PAPER

EFFECTS OF ALGINATE EDIBLE COATING ON QUALITY AND ANTIOXIDANT PROPERTIES IN SWEET CHERRY DURING POSTHARVEST STORAGE

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ABSTRACT

Two sweet cherry (*Prunus avium* L.) cultivars ("Big Lory" and "Grace Star"), were treated with 1%, 3% and 5% sodium alginate as an edible coating before storage. Analytical determinations were made after 7, 14 and 21 days of storage at 4°C. Cherries were analyzed for the following quality parameters: firmness, weight loss, titratable acidity, soluble solid content, external color, anthocyanin content, phenolic content and total antioxidant capacity. Alginate treatment at 3% delayed changes in most of the ripening parameters, weight and acidity losses, softening and color changes. However, the soluble solids content was not affected by the alginate fruit coating. In terms of the antioxidant properties, no significant results were obtained with the use of the alginate coating. The results of this study suggest that alginate treatments at 1% and 3% could be used as natural postharvest treatments in cherry cultivars with the aim of delaying the postharvest ripening process and maintaining fruit quality.

- Keywords: sweet cherry, quality, shelf life, edible coating -

INTRODUCTION

Sweet cherry is one of the most appreciated fruits by the consumer due to its precocity and quality. Among the factors determining consumer acceptability, soluble solids, skin color and acidity are the most important (DÍAZ-MULA *et al.*, 2012). Color is an indicator of quality and ripening of fresh sweet cherry and depends on the accumulation and profile of anthocyanins (CRISOSTO *et al.*, 2003). The antioxidant properties of sweet cherry are associated with the ascorbic acid and polyphenolic content (CHAOVANALIKIT and WROLSTAD, 2004; SERRANO *et al.*, 2005). Sweet cherries deteriorate rapidly after harvest and, in some cases, do not reach consumers with the optimal organoleptic quality. Both the fruit and the stem consist largely of air and water, and the water is lost very quickly. The main causes of sweet cherry deterioration are weight loss, loss of acidity, softening, color changes, surface pitting and stem browning, along with changes in the soluble solids content (BERNALTE *et al.*, 2003). Adequate postharvest technologies combined with cold storage are fundamental. Several pre- and postharvest technologies have been used to control cherry decay. In this sense, the use of an edible coating could be a new technological alternative to the use of modified atmosphere packaging to maintain fruit quality during storage, especially in minimally processed cherries (commercialized without the steam) (CAMPOS *et al.*, 2011). Edible coatings are traditionally used to improve fruits appearance and conservation. Coatings on products create a semipermeable barrier to external elements that can reduce moisture loss, solute migration, respiration and oxidative reactions and retard the natural physiological ripening process (VARGAS *et al.*, 2008). Maintenance of fruit quality has been achieved by the utilization of different coatings such as chitosan in peach (LI and YU, 2001) and nectarines (CHIABRANDO and GIACALONE, 2013), pectin coating in melon (FERRARI *et al.*, 2013), alginate in apple (OLIVAS *et al.*, 2007; ROJAS-GRAU *et al.*, 2007; CHIABRANDO and GIACALONE, 2012), and hydroxypropylmethylcellulose and whey protein in plum (NAVARRO-TARAZAGA *et al.*, 2008; REINOSO *et al.*, 2008). In particular, alginate is a hydrophilic biopolymer that has a coating function because of its unique colloidal properties, which have allowed its use as a thickening agent, in forming suspensions and gels, and for stabilizing emulsions (ACEVEDO *et al.*, 2012). Sodium alginate has been effective in maintaining postharvest quality in tomato (ZAPATA *et al.*, 2008) and peach (MAFTOONAZAD *et al.*, 2008). In sweet cherry, some effects on fruit quality have been obtained with edible coatings based on chitosan (ROMANAZZI *et al.*, 2003), sodium alginate (DIAZ-MULA *et al.*, 2012), Semperfresh™ (YAMAN and BAYINDIRLI, 2001) and with the use of aloe vera gel (RAVANFAR *et al.*, 2012).

Thus, the aim of this study was to analyze the effect of sodium alginate applied as an edible coating at three concentrations (1%, 3% and 5% w/v) on the quality properties and antioxidant activity in Grace Star and Big Lory sweet cherry cultivars during storage at 4°C.

