Evaluation of different postharvest conditions to preserve the amount of bioactive compounds, physicochemical quality parameters and sensory attributes of 'Sweetheart' cherries

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Abstract

Sweet cherries (*Prunus avium* L.) are among the most valued seasonal fruit, being 'Sweetheart' one of the most representative cultivars. The high consumer acceptance of sweet cherries could be attributed to different factors, as an adequate ratio between soluble solid contents (SSC) and tritratable acidity (TA), skin color, as well as the relevant nutritious properties and the important amount of health-promoting compounds, mostly due to the presence of considerable quantity of phenolic and anthocyanin pigments. This research aims to evaluate different postharvest treatments in order to establish the most appropriate storage conditions to preserve the overall quality of 'Sweetheart' cherries: external attributes of fruit (mainly color and firmness), chemical parameters (SSC and TA) and the maintenance of concentration of functional compounds (anthocyanin, phenolic acids and flavonoids contents). Fruit was harvested at commercial maturation, from an orchard in S. Julião region (Alentejo, Portugal). Cold conditions (CC) and modified atmosphere (MAP) samples were carefully accommodated in 1kg plastic boxes. Samples for MAP treatment were packed in micro-perforated bags of Pplus® (Sidlaw Packaging, Bristol, UK). Fruits were kept in different storage conditions: cold conditions CC (1 ºC, 95% RH); modified atmosphere MAP (1 ºC, 95% RH with PPlus bags); controlled atmosphere CA (1 ºC, 95% RH, 10% CO_2 and 8% O_2). The experimental design was a factorial: Storage Method (CC, MAP, and CA) and Storage Period (0, 6, 13, 20 and 27 days). Fruits from day 0, considered without storage, were kept at 20ºC and analyzed after temperature stabilization. Every sampling day, 90 fruits of each treatment, were randomly picked up and submitted to several analyses, all groups were analyzed after fruit temperature stabilized at 20ºC.

Material and Methods

Cold conditions

Storage period: 0, 6, 13, 20 and 27 days
1 ºC and 95 % RH

MAP conditions

Storage period: 0, 6, 13, 20 and 27 days
Packed in microperforated bags of Pplus, 1 ºC and 95 % RH

CA conditions

Storage period: 0, 6, 13, 20 and 27 days
CA: 10% CO_2 and 8% O_2, 1 ºC and 95 % RH

