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Application of sucralose on organic cherries cv. Sweetheart® with modified atmosphere, and its sensory acceptance

Aplicación de sucralosa a cerezas orgánicas cv. Sweetheart® en atmósfera modificada y
su aceptación sensorial

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Abstract

Cherries cv. Sweet Heart® from an organic orchard in the district of Los Angeles, Bio Bio Region, Chile, were subjected to the application of the treatments: T₀, control; T₁, 1.5% sucralose, and T₂, 2.0% sucralose. They were then packed in M.A. packaging, View Fresh, inside cardboard boxes of 5 kg conserved for 20, 35 and 50 days at a temperature of 0 ± 0.5 °C with relative humidity of $90 \pm 0.5\%$. Fruits under treatment T₁ showed the lowest weight loss at 35 days of storage. This trend was maintained on day 50, when the addition of sucralose (T₁ and T₂), involved a minor loss of fruit weight with respect those similar under treatment T₀. The fruit with sucralose showed as light decrease in pressure of pulp but always above the lower limit of recommended Durofel units. The use of sucralose was able to increase slightly the brightness of the fruit at 20 and 50 days of storage. The use of 1.5% sucralose (T₁) had a favorable effect on the flavor and color at day 35. The appearance and acceptability of cherries, showed significant positive changes at the 35 days of storage, with the treatment (T₁).

Key words: Protective covers, post harvest, storage.

Resumen

Cerezas cv. Sweet Heart® de un cultivo orgánico en la comuna de Los Angeles, región del BíoBío, Chile, sometidas a los tratamientos: T₀, control; T₁, con 1.5% de sucralosa y T₂, con 2.0% sucralosa. Se almacenaron en cajas de 5 kg con bolsas FreshView en A.M., conservadas por 20, 35 y 50 días a temperatura de 0 ± 0.5 °C y humedad relativa de $90 \pm 0.5\%$. Después de 35 días, las cerezas con el tratamiento (T₁) exhibieron la menor pérdida de peso. Esta tendencia fue mantenida al día 50, al utilizar sucralosa (T₁ y T₂), con menor pérdida de peso respecto al tratamiento T₀. La fruta con cobertura, mostró una leve disminución en la presión de pulpa, pero siempre sobre el valor límite menor recomendado en unidades Durofel. La sucralosa aplicada permitió incrementar levemente el brillo de cerezas tanto a 20 como a 50 días de almacenamiento. El tratamiento con 1.5% de sucralosa (T₁) tuvo un efecto favorable en el sabor y color al día 35. La apariencia y aceptabilidad de las cerezas mostraron un cambio positivo y significativo durante los 35 días debido a la sucralosa a 1.5%(T₁).

Palabras clave: Coberturas protectoras, post cosecha, almacenamiento cereza.

Introduction

Fruit growing in Chile is a major sector within the national agricultural area. New species and varieties introduction and organic farming are important contributions to fruit diversification; being *Prunus avium* L. cv. SweetHeart® an interesting option, as is preferred by growers of cold areas cultivars (Bargioni, 1996). Cherry trees have recognized importance in Chile, their pres-

ence is common in home gardens. Commercial plantations are located from the Coquimbo Region to Aysen, including the Metropolitan and Los Rios. Plantations in Chile have grown steadily, from 4900 ha in 2000 to about 13,500 ha in 2007, an average growth of over 1200 ha/year (Fundación para la Innovación Agraria, FIA, 2008).

The global market for organic products has been developing steadily in recent decades (Oficina de Estudios y Políticas Agrarias, ODEPA, 2007); this products are obtained in almost every country in the world, mainly due to a growing consumer demand and the requirement to make agricultural practices environmentally friendly. At the same time, organic farming in Chile continues to develop rapidly. The fruit has been defined as an alternative product for Southern Chile (Ellena, 2002) managed under organic production, which lead to greater competitiveness and allows for best prices on international markets.

According ODEPA (2008) during 2007-08 season were certified as organic in Chile 30,443 ha of plantations and 14% were fruit, which represents 4161 ha and cherry trees occupy 60.5 ha, which corresponds to 2.2% of the area occupied by fruit trees.

Cherry fruit has high levels of dehydration, favored by its thin cuticle (Joublan y Claverie, 2004). The use of modified atmosphere, waxed or covers, allowed to prolong the useful life thereof. The use of sucralose as a food was approved by the Food and Drug Administration (F.D.A.) in 1999 (Rodero et al., 2009), and could be used as a cover, since it is a substance permitted for organic food production.

The hypothesis of this study was: the application of sucralose, reduces the loss of sensory evaluation, physics and chemistry of cherries (*Prunus avium*) cv. Sweet Heart® in organic production with modified atmosphere, encouraging their appearance and acceptability. Besides, to support the hypothesis its was planted the objective to determine the effect of sucralose on the postharvest life of organic cherries cv. Sweet Heart®, stored under modified atmosphere, evaluating physical, chemical and sensory parameters, and analyze the intensity of sensory attributes and acceptability of the fruits after storage.

