

EFFECT OF SEAWEED EXTRACTS AND CALCIUM CHLORIDE DIPPING ON QUALITY OF ERABY DATE PALM (*Phoenix dactylifera* L.) FRUITS DURING COLD STORAGE

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ABSTRACT

The present study was carried during 2005-2006 seasons on Eraby dates from trees grown in a private orchard in Balteen district, Kafr El-Sheikh governorate, Egypt. Eraby is a season date palm cultivar, harvested at Khalal stage. At mature (Bisir) stage, the fruits are astringent as a result of high contents of soluble tannins and removal of tannins is necessary for the fruit to be edible for consumer. The fruits were subjected to various treatments {dipping for 5 min, in seaweed extracts (Algifert25,25k and 30k) and CaCl_2 in 1% and 4% conc.} beside control(distillate water). Thereafter fruits were stored at 3°C and 85-95% RH for 45 days. The results indicated that the fruits treated with seaweed extracts (Algifert25, 25k and 30k) better than treated CaCl_2 as compared with control fruits in most parameters of fruit quality during cold storage. As storage period progressed, the percentages of soluble solids content (SSC), total sugars, reducing sugars. Rota and fruits weight loss were increased in all treatments. While V.C., and tannin content (%) generally decreased during storage period. 4% of Seaweed extract (Algifert 30k) dipping recorded the best values for most of parameters, followed CaCl_2 (4%) in both seasons.

Keywords: Postharvest; Seaweed extracts; Cold storage ;Fruit quality; CaCl_2 :
Date palm.

1. INTRODUCTION

Date palm is the most successful important subsistence crop in most of the hot arid desert regions (Botes and Zaid, 1999).

Eraby date palm is late cultivar of soft dates and is very demanded in the Egyptian market. The main problem associated with this cultivar is the tendency to deteriorate quickly through physiological changes leading to ripening. Dates could be considered as a climacteric fruit (Serrano *et al.*, 2001). Development of techniques to delay and /or manage ripening would enhance the commercial and economic value of this crop and provide a delicious product for consumers (Al-Hooti *et al.*, 1997). There are many techniques including: cold storage, controlled atmosphere storage, ethylene addition and/or removal and inhibition of ethylene action through chemical means. Kamal (1995) found that 5°C or 7°C were suitable temperatures to storage Zaghoul date for two months, while. El-Shiekh (2001) noticed that 4°C was favorable for maintaining Zaghoul date quality for 3 week. In addition, post harvest dipping with Ca-solution improved storage quality (Poovaiah, 1998). Calcium generally had seen as protective in reducing the rate of plant senescence and fruit ripening (Ferguson and Drobak. 1988). The effect of foliar and postharvest application of calcium alone or in combination treatments of dipping with storage were positive effect on fruit quality (Aggarwal *et al.*, 2005; Antunes *et al.*, 2005; D'Aquino *et al.*, 2005; and Manganaris *et al.*, 2007).

Many different beneficial effects have been recorded for crops treated with seaweed extracts. increased crop yields (Povolny,1976 and Bentchikou *et al.*,1992). increased uptake of inorganic constituents from the soil, and increased resistance of plants to fungal and insect attack (Abetz,1980.Villiers *et al.*,1983 and Jolivet *et al.*,1991). Fruit ripening on tree as well as at storage was retarded by seaweed extracts treatment (Povolny1972, El-Ansary and El-Morsy 1997). The beneficial results from the use of seaweed extracts may be due to cytokine content (Featonby-Smith and Van Staden1984 and Tay *et al.*,1985). Booth (1969) observed that the value of seaweed as fertilizers was not only due to nitrogen, phosphorus and potassium content but also the presence of trace elements and metabolites.

Besides many other advantages, refrigerated storage is widely used strategy to reduce ethylene production and

sensitivity during postharvest storage of horticultural products (Thompson, 2004). Low temperature storage is the most commonly used method for extending storage life, the extent of which it can be stirred depends on the cultivars, temperature of storage and period of storage (Zauberman *et al.*,1977; Eaks,1976 and Ahmed and Barmore,1980).