Harvest — Transport at 20ºC — Postharvest storage

Results

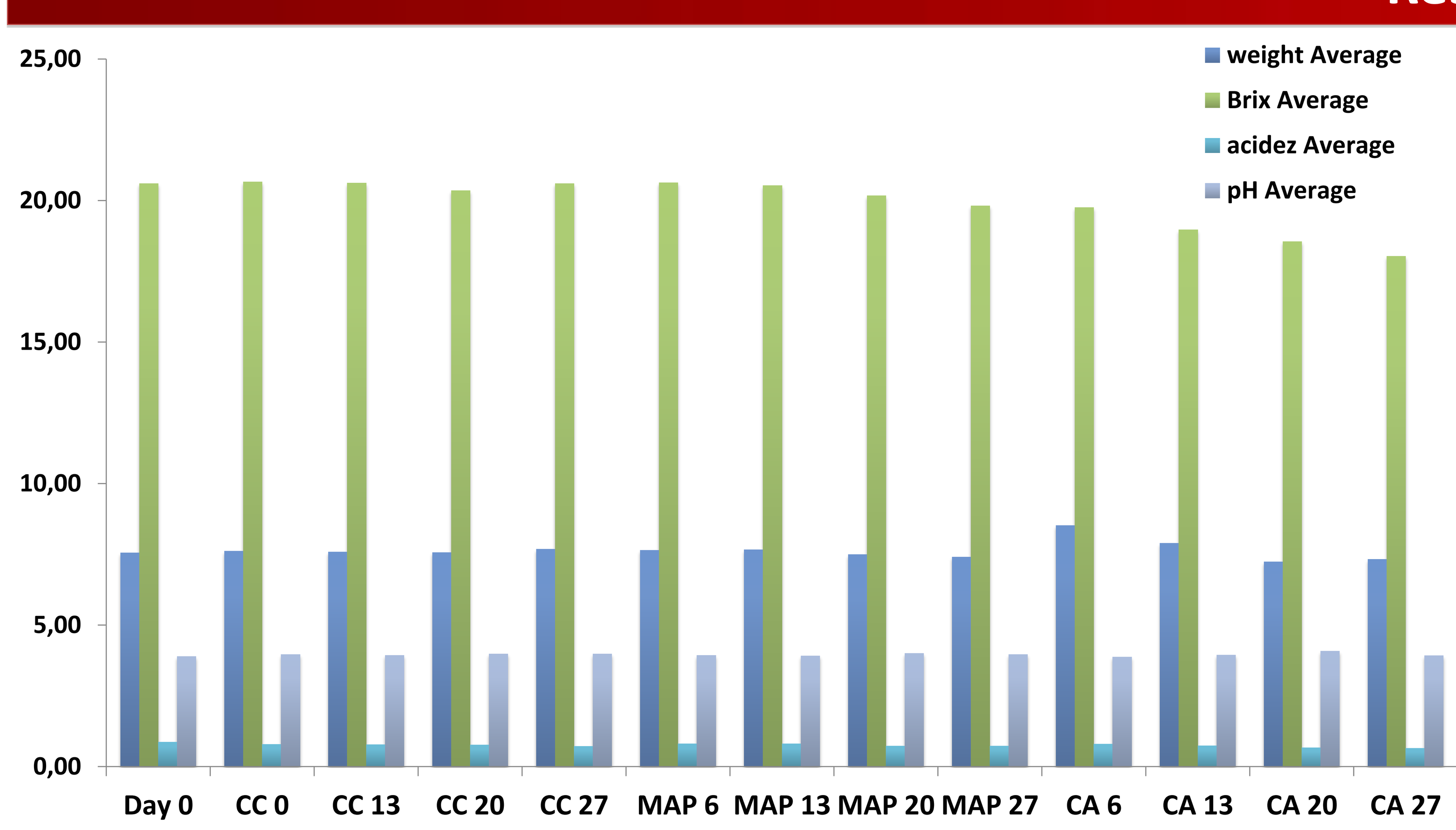

Figure 1: Evolution of the main physical and chemical parameters during the storage.