Materials and methods

The trial was conducted between December 2009 and June 2010. Raw material used to perform the trial was cherry (*Prunus avium* L.) cv. Sweet Heart® from the organic orchard called Farm Huaquen (37° 30' S, 72° 26' W) 7 km from the town of Los Angeles region Ñuble, Chile.

Organic cherry trees were planted in a frame of 5.0 x 3.0 m in 2001, on Colt (*Prunus cerasus*) rootstock, and oriented at 37° northwest. This zone is characterized by average temperatures ranging between 27.1 °C (maximum in January) and 4.1 °C (minimum in July) (Santibáñez y Uribe, 1993). The soil is alluvial, with a moderate degree of evolution and occupies a lower terrace, forming a deep field with an almost flat topography (Ciren, 1999).

The timing of harvest was decided according to the indices of maturity, skin color light mahogany red, flesh firmness with over 75 units Durofel, soluble solids higher than 16 °Brix, and acidity greater than 0.6% (Ferrer et al., 2000). Once harvested, cherries were placed in plastic perforate harvest containers with dimensions of 400 x 600 x 175 mm. A sheet of sponge soaked in water was used (360 x 560 x 80 mm), arranged in the base of the box and on the cherries. Once at the packing house cherries were identified, sampled and subjected to a fast hydro-cooling with water temperature between 0 - 1 °C, the temperature of the fruit pulp to the output of 0° to 2 °C, with 8 min time of the boxes under water. Fruit afterwards entered the maintenance chamber, whose temperature was $-1^{\circ} \pm 0.5^{\circ} \text{C}$ and a relative humidity of $90 \pm 0.5\%$.

For testing, there was used light mahogany red fruits and gauge range between 26.0 and 27.9 mm in diameter (Jumbo). The treatments were applied by immersion in the corresponding solutions of sucralose of 1.5 and 2.0%. Slider-type bags with fruit were placed in modified atmosphere bags inside cardboard boxes to 5.0 kg net. Also, the bags were identified and transferred to a chamber with temperature of $0 \pm 0.5^{\circ} \text{C}$ with relative humidity of $90 \pm 0.5\%$. When the fruit pulp temperature decreased to between -0.5 and 1.5 °C, modified atmosphere (M.A.) bags of View Fresh were heat sealed across its width, taking care to remove excess air from inside the bag, seeking to develop a passive M.A. (Day, 1995). The fruit was store aged for 20, 35 and 50 days at a temperature of $0 \pm 0.5^{\circ} \text{C}$ with a relative humidity of $90 \pm 0.5\%$, from December 24th. Three measurements were performed at 20, 35 and 50 days from the beginning of storage.

After packaging in slider bags of 0.5 kg net, the following treatments were applied and identified as T₀: without application of chemicals on cherries which were stored under passive M.A.; T₁: application of 1.5% sucralose on cherries that were stored under passive M.A.; T₂: application of 2.0% sucralose cherries that were stored under passive M.A.

The 1.5% sucralose solution was obtained by dissolving 675 g in 45 L of destilate water, while 900 g were dissolved in 45 L of water for the 2.0% solution. The application was performed by immersing the fruit in each solution, according to the concentration for 1 min and then allowed to dry at room temperature. The experimental unit was 200 g content in slider bags with three replication. Then it proceeded to its conservation. Physical paramethers evaluated after cold period was weight, skin color measured by the Commission Internationale d'Eclairage $L^* a^* b^*$ (Hunter Lab, 2001) and pressure. Gases were measured and expressed in mg/100 g fresh weight. A postable Check Point (O₂/CO₂) Densensor GDP device was used. The concentration of O₂ and CO₂ are expressed as a percentage. Chemical paramethers, to measure soluble solids in fruits a digital refractometer model Atago RX-5000 was used. A small juice sample was placed at 20 °C on the prism of the refractometer, the result was recorded in °Brix. The pH measurement was done by using a digital pHmeter model Thermo Orion 3 Star. Be-

sides, the Malic acid was measured, and for this, an automatic titrator Mettler Toledo was used. It was weighed 2 g of cherry juice in a sample container, then added 40 g of distilled water, mix and set to be read. The result was expressed as malic acid percentage (AOAC, 1990).

To measure the organoleptic characteristics of cherries, sensory analysis was performed through evaluation of 30 trained panelists, who rated, using a non-structured guide, the intensity of the attributes skin color, flavor, aroma and texture. Furthermore, this panelist used a second structured guide for evaluation of appearance and acceptability to a scale of 1 to 9, where: (1) I don't like it extremely, (2) I don't like it so much, (3) I don't like it moderately, (4) I don't like it some degree, (5) It has not effect on me, (6) I like it at some degree, (7) I like it moderately, (8) I like it so much, (9) I like it extremely (Witting, 2001).

Statistical analysis. A completely randomized design (CRD) with factorial arrangement of 3 x 3 with a confidence level of 95%, considering as factors the level of sucrose and days of storage. For multiple comparisons, it was used the Tukey test with a confidence level of 95%.

Results and discussion

Physical analysis

Weight. According to Gatti et al. (1984) the cherry fruit at room temperature and low humidity conditions, can lose up to 1% weight per hour. During the first 20 days of storage there were no statistically significant differences in weight loss between fruit subjected to different treatments. However, cherries under treatment T_0 showed a 0.9% weight loss, being the most evident loss compared to the other treatments, although slight.

