

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	8.90	8.40	7.95	7.62	8.21	8.90	7.95	6.56	7.80
Ethephon 250ppm	8.90	8.25	7.70	7.02	7.96	8.90	7.85	6.65	7.79
Ethephon 500ppm	8.90	7.85	7.40	6.82	7.74	8.90	7.65	6.52	7.69
Ethephon 750ppm	8.90	7.55	6.82	5.80	7.26	8.90	7.07	5.95	7.30
Ethephon 1000ppm	8.90	7.35	6.32	5.80	7.09	8.9	7.05	5.52	7.15
mean	8.9	7.88	7.24	6.62		8.90	7.51	6.24	-
L.S.D	Ttreatments = 0.345					Ttreatments = 0.269			
	Sstorage period = 0.345					Sstorage period = 0.269			

Furthermore, treated fruits with ethephon at 750 or 1000 ppm produced lower fruit firmness than dipping fruits in ethephon at 500 ppm or control during the two seasons of study. Since, the firmness percentage averaged about 5.80-5.80 lb/inch after 12 days at room temperature while, it averaged 5.95 - 5.52 lb/inch from fruits at cold storage as a mean of two seasons respectively. In this respect, the reduction attributed in fruit firmness due to these mainly due to decomposition of enzymatic degradation of insoluble protopectins to more soluble pectins, solubilization of cell wall contents as a result of increasing in pectin esterase activity and subsequent development of juiciness and the loss in peel and pulp hardness. (Deshpande and Salunkhe., 1964).

5- SSC percentage in fruit juice :

Concerning to the effect on SSC, Data from Table (5) showed that soluble solid content in fruit juice of "Kelsey" plum was gradually increased as storage period prolonged advanced either at room temperature or during cold storage. These results agree with that description by El- Sheikh (2002) who reported that the soluble solids content of Le Conte pear fruits was increased according to the extension of the storage period. This may be due to the losses in water through the respiration and evaporation during storage. The data also disclose that, ethephon at 1000 ppm was superior for increasing the values of SSC in fruit juice so, it presented 14.45 after 12 days storage at room temperature than the other treatments used or the control as a mean of both seasons.

Table (5): Effect of postharvest treatments on SSC percentage of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	8.87	11.02	11.55	12.05	10.87	8.87	11.2	12.47	10.85
Ethephon 250ppm	8.87	12.15	12.92	13.32	10.68	8.87	11.57	12.52	10.99
Ethephon 500ppm	8.87	12.05	12.77	13.67	11.84	8.87	12.65	13.92	11.81
Ethephon 750ppm	8.87	12.47	13.12	13.80	12.06	8.87	12.6	13.97	11.81
Ethephon 1000ppm	8.87	13.20	13.8	14.45	12.57	8.87	12.72	14.45	12.01
mean	8.87	12.18	12.83	13.46	-	8.87	12.15	13.47	-
L.S.D	Ttreatments = 0.589					Ttreatments = 0.566			
	Sstorage period = 0.589					Sstorage period = 0.566			

The data also presented that dipping fruits in ethephon at 750 ppm significantly increased the percentage of SSC in juice of Kelsey plum fruits in both seasons but the values was almost lower than ethephon at 1000 ppm. Since, ethephon application at 750 ppm presented about 13.80 after 12 days at room temperature whereas, the SSC percentage reached 13.97 after 30 days under cold storage . In this respect, Mann and Baljit Singh (1990) presented that treated *Pyrus pyrifolia* fruits with 250, 500 or 1000 ppm ethephon for 1 min after harvest ,found that at higher concentrations of ethephon reduced the values of fruit firmness decreased more rapidly than in the controls. SSC tended to increase during ripening. The increase being greater with high Ethephon concentrations, while total acidity reduced than the other concentration. Starch content decreased sharply during the initial 5 to 10 days with both harvesting dates. Pigments were increased while phenolics decreased during ripening.