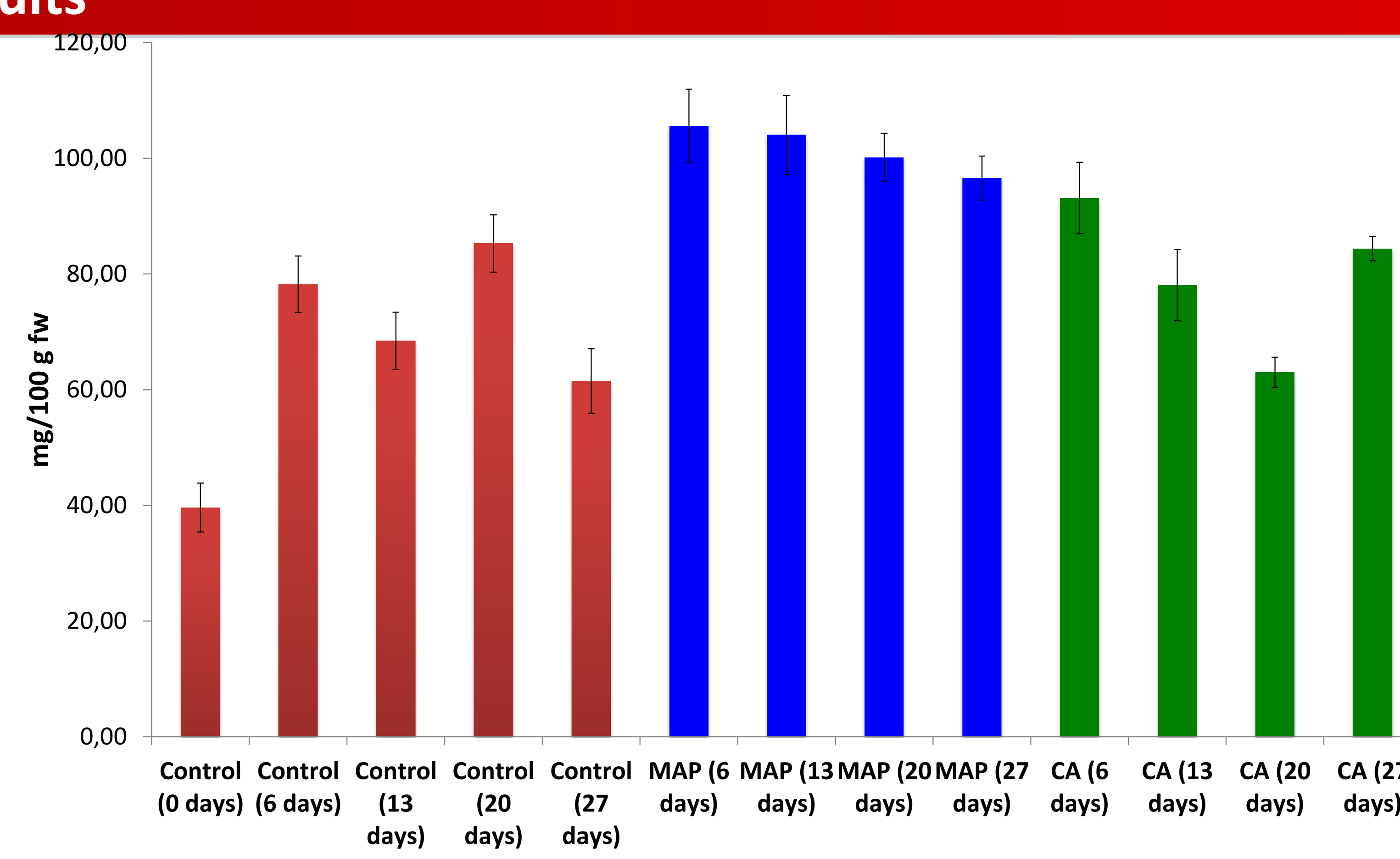

Figure 2: Evolution of the total phenolic contents during the storage.