MATERIALS AND METHODS

Plant material

Sweet cherry (*Prunus avium* L. cv "Grace Star" and "Big Lory") fruits were harvested from a commercial plot. Fruits were picked at commercial maturity stage, with a score of 4 on the color chart from the Centre Technique Interprofessionel de Fruits et Légumes (CTIFL, Paris). Fruits were transported immediately to the laboratory, and only whole and unwounded fruits were selected for the experiment. The following treatments were used: 0% (control), 1%, 3% and 5% (w/v) alginate coating. Sodium alginate (Sigma-Aldrich Co., Steinhein, Germany) was prepared according to previous reports (DIAZ-MULA *et al.* 2012; CHIABRANDO and GIACALONE, 2013), dissolved in hot water (45°C) with continuous shaking until the solution became clear. After cooling to 20°C, glycerol at 20% v/v was added as a plasticizer. Fruits were dipped twice in the fresh coating solution for 1 min to assure the uniformity of the coating of the whole surface. After, fruits were dried for 30 min under an air-flow heater at 25°C. Control fruits were dipped in distilled water. After drying, 30 cherries were placed in polypropylene (PP) punnets, weighed, and stored in a controlled chamber at 4°C and relative humidity of 90-95%. Six punnets for each treatment were prepared, and after 7, 14 and 21 days of cold storage, two punnets per treatment were taken at random and used for the analysis.

Quality properties measurements and weight loss

Quality measurements were determined at day 7, 14 and 21 of storage. Total acidity (meq/l), pH and the percentage of soluble solids (°Brix) were measured according to official methods (AOAC, 1995). The total soluble solids content (TSS) was determined using the juice from five cherries at 20°C. Three replicates were used for each treatment. Titratable acidity (TA) was determined by titration with 0.1 N NaOH up to pH 8.1, using 10 ml of diluted juice in distilled H_2O. Three replicates were used for each treatment.

For fruit firmness measurements, a hand-held Shore Durometer (T.R. Turoni, Italy) was used and 30 fruits (replicates) per treatment were analyzed (KAPPEL *et al.*, 1996). Weight loss was determined in each punnet by the percentage weight loss with respect to day 0.

Color measurements

The color of coated cherries was measured at day 7, 14 and 21 of storage, individually for each fruit (30 for each treatment). The surface color was analyzed with a tri-stimulus CR-400 Chroma Meter (Konica Minolta Sensing) with D75 illumination and observation angle of 10° calibrated with a standard white plate (Y = 94.00, x = 0.3158, y = 0.3322, L* = 97.79, a* = -0.43, b* = + 2.25). Two readings of L* (lightness), b* (yellow chromaticity), and a* (green chromaticity) coordinates were recorded for each cherry. Numerical values of a* and b* parameters were employed to calculate the hue angle ($h° = \tan^{-1}(b^*/a^*)^2$) and chroma ($C = (a^{*2} + b^{*2})^{0.5}$). The reported values are the mean ± SD of 60 determinations.

Anthocyanin content, phenolic content and Total Antioxidant Capacity

The anthocyanin content, phenolic content and total antioxidant capacity were measured at day 0 and after 21 days of storage. For determination of the anthocyanin content, phenolic content and total antioxidant capacity, extracts were prepared by weighing 10 g of fresh cherries into a centrifuge tube, adding methanol (25 ml) and homogenizing the sample for 1 min. Extractions were performed under reduced light conditions. Tubes were centrifuged (3000 rpm for 15 min) and the clear supernatant fluid collected and stored at -26°C. For identification and quantification, extraction was performed as three replicates. The anthocyanin content was quantified according to the pH differential method of CHENG and BREEN (1991). Anthocyanins were estimated by their difference in absorbance at 515 and at 700 nm in buffer at pH 1.0 and at pH 4.5, where $A = (A515 - A700)_{pH1.0} - (A515 - A700)_{pH4.5}$. Results are expressed as mg of cyanidin-3- glucoside (C3G) per 100 g of fresh cherries.

Total phenolics were determined with Folin-Ciocalteu reagent following the method of SLINKARD and SINGLETON (1977), using gallic acid as the standard. Absorption was measured at 765 nm. Results are expressed as mg gallic acid equivalents (GAE) per 100 g of fresh cherries.

The antioxidant activity was determined using a ferric reducing antioxidant power (FRAP) assay, following the methods of PELLEGRINI *et al.* (2003) with some modifications. The antioxidant capacity of the diluted cherry extract was determined by its ability to reduce ferric iron to ferrous iron in a solution of TPTZ prepared in sodium acetate at pH 3.6. Results are expressed as mmol Fe^{2+}/kg of fresh cherries.