Despite the loss of weight, the fruit significantly showed no signs of pedicel dehydration. In this sense, Gil (2001) suggests that the threshold for signs of wilting is between 3 and 5% by weight. After 35 days storage, fruit under treatment T_0 showed a slight decrease in weight, with respect to the other treatments, with daily values of 1.2 g. For treatments T_1 and T_2 , weight losses were recorded of 0.74 and 0.87 g per day, respectively. At 50 days storage, treatments continued with a trend similar to the second measurement, i.e. fruits in treatment T_0 showed a greater weight loss relative to that of T_1 and T_2 with a weight loss 2.03 g daily, with almost twice the weight loss compared to the best response, T_1 . That is, for these same days of storage, fruit with T_1 had the lowest weight loss of 1.02 g per day of storage, corresponding to a weight difference of 10.2% of initial weight. Fruits under treatment T_1 , with application of 1.5% sucralose, showed the lowest weight loss at 35 and 50 days of storage. The addition of sucralose and M.A. in fact could reduce the cherries weigh loss, besides is related with the atmosphere and temperature condition during storage and also with the level of respiration rate and maturity condition. Therefore, those treatments couldn't reduce the loss of firmness measured by pulp pressure in units Durofel as it will explain in the later paragraphs. For Gil (2001), by using covers or waxes, the fruit is subjected to a physical protection able to reduce water loss by up to 30 to

40%. Besides, almost harvested fresh fruit loses water as vapor from the intercellular spaces by transpiration, especially the cherry (Gil, 2001).

Skin color. In this study, use of sucralose at concentrations of 1.5 and 2.0% with both T₁ and T₂ did not show statistically significant changes on brightness (L^* value) and yellowness (b^* value) of organic cherries cv. Sweet Heart® during the assessments made in storage. None the less, each of the treatments showed a decrease in fruit brightness during storage, i.e., cherries were becoming darker. The loss of brightness and darkening of the skin were also recognized by Horvitz et al., (2004). Some fruits are usually coated to achieve more brightness (Gil, 2001). In this case, the use of sucralose was able to increase slightly the brightness of the fruit at 20 and 50 days of storage. Besides, in treatment T₂ as light increase in the value b^* was observed with respect to the fruit from T₀ and T₁, i.e. cherries from treatment T₂ were slightly more yellow than those from T₀ and T₁. The same trend occurred during the measurement at 50 days of storage, but even though no statistically significant differences was observed, it shows a decrease in the yellowness or value of b^* of fruits under treatments, with respect to the first measurement.

For the value of a^* (redness) there was statistically significant difference only at 20 days of storage, which was provoked by treatment T₁ with an average of a^* of 25.74. This value was 30.8 and 27.4% higher than T₀ and T₂, respectively. Then, after 20 days of storage, cherries T₁ treatment had a higher red tonality (Figure 1). Those instrumental values (L^* , a^* and b^*) obtained in this research are related with the increase of ripe and should contribute to the sensory evaluation of the cherry fruits.

During the following days of storage, no statistically significant differences between treatments were observed, although each of the treatments showed a decrease in red color, i.e. lower values of a^* . This disagree with those observed by Horvitz et al. (2004), who presented an increase in red dish tones of cherry cv. Sweet Heart® for 42 days of storage. The previous result was also found by Andris et al. (1994), who observed a similar change in some varieties of cherry. This would relate to the polymerization of phenolic compounds and fruit senescence (Horvitz et al., 2004).

In general, the relationship between color and soluble solids is close and direct (Gil, 2001). In this sense, the reduction of soluble solids of the fruit in this test was consistent with the decrease of the values of L^* , a^* and b^* . Even in this work did not study the influence of light and canopy fruit position in the tree over the skin color of cherry fruit such as did Lewallen and Marini (2003); therefore, it could be an influence not only in the skin color but also in the physical characteristics and sensory attribute of cherry fruits. The three treatments, mainly T₁ and T₂ had an influence in the red color and brightness according to the storage period probably related with the normal maturity phenomena but those treatments could support the color requirements of the cherries fresh market which may corroborated by the sensory

panelists.

Pressure. Firmness is one of the most important quality parameters in the determination of both acceptance and duration of the commercial life of cherries (Brown and Bourne, 1988). During refrigerated storage, in this trial, no significant statistical variation in the firmness of cherries cv. Sweet Heart® between treatments is observed. After 20 days of storage there were no statistically significant differences among the fruits with the three treatments. Nevertheless, measuring at day 35 of treatment for fruit in T₂ showed as lightly higher pressure, followed by treatment T₀, while the fruit with less pressure was that from T₁. At 50 days of storage, though not statistically significant changes were observed, the better respond to pressure changes with treatment was when fruits were under treatments T₀, T₂ and then followed by T₁. However, the firmness decrease compared with the measurement at 20 days was 6.8%, 9.1% and 6.9% for T₀, T₁ and T₂, respectively. That was, a decrease of (0.20), (0.26) and (0.20) Durofel units per day, for T₀, T₁ and T₂ (Figure 2). Because the cherry is a non-climacteric fruit (Gil, 2001) there is not precipitous loss of firmness. In addition, it was observed that after 50 days of storage, the pressure still remained above the minimum value for harvest, i.e. 75 units Durofel (Figure 2). Studies by Meheriuk *et al.*, (1995) in cherries cv. “Lapins” packed in Low Density Poly Ethylene (L.D.P.E.) showed no change in firmness during 8 weeks of refrigerated storage. On the other hand, under similar conditions of conservation there was an increase on firmness for Sweetheart® cherries (Horvitz *et al.*, 2004).