6-Total titratable acidity in juice of Kelsey plum fruits:

Data from Table (6) presented that the total titratable acidity in juice of plum fruits decreased as storage period advanced. In this respect, Paul *et al.*, (1993) found that titratable acidity of Columbia and Gebhard strains of red d' Anjou pear fruit was significantly decreased during storage. Furthermore, ethephon at 1000 ppm produced lower acidity in fruit juice than all treatments used or the control, since it averaged 0.43 after 12 days during stored at room temperature, while ethephon at 1000 ppm presented 0.41 after 30 days of cold storage as mean of two seasons, but the reduction was unpronounced. Moreover, there are no clear effect had obtained between the applied treatments and the control at cold storage or during storage period in both seasons.

Table (6): Effect of postharvest treatments on Total titratable acidity in juice of Kelsey plum fruits.

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	0.92	0.89	0.82	0.70	0.80	0.92	0.70	0.62	0.75
Ethephon 250ppm	0.92	0.77	0.69	0.61	0.74	0.92	0.67	0.59	0.72
Ethephon 500ppm	0.92	0.75	0.66	0.55	0.72	0.92	0.60	0.53	0.68
Ethephon 750ppm	0.92	0.68	0.60	0.48	0.67	0.92	0.55	0.48	0.65
Ethephon 1000ppm	0.92	0.58	0.45	0.43	0.60	0.92	0.45	0.41	0.59
mean	0.92	0.74	0.64	0.55	-	0.92	0.59	0.53	-
L.S.D	T _{treatments} = 0.065					T _{treatments} = 0.059			
	S _{storage period} = 0.065					S _{storage period} = 0.059			

In this aspect, Abd EL –Magid (1986) stored "Le Conte" pear fruit for 13,12,4 and 2 weeks at 0,5,10 and 20 C, respectively, found that malic acid is a respiratory substrate and its consumption in respiration increased with the progress of storage period and this may be responsible for the observed decrease in acidity during the last days of storage.

7- Total chlorophyll content:

Data from Table (7 and 8) showed the effect of various treatments used on changes of both chlorophyll A and B during storage under room temperature and cold storage.

From Table (7) data presented that chlorophyll A in plum fruits decreased with storage period advanced during cold storage or under room temperature. Since, all treatments presented a lower content of chlorophyll A in the skin of plum fruits than control either at room temperature 0.091 mg/100g or 0.092mg/100g skin fresh weight under cold storage Whereas, the values of chlorophyll A during storage period at room temperature were almost lower than those obtained at cold storage. In addition, color is the main factor for the consumer; if it is unappearing the consumers are unlikely to judge the flavor or texture (Francis, 1980). Moreover, ethephon application either at 1000 ppm or 750 ppm produced a lower chlorophyll A than all the other treatments or the control after 12 days at room temperature and 30 days of cold storage in both seasons. The reduction due to using ethephon either at 1000 ppm or 750 ppm reached about 0.048 and 0.056 mg/100mg fresh weight after 12 days at room temperature, respectively. While, after 30 days of cold storage the values averaged 0.072and 0.080 mg/100mg fresh weight in both concentrations, respectively.

Table (7):Effect of postharvest treatments on chlorophyll A content (mg/100g) of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	0.137	0.090	0.093	0.090	0.104	0.137	0.097	0.092	0.108
Ethephon 250ppm	0.137	0.081	0.076	0.070	0.091	0.137	0.093	0.088	0.106
Ethephon 500ppm	0.137	0.075	0.071	0.064	0.086	0.137	0.090	0.081	0.103
Ethephon 750ppm	0.137	0.068	0.063	0.056	0.081	0.137	0.084	0.080	0.100
Ethephon 1000ppm	0.137	0.063	0.055	0.048	0.075	0.137	0.079	0.072	0.096
mean	0.137	0.077	0.071	0.065	-	0.137	0.088	0.082	-
L.S.D	Ttreatments = 0.132					Ttreatments = 0.148			
	Sstorage period = 0.132					Sstorage period = 0.148			

Data from Table (8) showed that chlorophyll B content decreased as storage period advanced from harvest till 12 days at room temperature and at 30 days at cold storage. Yet the reductions of chlorophyll B during storage period were higher than those obtained at cold storage during the both seasons of study. In this respect, all treatments used produced a lower value of chlorophyll B than the control. Yet, ethephon at 1000 ppm gave lower values of chlorophyll B than the other treatments used at room temperature or at cold storage. Since the values reached about 0.053 mg/100mg after 12 days at room temperature and 0.056 mg/100mg fresh weight after 30 days of cold storage as means of both seasons.