The present study was undertaken to investigate the effect of seaweed extracts and calcium chloride on storability and chemical changes of Eraby date palm fruits during storage.

2. MATERIALS AND METHODS

2.1. Fruit material, postharvest treatments and storage regime:

Mature bunches of Eraby date (*Phoenix dactylifera* L.) were harvested in 15th , Dec.,2005 and 17th Dec., 2006 seasons from a private orchard, in Balteem district, Kafr El-Sheikh governorate, Egypt. The bunches were picked at Khalal stage according to Mawlood (1980), washed with tap water and air dried . Sound fruits with the spikelet were selected, dipped for 5 minutes in different concentrations of seaweed extracts (chemical analysis of seaweed extracts, Table 1).

Calcium chloride (CaCl_2) and control. Nine treatments were applied as follows:-

- 1-Control (distillate water)
- 2-Seaweed extracts (Algifert25)(1%)
- 3-Seaweed extracts (Algifert25K)(1%)
- 4-Seaweed extracts(Algifert30K)(1%)
- 5- Seaweed extracts (Algifert25)(4%)
- 6- Seaweed extracts (Algifert25K)(4%)
- 7- Seaweed extracts (Algifert30K)(4%)
- 8- Calcium chloride (CaCl_2) (1%)
- 9- Calcium chloride (CaCl_2) (4%)

After dipping, fruits were air dried, packed in four standard plastic boxes and stored at 3°C and 85-95 % RH in Faculty of Agriculture- Kafrelsheikh University.

Table (1): Chemical Analysis of Seaweed extracts :

Nam of compound	Conc.	Effective element	Its ratio
Tri Indole Acetic Acid (IAA)	154 micrograms per L	Magnesium (Mg)	0.04% w/w
Trans-Zeatin-Riboside (Zr)	7.0 micrograms per L	Sulphur (S)	0.2% w/w
Isopentenyl Adenosine (IPA)	2.0 micrograms per L	Cobalt (Co)	0.40 ppm
Trans-Zeatin (Z)	0.7 micrograms per L	Boron (B)	13 ppm
Isopentenyl Adenine (IP)	16.0 micrograms per L	Iron (Fe)	300 ppm
Bacterial Activity	8 x 10 ⁷ cells/g	Flouride	24 ppm
Total Solids	23.2% w/v	Manganese (Mn)	5.4 ppm
Ash (Mineral Content)	10.2% w/w	Zinc (Zn)	32 ppm
Organic matter (Solids minus Ash)	10% w/w	Copper (Cu)	0.64 ppm
Water Content	76.8% w/v	Nickel (Ni)	2.0 ppm
Total Nitrogen	0.22% w/w	Molybdenum (Mo)	3 ppm
Ammonia Nitrogen	156 mgm/kg	Aluminium (Al)	30 ppm
Nitrate Nitrogen	46 p.p.m	Selenium (Se)	0.02 ppm
pH Value	9.5 – 10.5	Silver (Ag)	0.02 ppm
Specific Gravity	20°C 1.08	Vanadium (Vd)	0.08 ppm
Free Alkalinity (as KOH)	0.06% w/w	Iodine (I)	120 ppm
Phosphorus	0.58% w/w	Mercury (Hg)	0.008 mg/kg
Potassium (K)	4.3% w/w	Polychlorinated Biphenyls	<0.001 mg/kg
Sodium (Na)	0.9% w/w		
Chloride (Cl)	0.33% w/w		

The above analysis pertains to Commercial Seaweed extracts concentrate. (ie. is not an analysis of the kelp used in the production of the product but the actual extract product.)

2.2. Fruit quality determinations

Determination of fruit quality was conducted at 15 days intervals throughout the storage period till the percentage of unmarketable fruits in all treatments reached $\geq 50\%$. Rutab and fruit weight loss percentages were calculated. Soluble solids contents (SSC %) of fruit juice were measured by the use of a hand refractometer according to Chen and Mellenthin (1981). Determination of ascorbic acid (V.C) was carried out according to (Association of Official Agriculture Chemical. A.O.A.C., 1995).

