

Effect of modified atmosphere package on apricot fruit storability

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Summary: The aim of this work was to study the effect of modified atmosphere package (MAP) on apricot storability. Apricots (*Prunus armeniaca* L.) cultivar Jumbo cot were harvested at commercial ripening stage. The fruits were treated with different storage treatments as following: i) control storage for 13 days at 1 °C, ii) stored fruit at 1 °C for 10 days then 3 days at shelf at 25 °C, iii) fruit stored in MAP at 1 °C for 13 days and iv) fruit stored in MAP at 1 °C for 10 days then 3 days at shelf at 25 °C. Data showed the positive effect of MAP in keeping the apricot fruit for long time with better quality than the control fruit. MAP showed positive effect by recording the lowest fruit weight loss, the highest firmness and lowest chilling injury and fruit decay.

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Key words: apricot, MAP, storability

Introduction

Apricot is a climacteric stone fruit that has a limited post-harvest life. The fruits remain fresh only for 2–4 weeks after harvest if they stored at 0°C depending on cultivar (Stanley 1991). Most apricot cultivars show chilling injury symptoms and a high percentage of fruit decay during storage (Stanley 1991, Holb et al., 2006, 2011ab). During storage, most apricot fruits lose their physical and chemical qualities e.g. fruit firmness, increased fruit acidity and reduction in soluble solid content (Stanley 1991; Ezzat et al. 2012). Modified atmosphere packaging (MAP) along with refrigeration of different food products has been shown to extend postharvest life of the fruit (Singh et al., 2010). The benefits of MAP in extending shelf-life of many fruits and vegetables have been extensively studied (Lee et al., 1995; Chonhenchob et al., 2007). In addition, a few studies investigated the effects of controlled atmosphere storage on the quality of different apricot cultivars (Wankier et al., 1970; Claypool and Pangborn, 1973; Pretel et al., 1999). The aim of this work to study the effect of modified atmosphere package and controlled atmosphere storage on apricot storability.

Materials and methods

100 fruit of *P. armeniaca* (cv. Jumbo cot) were selected from the storage house at 1 °C (fruit were harvested 3 days earlier) for all treatments. Treatments were:

- control (fruit stored for 13 days at 1 °C),
- control + shelf-life (fruit stored for 10 days at 1 °C + 3 days at 25 °C),
- MAP (13 days MAP at 1 °C),
- MAP + shelf-life (10 days MAP at 1 °C + 3 days at 25 °C).

All fruits were investigated physically by measuring the weight loss, fruit firmness, chilling injuries, and fruit decay.

Weight loss: percentage loss of the initial weight using a digital balance (BL S3102 Precision Balance, Bel Engineering, Italy). Fruit firmness was measured with a fruit penetrometer (model FT011; Facchini Francesco Srl, Brescia, Italy).

Chilling injury (CI) of apricot fruit was measured by detecting flesh browning. The percentage of CI was visually detected. The extent of flesh browning was detected according to the study of Ezzat et al. (2017b). Briefly, (0) no CI; (1) CI <25%; (2) CI between 25 and 50%; (3) CI between 50% and 75%; (4) CI ≥75% of the cut surface. From this a CI index was calculated as $\Sigma[(CI \text{ level}) \times (\text{number of fruit at the CI level})] / (4 \times \text{total number of fruit in the treatment})$. Fruit decay (FD) was detected as the severity of the symptoms according to the study of Wang et al. (2006). Briefly: (0) no FD; (1) FD ≥25%; (2) FD between 25% and <50%; (3) FD between 50% and <75%; and (4) FD ≥75%. From this, FD index was calculated as $\Sigma[(FD \text{ level}) \times (\text{number of fruit at the FD level})] / (4 \times \text{total number of fruit in the treatment})$ according to the study of Ezzat et al. (2017b).

Results and discussion

Weight loss is one of the basic parameters to determine apricot fruit quality. It was reported that during the storage apricot fruit tend to loss weight (Ezzat et al., 2017a). Data showed the positive effect of MAP on reducing the fruit weight loss, fruit stored in MAP for 13 days showed the lowest fruit weigh loss while fruit of control + shelf-life treatment showed the highest reduction in fruit weight (**Figure 1**). Apricot showed a trend to keep less weight loss by different treatments like methyl-jasmonate or salicylic acid (Ezzat et al., 2017a). Onursal et al. (2015) showed that MAP showed an effect on reducing the fruit weight loss during storage.

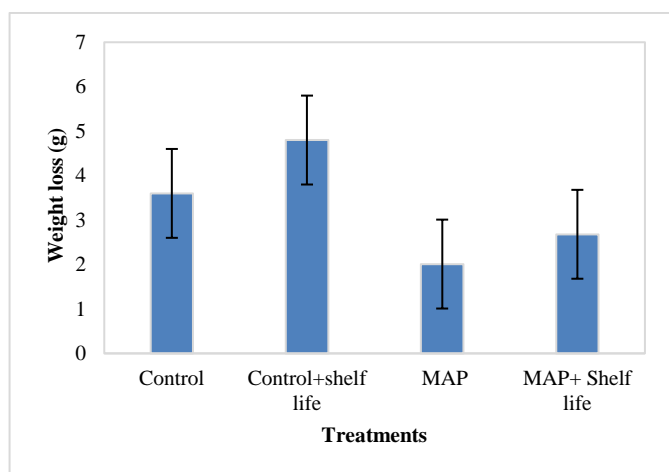


Figure 1. Effect of MAP on apricot weight loss with different treatments: i) control (fruit stored for 13 days at 1 °C), ii) control + shelf-life (fruit stored for 10 days at 1 °C + 3 days at 25 °C), iii) MAP (13 days MAP at 1 °C), iv) MAP + shelf-life (10 days MAP at 1 °C + 3 days at 25 °C). Error bars represent the SD values.