Gases (O₂ and CO₂). According to Zoffoli y Contreras (1997), the passively-generated M.A. by respiration of the fruit reaches equilibrium 5 to 10% O₂ and 5 to 15% CO₂ in 3 days. The percentage of O₂ inside the package ‘View Fresh’ for treatment T₁, decreased as the days in storage progressed, but the concentration of O₂ remained above that of T₀ and T₂ to 35 days conservation. However, at 50 days decreased its concentration under treatment T₁ when compared to other treatments, although the percentage of O₂ in T₀ and T₂ showed a similar trend of increase. Similar to Crisosto *et al.*, (1993) in this research the storage temperature and also the relative humidity were constant, so the variation in the oxygen and CO₂ level was related with the natural ripe phenomena only controlled by the package View Fresh and also sucralose represented by the treatments.

On the other hand, CO₂ concentrations inside the packages View Fresh, showed an increase in T₁ during the days of storage, while treatment T₀ decreased slightly. Fruit subjected to treatment T₂ was stable between 7, 0 and 7.5% as days storage advanced. Overall, levels of O₂ and CO₂ in all treatments were within recommended concentrations by Zoffoli y Contreras (1997) who suggest a passively-generated M.A. by respiration of the fruit from 5 to 10% O₂ and 5 to 15% CO₂. Similar is the case presented by Meheriuk *et al.* (1997) who kept in good condition cherries cv. Sweet Heart® for 4 to 6 weeks in atmospheres of 4.6% O₂ and 10% CO₂.

Horvitz et al. (2004) suggest that M.A. with CO₂ levels greater than 10% and 3 to 10% O₂, allow to extend the storage period of cherries cv. Sweet Heart® for 42 days by retarding the deterioration of the fruit.

Chemical Analysis

Soluble solids. In this essay, the evolution of soluble solids content during prolonged storage showed a constant behavior. That is, regardless of the treatment, all fruits decreased content of soluble solids and it was supported by the sensory panelist in relation to the flavor attribute measured. During assessments, cherries subjected to treatment T₀ always had higher soluble solids content compared to treatments with addition of sucralose, continually producing a statistically significant difference compared to T₂. Treatment T₁ and T₂, using sucralose, did not show statistically significant differences in soluble solids content during prolonged storage, although the T₂ treatment was the fruit that exhibited the largest decrease of this parameter.

This evolution of soluble solids in this research, coincides with assessments made by Chen *et al.*, (1981), who in cherries cv. Bing, preserved for 35 days at 1.1 °C, showed losses of 1 to 2% soluble solids. However, in other cases there has been an increase (Sangiacomo et al., 1994).

pH. During the refrigerated storage of organic cherries cv. Sweet Heart® there were no statistically significant changes in pH values between the three treatments. However, each showed an increase in pH over the storage of the fruit (Figure 3). The pH value of 3.72 for cherries in treatment T₀ at 20 days, increased by 0.07 at 35 days, then increase significantly at a pH of 3.88 at 50 days conservation, i.e. an increase of 4.1% compared with the first measurement. In turn, cherries from treatment T₁ showed a pH value of 3.69 at 20 days of storage, showing a significant increase of 3.2% at 35 days, then at 50 days slightly increase its pH value to 3.87. Fruits in treatment T₂ generated a pH value of 3.74 in the first measurement with only a slight increase in the pH value at 35 days, but after 50 days storage the observed pH 3.86 was significant higher (Figure 3). For Fourie (1997) the pH of the fruit tissue is controlled by the equilibrium between potassium and organic acids.

Acidity. In cherry fruit, malic acid content decreases during ripening (Gil, 2001). In this sense, after harvest, cherry loses acidity faster than its sugar (Drake and Fellman, 1987) which can improve their palatability (Gil, 2001). Cherries in treatments T₀ and T₁ at 35 days of storage, each decreased 0.06% malic acid with respect to the measurement at 20 days. This trend continued at 50 days of storage compared to the first measurement, showing a significant decrease of 0.19 and 0.18% for fruits with T₀ and T₁, respectively. The content of malic acid in the treatment T₂, decreased significantly at 0.08 and 0.19% at 35 and 50 days of storage, respectively (Figure 4). In this aspect later panelists should demonstrated more acceptance to the cherries until 35 days of storage probably because of the reducing of acidity.