Total sugars in dried flesh were determined according to as described in A.O.A.C.(1995). The extraction was carried out

by using distilled water (Loomis and Shull,1937), for determination of the reducing sugars content, the method of Shaffer and Hartman (1921) was used. Total sugars were determined after the hydrolysis with (HCl), after that the non-reducing sugars were calculated by the differences between the total sugars and the reducing sugars. Sugars content were expressed as mg per 100 g fresh weight of flesh fruit.

2.3. Statistical analysis

The obtained data were statistically analyzed using randomize plot block design. Significance of differences among treatments means were judged using Duncan multiple range test (Duncan1955) at the 5% level of probability, according to Snedecor and Cochran (1972).

3. RESULTS AND DISCUSSION

3.1 Weight loss (%)

The obtained results in Table (2), indicated that there was a significant effect of some postharvest treatments on the percentage of weight loss in the two types of dipping seaweed extracts, calcium chloride (at 1% and 4% conc.) and control .

Table (2):Effect of seaweed extracts and calcium chloride (CaCl₂) treatments on weighting loss (%) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	0	8.8a	28.5a	33.1a	22.1a	0	10.0ab	26.1a	38.9a	24.7a
1%25	0	8.2ab	23.1bc	30.0a	20.4b	0	12.27a	22.8b	34.8b	23.3ab
1%25k	0	6.5abc	22.1cd	30.7b	16.9d	0	9.5ab	22.0b	32.3bc	21.4b
1%30k	0	6.2bc	20.7de	27.5c	18.1cd	0	9.0b	17.6cd	29.8bc	18.8c
4%25	0	6.0bcd	19.8e	25.2de	17.0d	0	8.76b	19.0c	27.1d	18.2cd
4%25k	0	5.0cd	17.0f	25.1de	15.8de	0	8.2b	15.6de	20.2f	15.8de
4%30k	0	3.9d	14.9f	23.9e	14.2e	0	5.0c	13.8e	24.5de	14.5e
1%CaCl ₂	0	7.98ab	24.8b	27.2cd	19.9c	0	10.0ab	18.2cd	19.8f	17.1de
4%CaCl ₂	0	7.0abc	21.8cde	25.1de	18.0cd	0	9.4ab	17.8cd	24.17e	17.1cde

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test.5% level.

Postharvest treatments recorded lower average of fruit weight loss % compared to the control during storage period. That the percentage of fruit weight loss was recorded the lowest values in both seasons with seaweed extract solutions (Algifer)

25, 25-k and 30-k) at 4% as compared with CaCl_2 dipping (1% and 4%) and control treatments. 4% Algifert 30k gave the lowest average in both seasons and recorded 14.2% and 14.5%, respectively. The weight loss percentage is a result of water loss from the fruits and partially of the respiration process (Hussein *et al.*, 1998).

The results are agree with those reported by Rofael (1985), Augustin and Osman (1998), Abd El-Naby and Soliman (2003) on Zaghoul date fruits, Antuns *et al.*, (2005) on Kiwifruit and Manganaris *et al.*, (2007) on Plum fruits.

3.2. Rutab (%)

Rutab is the most advanced stage of fruit ripening (Sawaya *et al.*, 1986). Rutab fruits gradually increased as the cold storage period progress till 45 days during the two seasons. Both treatments algifert 25k and algifert 30k at (4%) conc. had the lowest average during cold storage in Rutabe percentage in both seasons as compared with the other treatments and untreated dates, Table (3).

Table (3): Effect of seaweed extracts and calcium chloride (CaCl_2) treatments on Rutab (%) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons.