Table (8): Effect of postharvest treatments on chlorophyll B content (mg/100g) of Kelsey plum fruits (mean of two seasons).

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	0.235	0.123	0.099	0.086	0.135	0.235	0.095	0.081	0.137
Ethephon 250ppm	0.235	0.113	0.092	0.0815	0.130	0.235	0.087	0.078	0.133
Ethephon 500ppm	0.235	0.091	0.086	0.076	0.095	0.235	0.087	0.073	0.132
Ethephon 750ppm	0.235	0.084	0.075	0.0675	0.115	0.235	0.079	0.065	0.126
Ethephon 1000ppm	0.235	0.073	0.062	0.053	0.105	0.235	0.069	0.056	0.120
mean	0.235	0.097	0.082	0.064	-	0.235	0.083	0.070	-
L.S.D	Ttreatments = 0.261					Ttreatments = 0.270			
	Sstorage period =0.261					Sstorage period = 0.270			

Furthermore, the untreated fruits produced higher values of chlorophyll B in both seasons than all treatments used either after 12 days at room temperature averaged 0.086 mg/100mg or after 30 days of cold storage

presented 0.081mg/100mg. In this respect Hussein *et al.* (1997) stored "Le conte" pear fruits at 0, 10 and 20 °C and found that, changes in peel coloration from green to yellow were related to storage temperature.

8 - Total carotenoids content:

It is clear from Table(9) that, carotenoids content in Kelsey plum fruits increased as storage period advanced from harvest till 12 days at room temperature or at 30 days at cold storage. Yet the values of total carotenoids during the storage at room temperature were higher than those obtained at cold storage during the both seasons of study.

Table (9): Effect of postharvest treatments on Total carotenoids content of Kelsey plum fruits. .(mean of two seasons).

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	Mean	0	15	30	mean
Control	0.663	0.356	0.205	0.181	0.351	0.663	0.183	0.179	0.341
Ethephon 250ppm	0.663	0.382	0.230	0.199	0.368	0.663	0.223	0.193	0.359
Ethephon 500ppm	0.663	0.423	0.324	0.243	0.413	0.663	0.284	0.272	0.406
Ethephon 750ppm	0.663	0.463	0.409	0.316	0.462	0.663	0.340	0.310	0.437
Ethephon 1000ppm	0.663	0.515	0.427	0.333	0.484	0.663	0.350	0.318	0.443
mean	0.663	0.428	0.319	0.254	-	0.663	0.276	0.254	-
L.S.D	Ttreatments =0.280					Ttreatments =0.205			
	Sstorage period =0.280					Sstorage period =0.205			

Data from these tables also reveal that all ethephon treatments gave higher values of total carotenoids than the control under room temperature or cold storage. Ethephon at 1000 ppm after 12 days at room temperature increased the total carotenoids since it gave about 0.333 mg/100mg than the other treatments used or the untreated fruits which presented 0.181 mg/100mg fresh weight as means of both seasons. Furthermore, Ethephon at 750 or 500 ppm gave a higher effect in this respect, but almost lower than those obtained from the ethephon application at 1000 ppm. Since it averaged about (0.316) mg/100mg or (0.243) mg/100mg fresh weight after 12 days at room temperature as means of both seasons under the study. Simon (1997) found that carotenoids protect the chlorophyll from photo-oxidation and are accessory, light harvesting pigments and photoreceptors.