Statistical analysis

The basic experimental design consisted of four coating treatments, each having three replicates. For each parameter evaluated, two punnets containing 30 fruits each were considered a replicate and all determinations were performed in triplicate. Data were analyzed by analysis of variance using statistical procedures in STATISTICA ver. 6.0 (Statsoft Inc., Tulsa, OK, USA). The sources of variance were the coating treatments. Tukey's test HSP (honestly significant differences) was used to determine significant differences among treatment means. Mean values were considered significantly different at $p \leq 0.05$. The mean values were calculated and reported as the mean ± SD (n = 3).

RESULTS AND DISCUSSION

Quality properties measurements and weight loss

Texture is a major factor defining the quality of fruit and strongly influences acceptability by consumers. The firmness values of cherries decreased, demonstrating texture softening during storage for both coated cultivars and control fruits, as shown in Table 1.

In cv Big Lory, the alginate coatings had a beneficial effect on fruit firmness. Retention of firmness can be explained by retarded degradation of the components responsible for the structural rigidity the fruit, primarily insoluble pectin and proto-pectin. The fruit firmness of cv Big Lory at harvest was 67.24 N; after 14 days of storage, this value increased and then decreased at the end of storage at 4°C, reaching a final value of 41.41 N for the control and 57.08 N, 53 N and 48.72 N for the 1%, 3% and 5% coatings, respectively (Table 1). By the end of the storage period, all the coating treatments gave rise to fruit with greater flesh firmness than the untreated fruit ($P < 0.05$) (Table 1). In addition, significant differences were noted between the alginate coating treatments: higher values for flesh firmness were found for fruit coated with 1% and 3% alginate. The beneficial effect of the alginate concentration on firmness has also been reported for strawberry (HERNÁNDEZ-MUÑOZA *et al.*, 2008), peach, Japanese pear, kiwifruit (DU *et al.*, 1997) and citrus (CHIEN *et al.*, 2007). The coating of fruits can be expected to modify the internal gas composition of fruits, especially reducing the oxygen concentration and elevating the carbon dioxide concentration, which might explain the delayed textural changes in the coated fruits.

In cv Grace Star, fruits tended to be less firm than cv Big Lory. At harvest, fruit firmness was 44.47 N; after 7 days of storage, this value increased and then decreased during storage at 4°C, reaching a final value of 32.87 N for the

Table 1 - Changes in the quality parameters of coated cherries (cv Big Lory and Grace Star) stored at 4°C for 21 days. Different letters in the same column indicate significant differences (p ≤ 0.05). Column without letters have no significant differences.

Cv Big Lory Quality parameter	Treatments	Values at storage days 0	7	14	21
Firmness (N)	control	67.24	65.80	80.60 b	41.41 b
	sodium alginate (1%)	67.24	65.06	85.26 a	57.08 a
	sodium alginate (3%)	67.24	64.80	84.31 a	53.00 a
	sodium alginate (5%)	67.24	66.01	84.05 a	48.72 ab
Total soluble solids content (°Brix)	control	16.43	15.67 a	14.85 b	14.37 b
	sodium alginate (1%)	16.43	16.97 a	14.37 b	16.17 a
	sodium alginate (3%)	16.43	13.83 b	14.47 b	16.00 a
	sodium alginate (5%)	16.43	15.47 a	16.93 a	14.23 b
Titratable acidity (meq/l)	control	69.27	46.81 b	46.2 b	41.77 a
	sodium alginate (1%)	69.27	51.49 a	41.41 b	40.46 a
	sodium alginate (3%)	69.27	42.31 c	42.23 b	43.92 a
	sodium alginate (5%)	69.27	47.79 b	48.25 a	31.56 b
Cv Grace Star Quality parameter	**Treatments**	**0**	**7**	**14**	**21**
Firmness (N)	control	44.47	77.06 b	54.96 a	32.87 b
	sodium alginate (1%)	44.47	78.83 b	56.18 a	37.4 a
	sodium alginate (3%)	44.47	69.47 c	49.97 b	29.97 b
	sodium alginate (5%)	44.47	82.01 a	53.76 a	36.15 a
Total soluble solids content (°Brix)	control	17.87	18.16	18.3	17.17
	sodium alginate (1%)	17.87	18.27	17.03	16.13
	sodium alginate (3%)	17.87	18.3	18.5	17.97
	sodium alginate (5%)	17.87	17.43	18.27	17.7
Titratable acidity (meq/l)	control	127.6	113.59	113.24 b	105.01 b
	sodium alginate (1%)	127.6	112.48	113.95 b	101.53 b
	sodium alginate (3%)	127.6	112.6	123.36 a	114.82 a
	sodium alginate (5%)	127.6	110.91	113.03 b	116.43 a