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	0	20.4a	26.0a	32.0a	26.1a	0	16.1b	26.4a	33.9a	27.1a
1%25	0	19.0ab	21.1bc	30.1b	23.4b	0	19.7a	23.1b	31.0b	24.6b
1%25k	0	15.2dc	20.2cd	28.3b	21.5bc	0	15.8bc	22.3cd	29.1c	22.6b
1%30k	0	14.4de	18.9de	25.1c	19.5d	0	14.6bcd	17.8cd	26.5d	19.6d
4%25	0	14.0ef	18.0e	23.0de	18.3de	0	14.0cd	19.2c	24.1e	19.1d
4%25k	0	12.3f	15.5f	22.9de	16.9e	0	13.3d	16.0d	22.9ef	16.7e
4%30k	0	9.0g	13.6f	21.8e	11.2f	0	8.2e	14.0e	21.8fg	14.8f
1%CaCl ₂	0	17.6b	22.6b	24.9cd	21.7bc	0	16.2b	18.4c	20.6g	16.8e
4%CaCl ₂	0	16.3cd	19.9cde	22.9de	19.7cd	0	15.2bcd	18.0c	21.4fg	18.6d

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test.5% level.

3.3. Soluble Solids Contents (SSC%)

Results in Table(4). showed that SSC (%) content was increased during period of storage at 3°C and 90-95 % RH Seaweed extracts at 1% and 4% (algifert 25.25k and 30k) as well as CaCl_2 dipping (1% and 4%) were significantly effected

on SSC % of Eraby dates in both seasons as compared with control fruits .

Table (4):Effect of seaweed extracts and calcium chloride (CaCl₂)treatments on Soluble Solids Contents (SSC %)of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	25.2	28.2f	29.3d	30.3e	28.3e	26.7	30.8ab	33.0	33.7a	31.6c
1%25	25.2	29.9ef	30.4d	32.5d	29.5e	26.7	31.8b	33.3	34.6a	31.6bc
1%25k	25.2	30.9de	32.1c	32.8d	30.3d	26.7	32.2ab	33.9	34.9a	31.9bc
1%30k	25.2	31.2cde	33.2bc	32.9d	30.6cd	26.7	32.5ab	34.0	34.5a	31.9bc
4%25	25.2	32.1cd	33.5b	34.6c	31.3c	26.7	33.4b	34.1	35.1a	32.3bc
4%25k	25.2	34.4b	34.3b	37.9b	33.0b	26.7	35.0ab	36.4	37.4a	33.9ab
4%30k	25.2	36.5a	37.9a	38.2b	34.5a	26.7	36.1a	38.3	39.1a	35.1a
1%CaCl ₂	25.2	32.3c	33.6b	34.2c	31.3c	26.7	34.6ab	35.4	37.3a	33.5ab
4%CaCl ₂	25.2	34.1b	34.6b	39.6a	33.4b	26.7	35.1ab	36.5	27.7b	31.5ab

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test,5% level.

These results are in harmony with Ferguson and Drobak (1988), Kamal (1995) on Zaghloul and Samani date fruits and Serrano *et al.*,(2001) for Barhi date fruits during the period of storage.

Seaweed extracts dipping at 4%-30k recorded the highest SSC (%) value during storage period in both seasons (34.5% and 35.1%), respectively, followed by dipping fruits at 4%(CaCl₂) recorded higher values as compared with CaCl₂ dipping fruits at 1% and other treatments and control treatment in both seasons.

Generally, seaweed extract at 4%- algifert 30k and 4% CaCl₂ gave the higher values in SSC% as compared with algifert 25 and algifert 25-k in both concentrations (1% and 4%) during both seasons. These results indicated that the changes in SSC % during the storage were caused by the difference in concentrations of CaCl₂ and seaweed extracts and time of storage.

These results are in accordance with those reported be Rofael (1985) and El-Seidy (1994) on Pear fruits: Hussien *et al.*, (1998) on Guava fruits and Abd El-Naby and Soliman (2003) on Zaghloul date fruit, Al-Redhaiman (2005) on Barhi dates and Antunes *et al.*, (2005) on kiwifruit .

3.4. Sugar content (mg/100 g flesh weight)

a-Reducing sugars

There was a significant effect of postharvest treatments (Seaweed extracts and CaCl_2) on the percentage of reducing sugars of Eraby dates in both seasons (Table 5).

