# Effect of storage on physical-chemical properties and phenolics of sweet cherry from São Julião region.

**A.C. Agulheiro-Santos[1], F. Vieira[1], D. Gonzalez[2], M. Lozano[2], V. Palma[1], A.E. Rato[1]**

[1]Universidade de Évora. Instituto de Ciências Agrárias e Ambientais Mediterrânica (ICAAM). 7000 Évora, Portugal.

[2]Centro de Investigaciones Científicas y Tecnológicas de Extremadura (CICYTEX). Ctra. San Vicente. Finca Santa Engracia. 06071 Badajoz, Spain.

Worldwide the consumption of fruit and vegetables is increasing due to the dietary guidelines recommended by nutritionist. Because of their high content on phenols, vitamins, mineral and antioxidants, berry fruits are consumed not only in fresh forms but also as processed and derivative products such as juices, yogurts, jellies and dried fruits. As a high consumed red fruit, sweet cherry has been the focus on some studies, mainly regarding bioactive compounds content. "Sweetheart" cherries from São Julião region (Alentejo, Portugal) from two different production campaigns were kept in different storage conditions in order to evaluate both the environmental and storage effect on some physical-chemical properties and phenolics. Cold conditions - Cold (1 ºC, 95% RH) and modified atmosphere - MA (1 ºC, 95% RH with micro-perforated bags of Pplus®, Sidlaw Packaging, Bristol, UK) were tested. In order to establish the appropriate storage conditions, individual phenolic acids and physical-chemical properties were analysed during two consecutive years. Results show a general decrease on phenolic compounds content between cherries from both years. It is also observed that MA conditions do not affect significantly both phenolics and physical-chemical parameters when compared with Cold conditions. Additionally, it is observed similar behaviour on Cold and MA sweet cherries regarding its pH, total soluble solids content (TSS), titratable acidity (TA) and colour and individual phenols during storage time. Concluding, these results show, as expected, changes between cultivars which may be correlated with the environmental conditions on different years.
Keywords: sweet cherry, postharvest, phenols, physical-chemical, storage conditions.

## INTRODUCTION

Evidences suggests that higher intakes of fruits is associated with a decreased risk of cancer and heart disease (Duthie, Duthie and Kyle, 2000; Arts and Hollman, 2005). As known, this protective role could be due to several nutrients in fruits such as, fiber, vitamins and phytonutrients. In fact, the most bioactive compounds are antioxidants and secondary plant metabolites, namely phenolic compounds (González-Gómez et al., 2010).

Phenolics, ranging from simple low molecular weight with a single aromatic ring, to larger and complex tannins are generally involved in the protective role against oxidative stress and free radical damages.

Several researches show that temperatures between 0ºC and 2ºC induces an extension of cherries shelf life and prevents degradation of phenolics during storage time. As an extensively used method to protect sweet cherry, the aim of this work was to compare the

effect of cold conditions (Cold) and modified athmosfere (MA) on phenolic compounds concentration(Wani et al., 2014).

## MATERIAL AND METHODS

Samples of "Sweetheart" cherry cultivars were obtained from an orchard in São Juião region (Alentejo, Portugal). Fruits were harvested at commercial maturation and storage during 20 days. Colour, total soluble solids (TSS) and titratable acidity (TA) were determined at harvested day and then 30 fruits were storage to determine phenolic compounds..

Samples for MA treatment were packed in micro-perforated bags of Pplus® (Sidlaw Packaging, Bristol, UK). Additionally, fruits were kept in different storage conditions: Cold (1 ºC, 95% RH) and MA (1 ºC, 95% RH with PPlus bags). Fruits from day 0, considered without storage, were kept at 20ºC and analyzed after temperature stabilization. Every sampling day, groups of three samples of 30 fruit each (90 fruits per treatment) were randomly picked up and submitted to several analyses, all groups were analyzed after fruit temperature stabilized at 20ºC.

External colour was measured on 30 cherries each storage day using a colorimeter Minolta CR-300. Measurements were made in the equatorial zone of the fruit and according CIELab method.

For phenolic compounds 1g of freeze dried fruits were mixed with 10 mL of acidified methanol (0.2% HCl) and left to extract during 30 minutes. The supernatant was used to determine individual phenolics as described by González-Gómez et al. (2010).

Data were analyzed by ANOVA (MANOVA), considering tree variables "Storage time", Storage method" and "Year of campaing". When needed the honest significant differences (Tukey's HSD test, $p < 0.05$) were calculated and used to detect significant differences between means.

## RESULTS AND DISCUSSION

To characterize quality of "Sweetheart" cherry, colour, TA, pH and TSS where studied. Regarding colour, only a* and b* seems to be affected during storage and between campaigns. Cherries from 2009 shows higher a* value (redness; mean=23.5) than 2010 fruits. As observed by Giacalone and Chiabrando (2012), at the end of the storage period L, a* and b* were higher on MA conditions. Although acidity, pH and total soluble solids showed a stable behaviour during storage both in MA and Cold storage, its values are slightly higher in 2009 (means; TA=0.80; pH=3.94; TSS=20.49). The content of major phenolic compounds detected is shown in fig. 1. Eleven phenolics were analysed namely cyanidine-3o-Rutinoside, neochlorogenic acid, *p*-coumaroylquinic acid and chlorogenic acid which appear in higher concentration than the others. The major phenolic analysed was *p*-coumaroylquinic acid ranging from 26.32 to 30.75 mg/100 g fw for 2009 campaign and from 16.61 to 46.80 mg/100 g fw for 2010.