Storage period and treatments modified the flesh firmness during storage (**Figure 2**). Fruit firmness decreased in all the treatments. Amount of decrease in firmness was lower in MAP treatments. Data showed that the unpackage fruit had the significant reduction in firmness in compare to MAP. Data also showed that the firmness reduced in the MAP + shelf-life treatment. While decrease in firmness of unpackage fruit mainly resulted from water losses (Ezzat et al., 2017a,b), that of packaged apricots was most probably due to fruit ripening and senescence (Pretel et al., 1999).

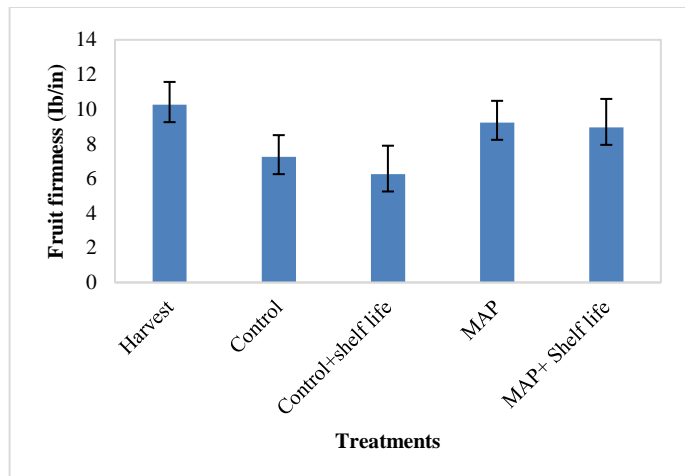


Figure 2. Effect of MAP on apricot fruit firmness with different treatments: i) control (fruit stored for 13 days at 1 °C), ii) control + shelf-life (fruit stored for 10 days at 1 °C + 3 days at 25 °C), iii) MAP (13 days MAP at 1 °C), iv) MAP + shelf-life (10 days MAP at 1 °C + 3 days at 25 °C). Error bars represent the SD values.

Data in **Figures 3-4** showed the effect of different storage treatment on chilling index and fruit decay. MAP treatment showed the lowest percentage of CI and FD followed by MAP +shelf-life treatment. Ezzat et al. (2017a) indicated that different apricot cultivars showed response by treatment with salicylic acid and/or methyl-jasmonate. Chilling injury occurs primarily as the membrane damage which initiates as a cascade of secondary reactions leading to disruption of cell structures (Stanley 1991). Membrane damage can be measured by the electrolyte leakage.

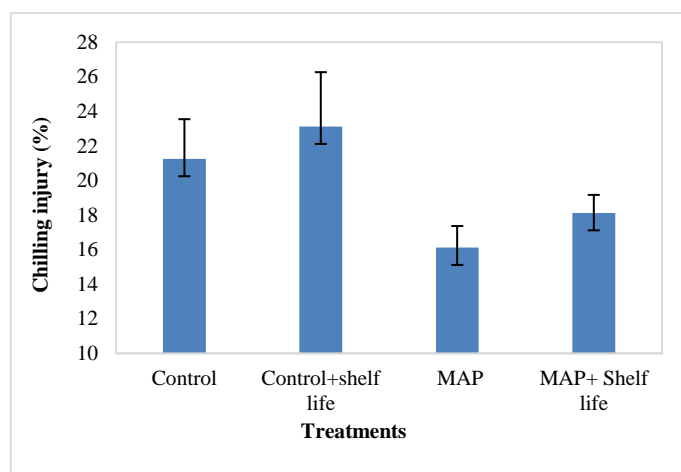


Figure 3. Effect of MAP on apricot chilling injury (%) with different treatments: i) control (fruit stored for 13 days at 1 °C), ii) control + shelf-life (fruit stored for 10 days at 1 °C + 3 days at 25 °C), iii) MAP (13 days MAP at 1 °C), iv) MAP + shelf-life (10 days MAP at 1 °C + 3 days at 25 °C). Error bars represent the SD values.

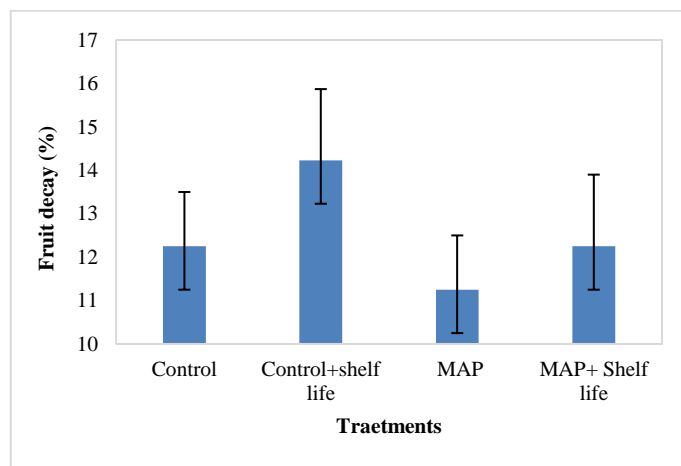


Figure 4. Effect of MAP on apricot fruit decay (%) with different treatments: i) control (fruit stored for 13 days at 1 °C), ii) control + shelf-life (fruit stored for 10 days at 1 °C + 3 days at 25 °C), iii) MAP (13 days MAP at 1 °C), iv) MAP + shelf-life (10 days MAP at 1 °C + 3 days at 25 °C). Error bars represent the SD values.

Conclusions

The MAP treatment can keep the fruit in a good quality during the storage but further study need to determine how MAP can be applied practically at business level. Fruit can directly packed in MAP then stored in cold or fruit can be stored in cold and then packed into MAP.

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