These results coincide with those proposed by Gil (2001) who discloses that the organic acid concentration decreases during maturation, as a consequence of its use as substrate for respiration or structure on other synthesized substances, this decrease being lower in sour cherry (*Prunus cerasus* L.) cv. Morello. Gil (2001) suggests that the loss of malic acid acidity in cherries is reduced in atmospheres with low oxygen and moderate carbon dioxide. In addition, the increasing pH value along the conservation of the cherries may be due to the downward trend of malic acid content of this study.

Sensory analysis. The nutritional and organoleptic characteristics of fruits and vegetables are responsible for the preference for fresh consumption (Mondino y Ferratto, 2006).

Flavor. The sugar content such as; glucose and fructose would be closely related to the firmness and flavor, indicating that the cherries with a lower level of soluble solids are firmer, but have less flavor (Drake and Fellman, 1987). Flavor of the fruits from all treatments, according to the panelists, remained with no large variations after 20 days of storage, ranging between 8.84 and 10.26. These values correspond to a rather sweet taste. At 35 days, cherries from treatment T₀ had a lower value 7.79, differing statistically significantly from T₁, which values remained largely unchanged until the end of the trial. During the 50 days of storage, the taste attribute of cherry did not show statistically significant differences between treatments, with values between 8.70 and 9.72 (Table 1).

In this assay, soluble solids content decreased during storage, which resulted in a decrease of flavor during this period of time. The acidity of cherries also decreased, but this attribute, which was evaluated by panelist, showed no major changes during the days of storage.

Color. Upon storage the first 20 days, did not find statistically significant changes for the evolution of color, as it showed values, according to the panelists between 5.14 and 6.38, the least of them in the cherries from treatment T₁. In general, all evaluators noticed a light red in this measurement. Regarding the evaluation of the 35 days of storage, fruit subjected to treatment T₁ had the highest value with 8.33, perceiving a color closer to red. In turn, generated a statistically significant difference compared to treatment T₀, which yielded a value of 4.77, which turned out to be the lowest value among the treatments and perceived a light red color. At 50 days of storage, there were no statistically significant differences between treatments. Panelists gave cherries scores between 5.13 and 6.69 (Table 2).

Surface color of the fruits of each treatment showed a tendency to stability during storage, except that for treatment T₂ in the second measurement, which showed a considerable increase from the first measurement (Figure 5). In general, cherries from all treatments remained light red mahogany and/or became slightly darker. This coincides with the decrease in luminance or brightness of cherries for all treatments during storage in this study, i.e. cherries were becoming darker. Loss of brightness and darkening of the skin were also recognized by (Horvitz *et al.*, 2004).

Aroma. No statistically significant changes in the aroma of cherries cv. Sweet Heart® was observed, during refrigerated storage, between treatments. The average values ranged between 3.37 and 5.53. However, cherries from treatment T₀, during testing, were the one with the least flavor according to the panelists, who in turn, perceived a greater aroma on cherries belonging to T₂. Cherries cv. Sweet Heart® stored for 50 days did not show a strong aroma. Panelists perceived them as poor. No panelist during the three measurements sensed an unpleasant aroma.

Texture. The texture of cherries cv. Sweet Heart® during refrigerated storage, did not show statistically significant changes between treatments. The mean values fluctuated with scores given by panelists between 7.62 and 9.15. Texture appreciation by people in their mouth contains many variables that are not easily detected, and this affects the evaluation (Szczesniak, 1990). However, evaluating the texture of cherries in this assay, showed data with a balanced and rather crunshy trend. These results are related with the pressure measured and showed previously which remain almost constant with not significant variation.

Appearance. Appearance of cherries cv. Sweet Heart® during refrigerated storage for 20 days, did not show statistically significant changes between treatments, however, the panelists evaluated the fruit slightly better with treatment T₀ with a score of 7.15 giving the degree of "I like it moderately". In turn, both the fruit from treatments T₁ and T₂, showed a level of satisfaction of 6.0. This is equivalent to "I like it at some degree."

At 35 days of storage, cherries cv. Sweet Heart® belonging to treatments T₁ and T₂, exhibited statistically significant differences with respect treatment T₀. The latter showed a liking for panelists who was listed as "It has not effect on me", while cherries from T₁ and T₂ were classified as "I like it moderately". During the 50 days of storage, there were no statistically significant changes between treatments, although cherries from T₁ maintained a rating of "I like it moderately". On the other hand, cherries from T₀ and T₂, provoked a sense of "I like it at some degree". It is noteworthy that from day 50 of storage, it was recorded by some panelists the presence of slightly rough fruits from treatment T₀. Zoffoli (1995) associates it with lizard-skin fruit, characteristic of this strain over long periods of storage and relates to senescence. In parallel, several panelists after 35 days of storage, visualized in cherries belonging to T₁ and T₂, higher gloss on the surface, a condition that probably originated by the presence of sucralose as a cover.

Acceptance. Acceptability of cherries during storage for 20 days did not show statistically significant changes between treatments; however, and similar to the appearance attribute, panelists evaluated the fruit slightly better with treatment T₀ with a score of 7.23 which was included in the degree of "I like it moderately". Both the fruit from T₁ and T₂, showed a 6.61 level of pleasure that is equivalent to "I like it at some degree."

