

# Microstructural, physicochemical and sensorial effects of pears (cv. Rocha) stored under controlled atmosphere conditions



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## INTRODUCTION

- \* The increase in the production area of 'Rocha' pear, a Portuguese variety, has urged attempts to optimize CA-storage conditions
- \* This variety has good potential to conquer new markets, due to its good storability and sensory attributes
- \* The objectives of this work were to assess the influence of different levels of CO<sub>2</sub> and their influence on the physicochemical, microstructural and sensorial quality of 'Rocha' pears under controlled atmosphere conditions.

## MATERIALS AND METHODS

Pears were picked at commercial maturity and stored in:

NA (air) or CA:  
O<sub>2</sub>: 2 % (v/v) plus  
CO<sub>2</sub>: 0, 0.5 or 1.5 % (v/v)

Removed from storage after:

4 months and allowed to ripen in air at 18-20 °C

Evaluated by 1, 6 and 8 days of exposure at 18-20 °C in terms of:

- Soluble solids (SS), titratable acidity (TA), pH
  - Flesh colour and firmness
- Ascorbic acid (AA) and dehydroascorbic acid (DHA)
  - Polyphenolic compounds
- Microstructural and sensorial evaluations

Statistical analysis:  
Analysis of variance (ANOVA)

## RESULTS

- After 4 months of storage significant differences in the SS and pH were detected in pears from the different storage conditions. Pears stored in air had higher SS content than those stored under 2 % (v/v) O<sub>2</sub> + 0.5 % (v/v) CO<sub>2</sub>. Pears stored in air presented lower pH than pears stored in 2 % (v/v) O<sub>2</sub>. No difference in the TA were observed in pears from the different storage conditions. There was an increase in SS and a decrease in pH when pears were ripened for 8 days at room temperature.
- After storage and by 1 day of exposure to air at room temperature pears stored in 2 % (v/v) O<sub>2</sub> + 0.5 % (v/v) CO<sub>2</sub> were 22 % firmer than pears stored under 2 % (v/v) O<sub>2</sub>. There was a decrease in firmness when pears were exposed to air at room temperature, by the 8 day of exposure pears stored in 2 % (v/v) O<sub>2</sub> exhibited the lowest firmness.

## RESULTS

- Flesh colour of pears was significantly affected by the storage conditions and by the time of exposure to air at room temperature. After 4 months of storage and by 1 day at room temperature, pears stored in air presented higher b\* values than pears stored in 2 % (v/v) O<sub>2</sub> + 5 % (v/v) CO<sub>2</sub>. Hunter's b\* value decreased when pears were exposed to air at room temperature. By day 8 pears stored in 2 % (v/v) O<sub>2</sub> + 5 % (v/v) CO<sub>2</sub> exhibited the lowest b\* value.
- The concentration of vitamin C (AA and DHA) were influenced by the storage conditions and by the time of exposure to air at room temperature. After 4 months of storage a reduction and an increase in the contents of AA and DHA were detected respectively in the flesh of pears from all conditions. Along the time of exposure to air vitamin C decreased in pears from all conditions.
- The polyphenolic composition in the flesh of the pears was represented by hydroxycinnamic compounds, flavan-3-ols and arbutin and in the peel were also identified flavonols compounds. The concentration of polyphenolic compounds was higher in the peel than in the flesh of the pears. After 4 months of storage, the flavan-3-ols and arbutin content were significantly influenced by the storage conditions. In the flesh and in the peel the concentration of flavan-3-ols and arbutin were higher in pears stored in air than in those stored under CA conditions. During the time of exposure to air the concentration of flavan-3-ols tended to decrease in the flesh and in the peel of pears from all conditions and the arbutin tended to be stable.
- The typical microstructure of pears at harvest and after 4 months of storage confirmed that after storage pears presented structural changes (Figs. 1a and b). Higher degree of cellular destruction, large intercellular space and lower presence of complete cells were observed in pears stored under 2 % (v/v) O<sub>2</sub> and 2 % (v/v) O<sub>2</sub> + 5 % (v/v) CO<sub>2</sub> than in those stored in air and 2 % (v/v) O<sub>2</sub> + 0.5 % (v/v) CO<sub>2</sub>. The sensorial test confirmed that after 4 months of storage and by 1 day of exposure to air pears stored under 2 % (v/v) O<sub>2</sub> + 0.5 % (v/v) CO<sub>2</sub> were firmer than pears stored under the other conditions.

Figure 1. Sensory evaluation of 'Rocha' pears stored under air ( ), 2 % O<sub>2</sub> + 0.5 % CO<sub>2</sub> ( ), 2 % O<sub>2</sub> + 1.5 % CO<sub>2</sub> ( ), 3 % O<sub>2</sub> + 0.5 % CO<sub>2</sub> ( ) and 3 % O<sub>2</sub> + 1.5 % CO<sub>2</sub> ( ) in terms of (a) yellow color and (b) firmness by 4, 7 and 9 mo of storage.

## CONCLUSION

By 4 months of storage, a low CO<sub>2</sub> (0.5 %) concentration led to maintain the firmness of pears, results confirmed by the sensorial and microstructural evaluations. The losses of vitamin C were apparently not related to CO<sub>2</sub> concentration, but its influence on the polyphenolic composition needs to be fully established.

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