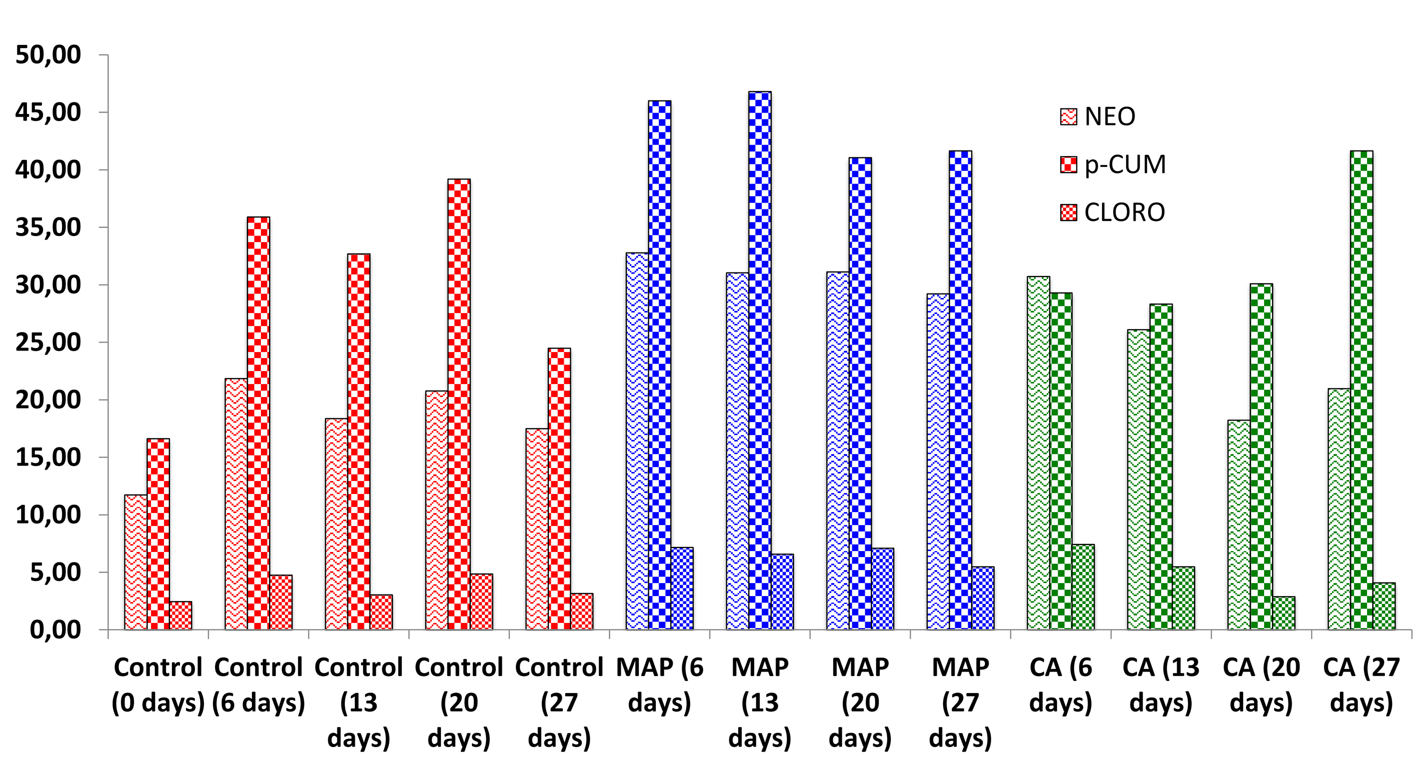

Figure 3: Evolution of the hydroxycinammic acids during the storage.