During the 35 days of storage, cherries from treatments T₁ and T₂ showed significant

differences from those under treatment T₀, which showed a liking cataloged as "It has not effect on me". While cherries from T₁ and T₂ were classified as "I like it moderately". At 50 days of storage, there were no statistically significant changes between treatments, although cherries subjected to treatment T₂ maintained a rating of "I like it moderately". The fruit in T₀ and T₁, presented, according to the panelists, a perception of "I like it at some degree" (Figure 6). Acceptability of cherries cv. Sweet Heart® for 50 days of storage, showed a close relationship with the appearance, i.e., it was found, in this study, a similar trend to that appearance. Therefore, we can suggest that the acceptability could be as a result of a visual stimulus instead.

Conclusions

- The application of sucralose on organic cherries cv. Sweet Heart® and stored under modified passive type atmosphere (M.A.P.), did not lessen the loss of either sensory chemical and physical evaluations during postharvest.
- The use of sucralose on organic cherries cv. Sweet Heart® and stored under passive type modified atmosphere, did not show a significant effect on chemical parameters such as soluble solids, pH and acidity. The use of sucralose in 1.5% (T₁) had a positive effect, on physical parameters such as firmness and color only after 20 days of storage.

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Table 1. Average of taste attribute as evaluated using a non-structured guide on organic cherries cv. SweetHeart® stored under modified atmosphere at 0 ± 0.5 ° C.

| Treatment | Period of storage (days) | | |
|--|--------------------------|---------|------|
| | 20 | 35 | 50 |
| T ₀ (MAE) | 10.26 | 7.79 b* | 8.70 |
| T ₁ (Sucralose 1.5 % + MAE) | 8.92 | 10.82 a | 9.40 |
| T ₂ (Sucralose 2.0 % + MAE) | 8.84 | 8.86 ab | 9.62 |

* Average in columns without common letters are significantly different using Tukey test with a level of significance of 0.05.

Table 2. Average of color attribute as evaluated using a non-structured guide on organic cherries cv. SweetHeart® stored under modified atmosphere at 0 ± 0.5 ° C.

| Treatment | Period of storage (days) | | |
|--|--------------------------|---------|---------|
| | 20 | 35 | 50 |
| T ₀ (MAE) | 6.38 ab* | 4.77 b | 5.13 b |
| T ₁ (Sucralose 1.5 % + MAE) | 5.14 b | 8.33 a | 6.69 ab |
| T ₂ (Sucralose 2.0 % + MAE) | 6.12 ab | 5.37 ab | 5.80 ab |

* Average in columns without common letters are significantly different using Tukey test with a level of significance of 0.05.

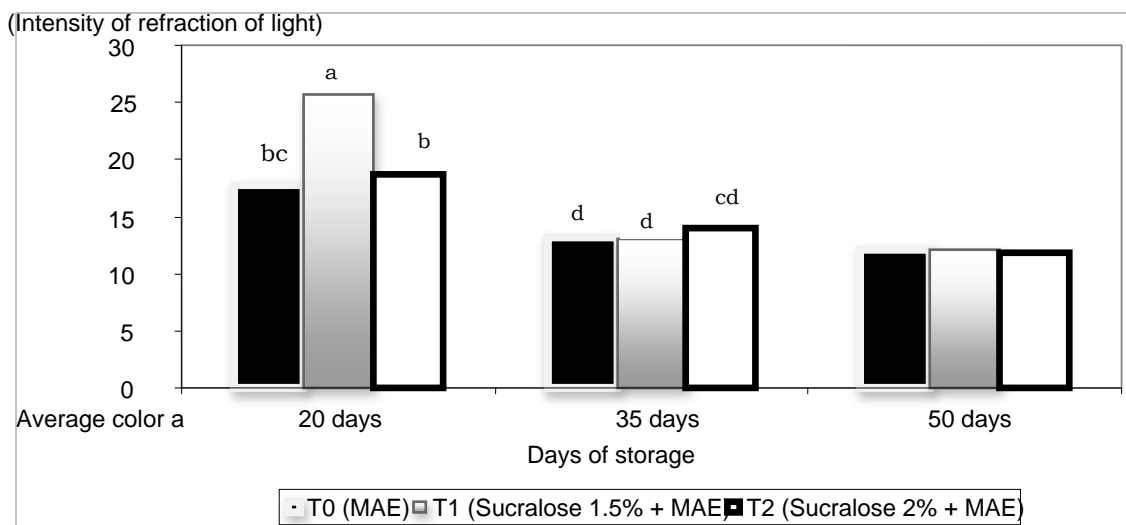


Figure 1. Evolution of value of a^* (Redness) of organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 ° C.