9-Anthocyanin content in Kelsey plum fruits:

The results in Table disclosed that, anthocyanin content in skin of Kelsey plum fruits was significantly increase with storage period advanced from harvest till 12 days at room temperature and 30 days of cold storage. Yet the values of anthocyanin during the storage at room temperature were higher than those obtained at cold storage during the both seasons of stud. Also, ethephon at 1000 ppm after 12 days at room temperature increased

anthocyanin content averaged about (0.621) mg/100mg fresh weight than the other treatments used or the untreated fruits which presented (0.516) mg/100mg fresh weight as means of both seasons.

Table (10): Effect of postharvest treatments on Anthocyanin content (mg/100g) of Kelsey plum fruits.(mean of two seasons)..

Treatments	Room temperature					Cold storage			
	Storage period in days					Storage period in days			
	0	4	8	12	mean	0	15	30	mean
Control	0.247	0.348	0.424	0.516	0.384	0.247	0.529	0.537	0.437
Ethephon 250ppm	0.247	0.353	0.430	0.540	0.392	0.247	0.533	0.539	0.439
Ethephon 500ppm	0.247	0.364	0.449	0.548	0.402	0.247	0.548	0.553	0.449
Ethephon 750ppm	0.247	0.403	0.467	0.596	0.428	0.247	0.583	0.588	0.473
Ethephon 1000ppm	0.247	0.442	0.534	0.621	0.460	0.247	0.611	0.630	0.496
mean	0.247	0.382	0.460	0.564	-	0.247	0.560	0.569	-
L.S.D	Ttreatments =0.016					Ttreatments =0.018			
	Sstorage period =0.016					Sstorage period =0.018			

Yet, ethephon application at 750 ppm gave higher values of anthocyanin content in both seasons than ethephon application at 500 ppm or the control. Since, ethephon application at 750 ppm presented about (0.596) after 12 days at room temperature whereas, anthocyanin content percentage reached (0.588) after 30 days of cold storage as a mean of the two seasons. Shaden& Davarynejad (2010) investigated influences of preharvest ethephon spray on fruit quality attributes and certain nutritional compounds of 'Cigany' sour cherry (*Prunus cerasus*). Trees were sprayed with 250 ppm ethephon one week before anticipated commercial harvest. Fruits from ethephon-sprayed trees had significantly lower soluble solids concentration (SSC), anthocyanin content, antioxidant activity, and firmness than those from non-sprayed control. The ethephon spray did not affect in total phenolic content, although its content tended to be higher in fruits from non-treated control. Titratable acidity (TA), pH and SSC/TA ratio were not affected by ethephon spray. There was a significantly positive correlation between anthocyanin content and SSC ($r = 0.99$).

From this data it is clear that, in spite of the ethephon treatments increased loss in weight, decayed fruits and total loss in fruit weight of Kelsey plum fruits, these treatments enhanced fruit ripening due to their effect on reducing fruit firmness and Chlorophyll A, B with increasing both soluble solids and anthocyanin contents. So, it is possible to recommend using ethephon at 1000 ppm to accelerate fruit ripening of Kelsey plum fruits and cold stored at (3+or-1°C and 90% R.H).

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تأثير الايثفون على انضاج ثمار البرقوق صنف كلسى.

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اجريت هذه الدراسة خلال موسم الدراسة ٢٠١٠ ، ٢٠١١ لتقييم غمس ثمار البرقوق صنف كلسى فى تركيبات مختلفة من الايثفون بغرض تحسين عملية نضج ثمار البرقوق الكلسى . مما سبق يتضح انه على الرغم من نفع ثمار البرقوق فى الايثفون ادى لزيادة الفقد فى الوزن ونسبة الثمار التالفة الا انها تعمل على الاسراع من نضج الثمار وكذا تحسين التلوين وزيادة محتوى عصير الثمار من المواد الصلبة الذاتية الكلية وصبغة الانثوسيانين مقارنة بتلك الغير معاملة لذلك فمن الممكن ان يوصى باستخدام الايثفون بتركيز ١٠٠٠ جزء فى المليون حيث اعطى افضل نتيجة فى تحسين التلوين وكذا درجة نضج الثمار مع المحافظة على صفات الثمار الاكلية