control and 37.4 N, 29.97 N and 36.15 N for the 1%, 3% and 5% coatings, respectively (Table 1). Fruit softening was delayed in the 1% and 5% alginate-treated cherries, while the control and 3% alginate-treated cherries exhibited a significantly higher reduction in firmness (Table 1). For this parameter, the alginate concentration of 1%, according to the results obtained in cv Big Lory, was more effective than 3% and 5% alginate in reducing softening, especially at the last sampling date. The effects of edible coatings on decreasing softening have been also found in sweet cherry coated with Semperfresh™ (YAMAN and BAYINDIRLI, 2002) and with aloe vera gel (MARTÍNEZ-ROMERO *et al.*, 2006). According to the results obtained for cv Big Lory, a 1% alginate edible coating significantly slowed down the softening process compared to the other coated treatments.

In cv Big Lory, the TSS at harvest was 16.43° Brix, which decreased slightly during storage. At the end of storage, the 1% and 3% alginate coatings had a significant effect on TSS (Table 1), with significantly higher values compared with the control and 5% alginate coating. In this case, the 1% and 3% alginate coatings delayed the degenerative processes of the treated fruits. Grace Star showed higher TSS values compared to the cv Big Lory at harvest and during storage with similar values in all the samples. No significant differences in TSS values were found in relation to specific treatments, in accordance with the results of YAMAN and BAYOINDIRLI (2002).

A decrease in total acidity is typical during postharvest storage of fleshy fruit and has been attributed to the use of organic acids as substrates for respiratory metabolism (VALERO and SERRANO, 2010). In cv Big Lory, TA values decreased from 69.27 meq/l at harvest to 41.77 meq/l in control fruits after 21 days at 4°C, and 40.46 meq/l, 43.92 meq/l and 31.56 meq/l in cherries coated with 1%, 3% and 5% alginate, respectively (Table 1). Only samples coated with 5% alginate showed significantly lower TA values. In this case, the use of the coating did not limit the degradation of organic acids. In cv Grace Star, the storage period led to a similar drop in the acidity of all samples, including the control. However, at the end of storage, acidity losses were significantly higher in the 1% alginate coated cherries and control, since after 21 days of storage was ≈ 20% and ≈ 18% respectively (Table 1) respect to ≈ 9% in the 3% and 5% coated fruits. A decline in acidity demonstrates advanced maturation, thus the coating on the fruits contributed to delaying fruit maturation/ripening.

In cv Big Lory, weight loss increased during storage, reaching values of 7.35% in control fruits after 21 days of cold storage and 8.15%, 7.4%, 8.25% in fruits coated with alginate at 1%, 3% and 5%, respectively, without significant differences between treatments. In cv Grace Star, after 21 days of storage, weight loss ranged from ≈ 10% in the control and 1% alginate coated cherries, to ≈ 12% in the 3% and 5% alginate coated cherries. Greater losses were found in Grace Star compared to Big Lory, probably due to the larger size of the fruits of this cultivar. In both cultivars, no significant reduction of weight loss was detected in cherries treated with the coatings (data not shown). The use of an edible coating did not lead to a general reduction in weight loss, as expected.

Color measurements

It is accepted that the most important quality parameters determining sweet cherry visual quality and acceptability by consumers are a bright red color and firmness (Crisosto *et al.*, 2003). Hue angle is an indicator of ripeness and it is expressed as $\tan^{-1} (b^*/a^*)^2$. At harvest, Big Lory cherries had a red bright color with a hue angle of 24.44. During storage, an increase in hue angle was observed in all samples, in particular the coated cherries (Table 2) with final values of 27.43, 27.56 and 27.65 in cherries coated with alginate at 1%, 3% and 5%, respectively, similar to that found in other sweet cherry cultivars (SERRANO *et al.*, 2009). At the end of storage, the hue angle was significantly higher for all the coated fruits than in the controls (Table 2).