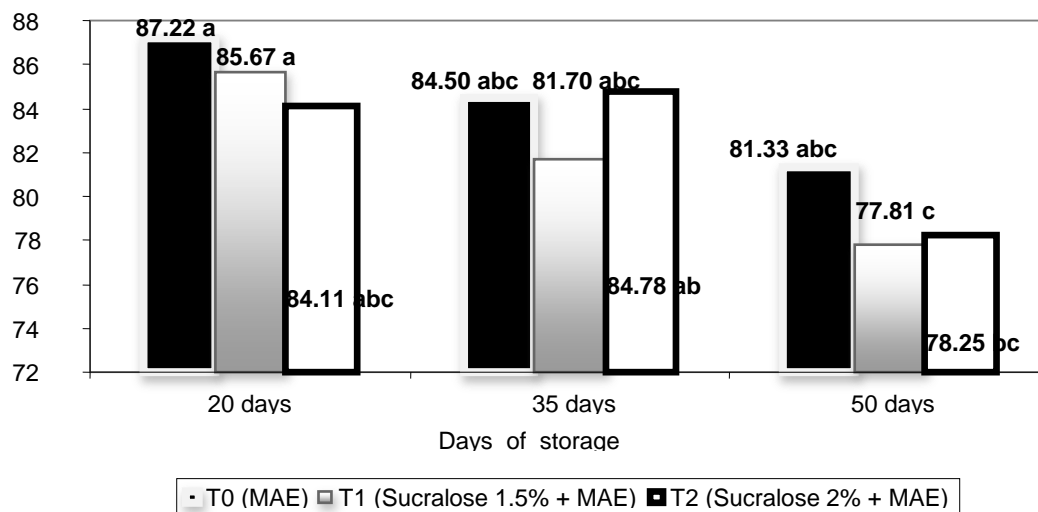


Figure 2. Evolution of pressure on organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 ° C.

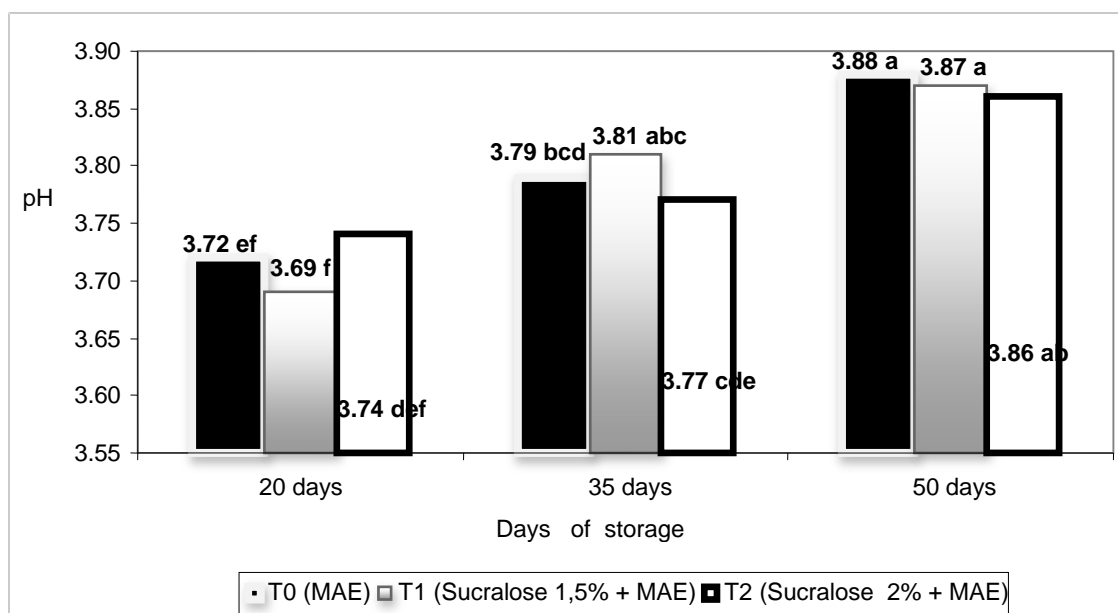


Figure 3. Evolution of pH on organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 °C.

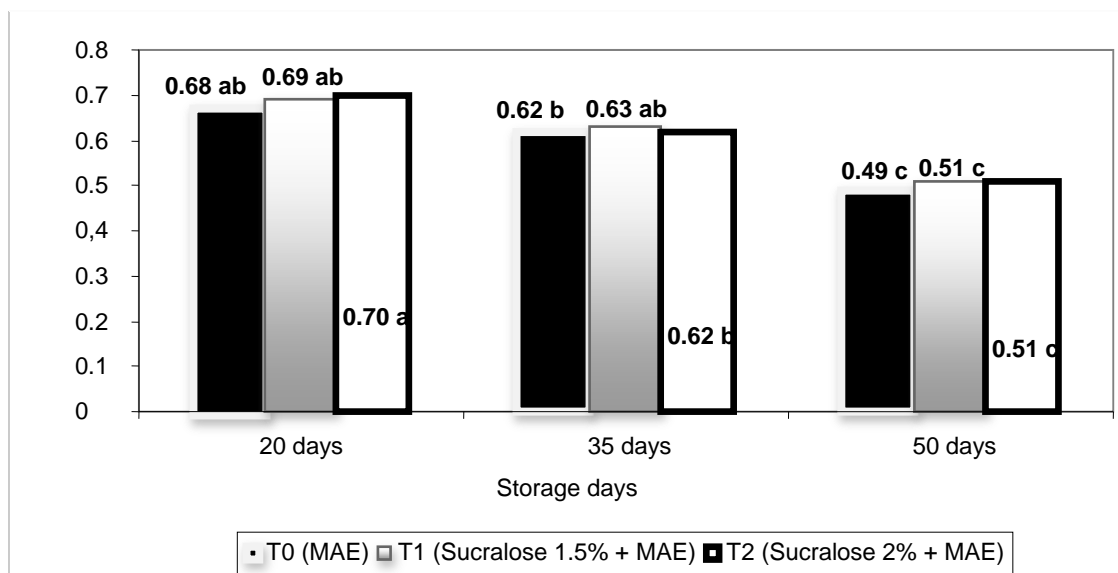


Figure 4. Evolution of acid malic content on organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 °C.