For total phenols a sum of all phenolic compounds detected was made and, as observed by Ferretti et al. (2010) for sweet cherry, "Sweetheart" cherries from MA conditions contained at the end of storage period 100.13 mg/ 100 g fw.

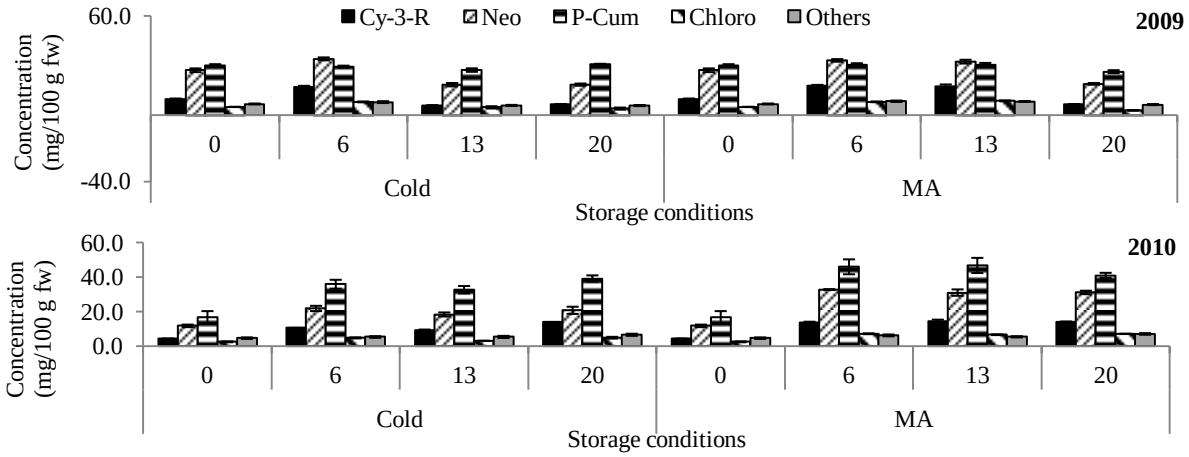


Fig. 1. Major individual phenolic compounds detected in "Sweetheart" cherries from 2009 and 2010 and their differences during storage for cold and MA conditions.

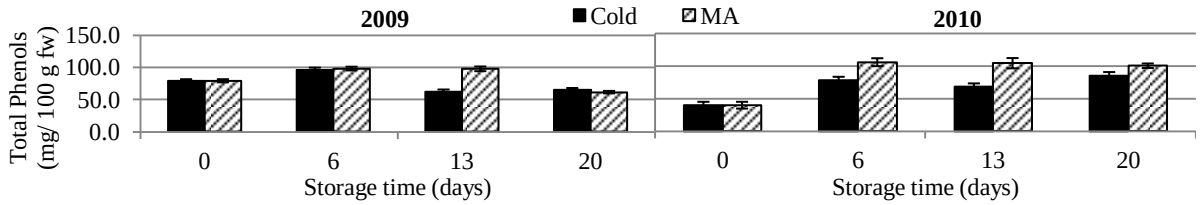


Fig. 2. Total phenolic compounds detected in "Sweetheart" cherries from 2009 and 2010 during storage at different conditions

Several authors reported increasing content on phenolic compounds during storage (Kalt et al., 1999; Bernalte et al., 2003). However, in our study, phenolics are less stable during the storage period in 2010 and values obtained from MA conditions (39.62 to 105.60 mg/100 g fw) are higher than those from Cold conditions (39.62 to 85.29 mg/100 g fw). From day 13 MA and Cold conditions show significant differences ($p<0.05$) both in 2009 and 2010 and, additionally, it was observed a slight decrease in phenolic content. This behaviour is correlated with the decrease of colour parameters from day 13 and it was previously described for anthocyanins and other phenolics by Mozetič et al. (2004); Serrano et al. (2005); Gonçalves et al. (2007) and Usenik, Fabčič and Štampar (2008). Regarding pH and Acidity it was observed higher values from 2009 grapes which are according to results obtained for phenolics.

## CONCLUSION

The results of our research show low variability between storage type neither in quality attributes nor in individual phenolics. Nevertheless there were some important and significant differences ($p<0.05$) between 2009 and 2010 campaign. Those variations might be linked with environmental factors which may be responsible for changes on maturity stage of different years. Additionally, as expected fruits from MA conditions show a more stable behaviour than those from Cold conditions.

With this research different postharvest treatments were tested in two consecutive years in order to establish the most adequate procedure to extend shelf life of "Sweetheart"

cherries. According to this, the MA conditions were the most appropriate to preserve the concentration of phenolics and other quality parameters important to achieve consumers demand.


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