A decrease in hue angle could indicate the senescence process of sweet cherry, which is considered detrimental. In Big Lory, the coating treatments maintained the typical bright red color of recently harvested fruits with high

Table 2 - Changes in color parameters of coated cherries (cv Big Lory and Grace Star) stored at 4°C for 21 days. Different letters in the same column indicate significant differences (p ≤ 0.05). Column without letters have no significant differences.

		Values at storage days			
Cv Big Lory Color parameter	**Treatments**	**0**	**7**	**14**	**21**
Chroma	control	33.88	27.91 b	31.66 b	26.26 b
	sodium alginate (1%)	33.88	33.76 a	34.56 a	31.56 a
	sodium alginate (3%)	33.88	33.89 a	30.96 b	33.34 a
	sodium alginate (5%)	33.88	33.78 a	28.72 b	30.46 a
Hue angle	control	24.44	23.39 b	26.32	24.56 b
	sodium alginate (1%)	24.44	26.03 a	26.64	27.43 a
	sodium alginate (3%)	24.44	25.09 a	25.47	27.56 a
	sodium alginate (5%)	24.44	25.53 a	24.85	27.65 a
Lightness	control	33.01	30.23 a	28.33 a	26.23 b
	sodium alginate (1%)	33.01	30.66 a	29.64 a	26.57 b
	sodium alginate (3%)	33.01	32.09 a	28.32 a	27.2 a
	sodium alginate (5%)	33.01	27.73 b	27.87 b	26.74 b
Cv Grace Star Color parameter	**Treatments**	**0**	**7**	**14**	**21**
Chroma	control	22.48	16.01 b	19.79 b	16.66 b
	sodium alginate (1%)	22.48	19.98 a	21.11a	18.57 a
	sodium alginate (3%)	22.48	15.62 b	18.46 b	16.87 b
	sodium alginate (5%)	22.48	21.50 a	19.20 b	17.92 a
Hue angle	control	21.92	22.2	26.38 a	27.08
	sodium alginate (1%)	21.92	22.28	25.81 a	25.72
	sodium alginate (3%)	21.92	22.05	26.77 a	26.55
	sodium alginate (5%)	21.92	22.1	23.46 b	26.64
Lightness	control	23.81	24.77	18.39 b	21.16
	sodium alginate (1%)	23.81	25.56	21.68 a	22.66
	sodium alginate (3%)	23.81	24.9	20.17 b	22.33
	sodium alginate (5%)	23.81	24.11	22.18 a	21.88

hue angle values during postharvest storage and even after 21 days of cold storage. In this case, the use of an alginate coating contributed to maintaining the original color of the cherries. The same trend was also observed in cv Grace Star, where hue angle values increased during storage, but without significant differences between treatments, in agreement with the results of YAMAN and BAYOINDIRLI (2002) with the Semperfresh™ coating, but in disagreement with the results of cv Big Lory, where the use of the alginate coating contributed to maintaining the original color of the cherries.

A decrease in L (lightness) is an indicator of fruit darkening. During storage, Big Lory darkened slightly as evidenced by decreasing values of L for control and all treated cherries (Table 2). By the end of the storage period, L decreased by around 21% for control fruit, by around 19% for fruit coated with 1% and 5% alginate and by 17% for fruit coated with 3% alginate. This result confirms that the alginate coating exert significant effects in maintaining the original color of Big Lory cherries. In Grace Star, the lightness values of the cherries increased after 7 days of storage and then showed a decreasing trend until the end of cold storage. After 21 days of storage at 4°C, there were no significant ($P \leq 0.05$) differences in lightness values between the treated samples and the control (Table 2). We may therefore conclude that the use of an alginate coating on Grace Star sweet cherries did not significantly alter, but rather improved the skin color or its evolution during storage at 4°C.

The changes in the chroma values (C) of Big Lory cherries during storage are presented in Table 2. Fruit developed less vivid coloration, as evidenced by lower values of C in cherry samples during storage. The reduction in C values was significantly greater for uncoated fruit, and significant differences were found between control and coated cherries ($P \leq 0.05$). Regarding the coated fruits, significant differences were found among samples treated with different concentrations of alginate, since 3% coated cherries showed higher C values. Chroma was reduced by around 30% for control and 10% for coated cherries.

In cv Grace Star, the main color changes were observed in the C values, which diminished during cold storage at 4°C, in particular in the control and 3% coated fruits. The values at 21 days were 25% and 24% lower, respectively, than those found at day 0 (Table 2).