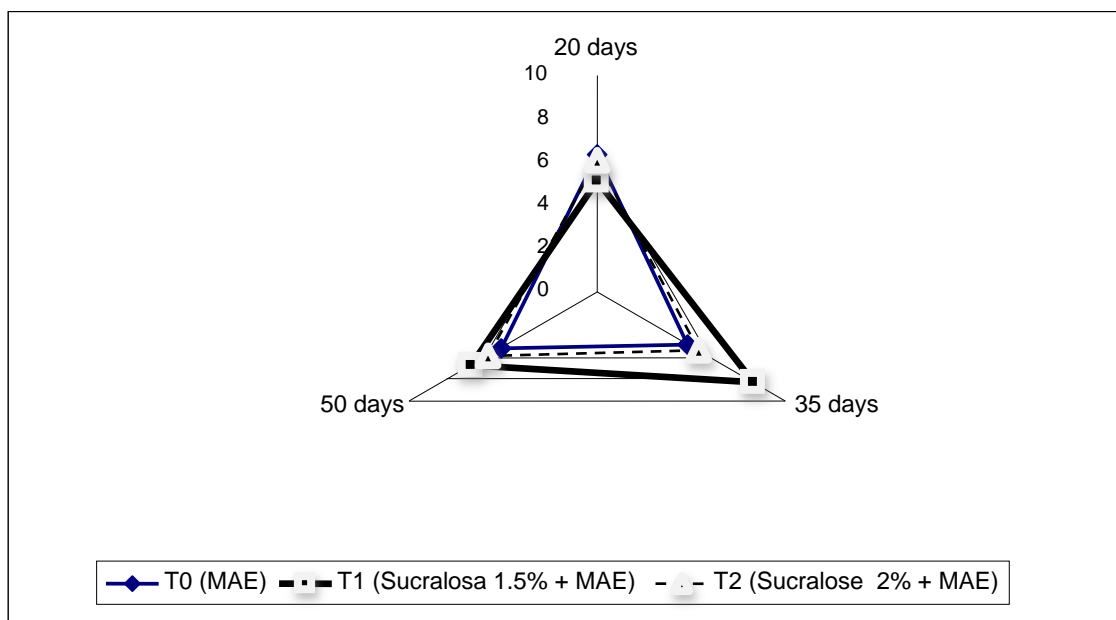


Figure 5. Evolution of color on organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 °C.

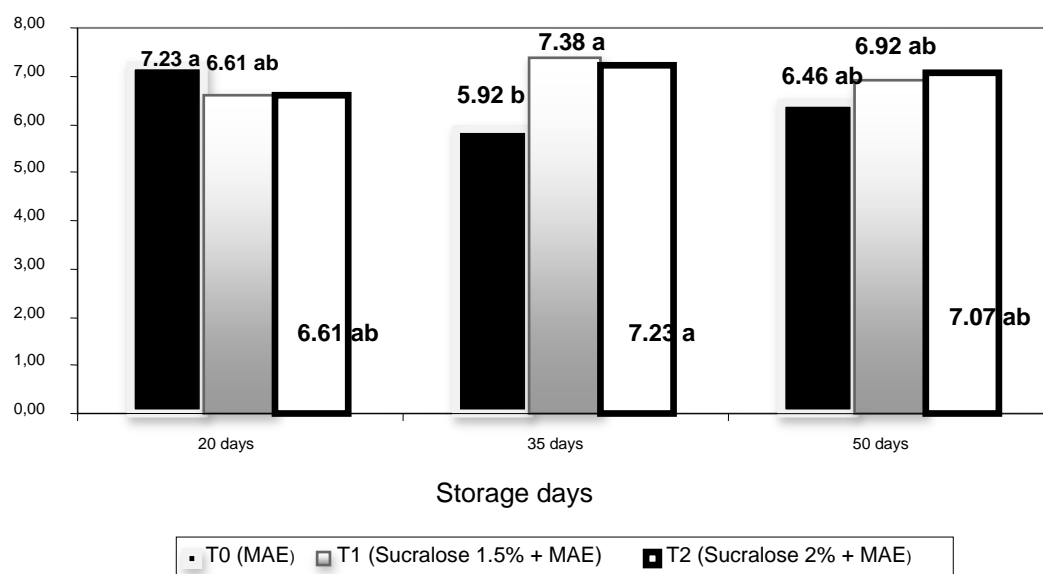


Figure 6. Evolution of acceptability on organic cherries cv. SweetHeart® stored under modified atmosphere for a period of 50 days at 0 ± 0.5 °C.