Table (5): Effect of seaweed extracts and calcium chloride (CaCl_2) treatments on reducing sugars contents (mg/100gm flesh fruit) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	24.42	26.6e	27.6e	28.4d	26.7d	23	26.8e	27.7d	28.0e	26.4e
1%25	24.42	30.3bc	31.0cd	29.1d	28.7c	23	29.2d	32.4c	34.3cd	29.7d
1%25k	24.42	28.8cd	30.3d	32.4bc	29.9c	23	31.3bc	32.7bc	33.0d	30.2cd
1%30k	24.42	30.9b	33.02bc	29.4d	29.4c	23	32.8b	34.1ab	34.0cd	31.0bc
4%25	24.42	29.6bcd	30.4d	31.7c	29.0c	23	32.3b	34.3ab	35.3c	31.3abc
4%25k	24.42	28.2d	31.2cd	32.5bc	29.1c	23	30.4ed	32.4c	32.8d	31.4abc
4%30k	24.42	32.3a	38.1a	35.2a	32.5a	23	35.8a	33.7abc	37ab	32.34
1%CaCl ₂	24.42	31.0b	33.7b	33.2b	30.6b	23	32.1b	33.8abc	35.6bc	31.1abc
4%CaCl ₂	24.42	32.4a	39.3a	33.0	32.6a	23	31.9bc	34.7a	37.9a	31.9ab

Means followed by a common letter in the same column do not differ significantly by Duncan's Multiple Range Test, 5% level.

Results indicated that fruit reducing sugar content increased with the progress of storage period. The highest average of reducing sugars was obtained by treatment of 4%, Algifert 30-k in both seasons. The above results are in accordance with those reported by Rofael (1985), Augustin and Osman (1998) and Hussein *et al.*, (1998) on Guava fruits and Abd El-Naby and Soliman (2003) on Zaghoul date fruits. Tefera *et al.*, (2008) reported that the benefits of the combined effect of post-harvest treatments on Mangoes included maintenance of high reducing sugar and total sugar.

b-Total sugars

Data listed in Table (6) revealed that there was a significant effect of (Seaweed extracts and CaCl_2) treatments on the total sugars percentage of Eraby dates in both seasons.

The results indicated that total sugar content increased in dipping treatments of content seaweed extracts and CaCl_2 with the progress of storage period. Total sugars percentage was higher at dipping in 4% Algifert 30-k treatment and the average

values during period of storage were 40.0% and 39.1% in both seasons, respectively.

Table (6):Effect of seaweed extracts and calcium chloride (CaCl₂) treatments on total sugars content(mg/100gm flesh fruit) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	29.6	34.5g	35.5h	36.3f	34.0e	29.2	35.0f	36.0e	38.2e	34.6g
1%25	29.6	36.8f	36.9g	40.4c	35.9d	29.2	37.3e	39.9cd	40.3b	36.7e
1%25k	29.6	37.8e	38.5f	36.65f	35.8d	29.2	39.4c	41.1b	41.4d	37.3de
1%30k	29.6	38.8d	40.2d	37.3e	36.5c	29.2	40.0b	41.3a	41.9c	38.1c
4%25	29.6	39.3c	41.9c	41.5b	38.1b	29.2	38.3d	39.5d	40.0d	36.87f
4%25k	29.6	40.8b	45.5b	42.7a	39.7a	29.2	40.6b	41.9a	44.4a	39.1b
4%30k	29.6	41.5a	47.3a	41.6b	40.0a	29.2	41.0a	41.6ab	44.9a	39.2a
1%CaCl ₂	29.6	37.5e	38.3f	39.6d	36.3c	29.2	36.9e	40.3c	42.3c	37.2d
4%CaCl ₂	29.6	36.5f	39.5e	40.7c	36.6c	29.2	40.1b	41.6a	43.1b	38.8bc

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test,5% level.