Anthocyanin content, phenolic content and Total Antioxidant Capacity

Anthocyanins are responsible for the red color in sweet cherry (GARDINER *et al.*, 1993) and are beneficial to human health. In cv Big Lory, the anthocyanin content at harvest was 28.5 mg (C3G) and decreased significantly during storage (Table 3), in agreement with BERNALDE *et al.* (2003). After 21 days of storage, significantly lower levels were found in 5% alginate coated fruits with mean values of 18.12 mg (C3G).

In cv Grace Star, during post-harvest storage, anthocyanin significantly increased. Thus, the cherries became darker during storage as ripening progressed. Anthocyanin values showed that 5% alginate treatment delayed the ripening process, with significantly lower anthocyanin accumulation during storage compared with the other treatments (Table 3). Cherries coated with 1% and 3% alginate showed the greatest anthocya-

Table 3 - Values of anthocyanin contents, phenolic contents and total antioxidant capacity of coated cherries (cv Big Lory and Grace Star) at harvest and at the end after 21 days of storage. Different letters in the same column indicate significant differences ($p \leq 0.05$).

	Storage (days)	Anthocyanins (mg cyanidin-3- glucoside (C3G) per 100 g)	Polyphenols (mg gallic acid equivalents (GAE) per 100 g)	Antioxidant activity (mmol Fe^{2+}/kg)
cv Big Lory				
Treatments				
harvest	0	28.5	57.49	13.64
control	21	15.11 b	42.17 a	12.62 a
sodium alginate (1%)	21	15.14 b	41.41 a	12.00 a
sodium alginate (3%)	21	14.32 b	35.68 b	10.92 b
sodium alginate (5%)	21	18.12 a	39.88 ab	12.91 a
cv Grace Star				
Treatments				
harvest	0	53.85	194	15.33
control	21	64.65 b	156.56 a	15.17 a
sodium alginate (1%)	21	85.96 a	140.44 a	15.76 a
sodium alginate (3%)	21	76.15 a	128.22 b	15.07 a
sodium alginate (5%)	21	58.15 c	93.83 c	15.12 a

nin accumulation after cold storage. Post-harvest increases in anthocyanin have been previously reported for cherries and for other small red fruits like raspberries, plums and strawberries (WANG and STRETCH, 2001; SERRANO *et al.*, 2009; DÍAZ-MULA *et al.*, 2012). Anthocyanin accumulation during storage is attributed to normal sweet cherry ripening. WONG *et al.* (1992) suggested that the edible coating film forms a gas barrier, probably due to the dense structure of the film, so a possible modification of the internal atmosphere in coated samples due to film application could explain this behavior; this seemed to delay anthocyanin synthesis and/or degradation.

Polyphenols are important non-color compounds present in sweet cherry at harvest and during storage. These compounds not only contributed to the flavor but may also influence fruit color (MAZZA and BROUILLARD, 1990). The total polyphenol content decreased in both cultivars after 21 days of storage at 4°C and total polyphenol contents were significantly different between treatments (Table 3). In Big Lory, more pronounced changes were observed for the 3% and 5% coated samples, resulting in 37% and 30% losses, respectively (Table 3). In Grace Star, there was a 19-51% loss, depending on the treatment (Table 3). In the control and 1% alginate coated fruit, the decrease in the polyphenol content was significantly lower. The polyphenol content in the 5% coated fruit decreased during storage, and the value at 21 days of storage was 51% lower than that found at 0 days.

No changes in antioxidant capacity were observed during cold storage (Table 3). In particular, in Big Lory samples, the total antioxidant capacity at harvest was 13.69 mmol Fe^{2+}/kg and at the end of storage period this was 12, 10.92 and 12.91 mmol Fe^{2+}/Kg in cherries coated with alginate at 1%, 3% and 5%, respectively. Similarly, in Grace Star, the antioxidant activity remained stable during storage without differences between treatments (Table 3).

CONCLUSIONS

Alginate treatments can be used as a natural postharvest treatment in sweet cherry cultivars with the aim of delaying the postharvest ripening process and maintaining fruit quality. Alginate treatment at 1% and 3% was effective in delaying weight and acidity losses, softening and color changes in the cultivars Big Lory and Grace Star. In terms of the antioxidant properties, no significant results were obtained using the alginate coating. The results of this study suggest that alginate treatments at 1% and 3% can be used as natural postharvest treatments to improve cherry quality after harvest.

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