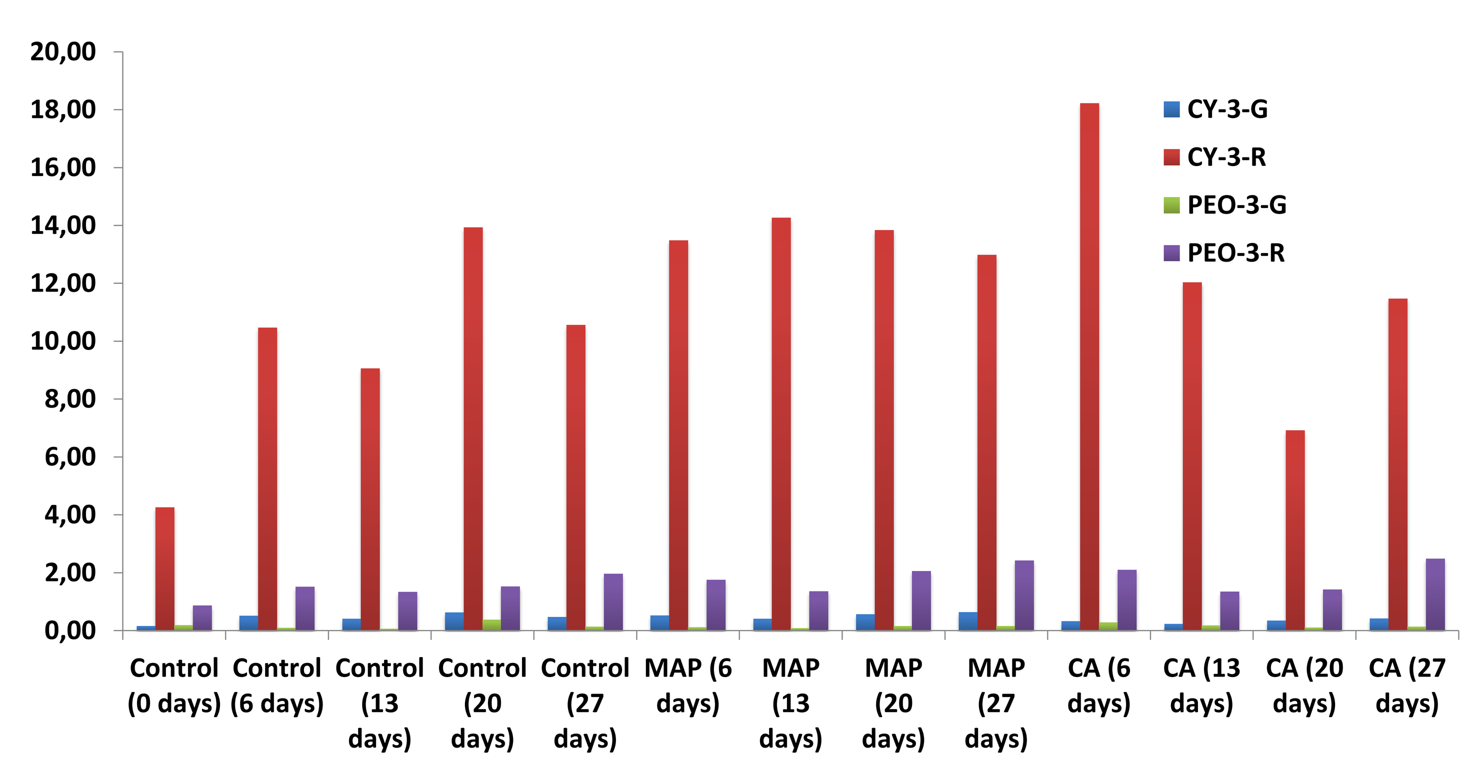

Figure 4: Evolution of the anthocyanins during the storage.

In these results we observe that the different postharvest treatment (Control, MAP and CA) did not have any impact in the fruit weight losses during the four weeks storage period. On the other hand, regarding the values of SSC and TA, it was observed that these parameter levels remained statistically constant during the storage in control and MAP conditions, while in CA conditions the constant diminution is observed with the storage period (Figure 1). The evolution of total contents of phenolic compounds (Figure 2), according to the storage conditions, is summarized in Figure 1. From these results we can establish that the most appropriate way, in term of preserving the amount of bioactive compounds, is obtained when fruit is stored under MAPs conditions, as the higher values of total bioactive compounds were achieved, and in addition, these values remained statistically constant during the storage period. CA conditions also reported good values at the end of storage, but not at the same levels as those obtained in MAPs. On the other hand, storing the fruit in Control conditions is not appropriated to preserve the bioactive compounds. According to the individual analysis performed in the different assays CY-3-R, NEO and p-CUM were the most abundant anthoycianins (Figure 3 and 4), and among polyphenols QER-3-R the most abundant flavonol in this cultivar.

Conclusion

In this research, different postharvest treatments were studied in order to establish the most adequate procedure to extend the storability of sweet cherries preserving the concentration of the main bioactive compounds together with the main outer quality parameters. According to our results, the MAPs storage conditions, using Pplus films, were the most appropriate conditions to maintain and increase the concentration of these bioactive compounds. The amount of the most predominant compounds doubled their concentration in MAPs conditions with regard the amount measured right after harvest.

Acknowledgments

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