Also, CaCl₂ dipping treatment recorded higher values as compared with control treatment and some other treatments in both seasons. The results indicated that fruit content of non-reducing on total sugars depends on many things such as respiration rate and the conversion of the carbohydrate (Hussein *et al.*,(1998).

These findings are agreed with those reported by Rofael (1985), Augustin and Osman (1998) and Abd El-Naby and Soliman(2003) on Zaghloul date fruits and Tefera *et al.*,(2008) on Mango fruits.

3.5.Ascorbic Acid Content (Vitamin C, mg/100g flesh weight)

There was a significant effect of seaweed extracts and CaCl₂ treatments on the ascorbic acid content of Eraby dates during cold storage (Table 7).

The results indicated that there was a gradual decrease in ascorbic acid content by storage period progress. There was a significant difference between ascorbic acid content at cold storage. The results showed that the average decrease of ascorbic acid content was lower in CaCl₂ dipping (1% and 4%) and control treatment as compared with algifert 25, 25-k and algifert 30-k dipping treatments for both concentrations (1% and 4%). Also. data showed that Eraby dates can be stored for

45 days by dipping in 1%- algifert 30k without missing a high amount of its ascorbic acid as compared with other treatments in both seasons .

Table (7):Effect of seaweed extracts and calcium chloride (CaCl₂)treatments on vitamin C content(mg/100gm flesh weight) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	13.4	8.4f	8.0e	7.4d	9.3d	13.8	7.2f	6.8d	5.8d	8.4d
1%25	13.4	10.1f	8.0e	7.8d	9.8d	13.8	8.6ef	8.0cd	7.5c	3.7d
1%25k	13.4	12.6ab	10.6b	9.8	11.6a	13.8	12.2a	11.8a	7.6c	11.3a
1%30k	13.4	13.0a	11.9a	8.5b	11.7a	13.8	12.9a	8.8bc	10.0a	11.4ab
4%25	13.4	10.2d	9.0b	8.3b	10.2b	13.8	11.9b	9.4bc	7.6c	10.6bc
4%25k	13.4	11.0e	9.0d	8.8c	10.6c	13.8	9.3de	12.5a	7.6c	10.8bc
4%30k	13.4	12.0bc	10.2b	10.0a	11.4a	13.8	9.9cde	11.5a	8.4bc	10.9BC
1%CaCl ₂	13.4	11.3c	8.7c	7.0c	10.1b	13.8	11.3bc	9.5bc	7.3c	10.5c
4%CaCl ₂	13.4	10.2d	9.8b	8.0b	10.4b	13.8	10.2cd	10.0b	9.2b	10.0bc

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test,5% level.

The loss in ascorbic acid content during storage could be attributed to the rapid conversion of L-ascorbic acid into dihydro - ascorbic acid in the presence of L-ascorbic acid oxidase Hussein et al.(1998) .

The above results are agreed with those obtained by Rofael (1985), Augustin and Osman (1998).

3.6 .Tannin (%)

Illustrated data illustrated in Table (8) clearly indicated that tannin % was significantly decreased with some postharvest treatments and storage period, in both seasons.

Best results were obtained by CaCl₂ (1%) treatment, it showed lower tannin percent at the end of storage period compared with the initial time of storage and the average value was recorded 0.315% as compared to the other treatments in the second season. The decrease of tannin % during storage period at different dipping (Seaweed extracts and CaCl₂) concentrations

could be due to the destruction of tannic acid and organic acids through oxidation and consumption of these acids as an organic substrates in the respiration process of the fruit tissue (Hussein *et al.*, 1998).

Table (8):Effect of seaweed extracts and calcium chloride(CaCl₂) treatments on tannin content (%) of Eraby dates during cold storage at 3°C and 85-95 RH % in 2005 and 2006 seasons

Treat.	2005					2006				
	0	15	30	45	M	0	15	30	45	M
Cont.	0.50	0.60a	0.55a	0.45a	0.52a	0.48	0.57a	0.45a	0.38	0.47a
1%25	0.50	0.42b	0.40bc	0.38ab	0.42 bc	0.48	0.37bc	0.35ab	0.34	0.36ab
1%25k	0.50	0.44b	0.39bc	0.36b	0.42bc	0.48	0.34bc	0.35ab	0.34	0.38ab
1%30k	0.50	0.36b	0.34bc	0.32b	0.38c	0.48	0.369bc	0.32ab	0.32	0.37ab
4%25	0.50	0.41b	0.40bc	0.38ab	0.42bc	0.48	0.34bc	0.33ab	0.31	0.37ab
4%25k	0.50	0.40b	0.395bc	0.35ab	0.41c	0.48	0.37bc	0.36ab	0.34	0.39ab
4%30k	0.50	0.37b	0.34bc	0.32b	0.38c	0.48	0.329c	0.37ab	0.29	0.35b
1%CaCl ₂	0.50	0.57a	0.44b	0.46b	0.49ab	0.48	0.47ab	0.39ab	0.40	0.32ab
4%CaCl ₂	0.50	0.44b	0.31c	0.28b	0.38c	0.48	0.39bc	0.30b	0.28	0.36ab

Means followed by a common letter in the same column do not differ significantly by Duncan s Multiple Range Test,5% level.

The progress of storage time raised the respiration rate of the fresh fruits .This could also explain the lower tannin content in fruits dipping (1%- algifert 30k and 4% algifert -30k) during cold storage compared to other treatments and control.

These finding are in line with those reported by Ozelkok and Albayrak (2005) on Persimmon fruits, that postharvest treatments dramatically reduced soluble tannins to insoluble tannin forms without loss of sweetness resulting in a "non-astringent fruit.

The results of the experimental reveal that seaweed extracts and calcium chloride improved the storability of Eraby date (*Phoenix dactylifera* L.).Further investigations in this direction are being continued.

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الملخص العربي

تأثير مستخلصات الطحالب وكلوريد الكالسيوم علي جودة ثمار البلح (صنف العربي) أثناء التخزين البارد

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أجريت هذه الدراسة خلال موسمي ٢٠٠٥، ٢٠٠٦م - قسم البساتين بكلية الزراعة جامعة كفر الشيخ علي ثمار البلح العربي المأخوذة من أشجار نامية بمزرعة خاصة - منطقه بلطيم بمحافظة كفر الشيخ - مصر، حيث أن صنف البلح العربي متأخر النضج وتجمع ثماره في مرحلة الخلال (اكتمال النمو) وهي مرحلة يكون فيها محتوى الثمار من التانينات الذائبة عاليا وتهدف الدراسة إزالتها لتكون مناسبة للاستهلاك.

أجريت الدراسة بتسع معاملات غمس لثمار البلح (صنف العربي) لمدة خمس دقائق وبتركيزين (١% و ٤%) لكلا من مستخلصات الطحالب (Algifert25 - Algifert25K - Algifert30k) وكلوريد الكالسيوم بالإضافة لمعاملة الكنترول (ماء مقطر) تم تخزينها علي درجة ٣ درجة مئوية ورطوبة من ٨٥ الي ٩٥% لمدة ٤٥ يوم. أوضحت النتائج أن الثمار المعاملة بمستخلصات الطحالب كانت أفضل من الثمار المعاملة بكلوريد الكالسيوم والكنترول في اغلب صفات الجودة خلال فترة التخزين. كما أنه وجد زيادة محتوى الثمار في نسب تركيزات المواد الصلبة الكلية والسكريات الكلية و المختزلة والترطيب والفقد في الوزن للثمار في كل المعاملات، بينما وجد أن محتواها من فيتامين ج والتانينات الكلية قد انخفض تدريجيا خلال فترة التخزين.

معاملة الغمس في مستخلص الطحالب (Algifert30k) بتركيز ٤% سجلت اعلي متوسطات في معظم صفات الجودة للثمار ويليه المعاملة بكلوريد الكالسيوم بنفس التركيز خلال فترة التخزين في كلا الموسمين.