



## Quality evaluation of Maria Aurelia nectarine variety during short-term storage

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### Abstract

Advanced maturity of nectarines cv. Maria Aurelia were harvested and sealed in modified atmosphere packaging (MA) bags and stored for 10 days. Quality was evaluated initially and after storage period plus 5 day shelf life. According to the results MA packaging reduced the weight losses. Other quality parameters; total soluble solid concentration, fruit juice acidity, color and individual sugar levels; were almost similar with control. Depending on overall quality evaluation MA packaging can be useful for short-term storage for reducing the weight losses and maintain the other studied parameters for 10 day storage of Maria Aurelia nectarin variety.

**Key words:** Nectarin, storage, shelf life, quality.

### Introduction

The increase in production of stone fruits in recent years includes new cultivars with different quality parameters. Recent studies have focused on postharvest handling and keeping the overall quality during this chain.

Nectarines (*Prunus persica* L.) are climacteric fruits. They undergo rapid ripening and therefore have a limited postharvest life. They are picked at a preclimacteric stage depending on aim they can be either stored for a while or direct send to retail market<sup>1</sup>. In both situations preclimacteric harvested fruits should reach to consumers in a high quality to get acceptance and high price.

Fruit ripening in climacteric fruits like nectarin is a complex, genetically programmed process that culminates in dramatic changes in color and texture of fruit flesh<sup>2</sup>. It is very important to maintain the postharvest chain of climacteric fruits to get the satisfactory quality. Hot water dips<sup>3</sup>, ethylene inhibitors<sup>4</sup>, modified atmosphere packaging<sup>5</sup> and calcium applications<sup>6</sup> are some of recently done examples of treatments in these researches. Modified atmosphere packaging (MA) is still the most conventional tool for storage of nectarines among other experiments.

The objective of this study was to evaluate the effects of MA packaging on Maria Aurelia nectarin variety quality during short-term storage and followed long-term shelf life period.

### Material and Methods

Maria Aurelia nectarin variety was used in this study. Fruits were harvested in preclimacteric stage and immediately transported to Cukurova University, Horticulture Department, Postharvest Laboratory. After forced air cooling for 12 hours fruits were sorted and divided into two groups as control and MA packaging and stored in a plastic tray for 10 days at 0°C and 90-95% relative humidity. The shelf life determination was done with the fruits that were separated from those stored and kept for 5 days at 20°C room temperatures. The experiment was set up with 3 replicates

including 20 fruits for each.

Weight loss during postharvest storage was determined by subtracting sample weights from their previous recorded weights and presented as % of weight loss compared to initial weight. Flesh firmness was measured on both cheeks of each fruit with an Effegi penetrometer equipped with 8.9 mm diameter plunger and expressed as kg.

Fruits were squeezed through cheesecloth and juice analysed for percent soluble solids using a hand held refractometer (Atago, ATC1, Japan). The pH of the juice was measured with a pH meter (Schott, CG840, Germany) and the titratable acidity (TA) determined by titration of juice (5 ml) with 0.1 N sodium hydroxide with pH meter end point 8.10 (expressed as gram of citric acid per 100 ml juice).

Color was assessed using a Minolta 300CR colorimeter after calibration with white tile. Each fruit was characterized using the average of 3 measurements at equidistant points around equatorial circumference of each fruits. The color was reported as hue angle ( $h^\circ$ ) since hue angle is the most important attribute of color in regards to human perception<sup>7</sup>.

Dilution with the ultra pure water (18.2 M $\Omega$  cm, Millipore Corp., Bedford, MA) and filtration (Whatman nylon syringe filters of 0.45  $\mu$ m, 13 mm diameter) were performed for the individual sugars determination. The individual sugars of fruits were determined by a high-performance liquid chromatographic apparatus (Shimadzu LC 10A Kyoto, Japan) consisted of an in-line degasser, pump, manual injection (20  $\mu$ l injection volume) interfaced to a PC running Class VP chromatography manager software<sup>8</sup>.

All data were subjected to analysis of variance (ANOVA), using COSTAT software (Cukurova University). The effects of various treatments were assessed within ANOVA and least significance differences (Tukey, LSD) were calculated ( $P \leq 0.01$ ).

**Table 1.** Quality parameters of nectarines after 10 day storage (10) and shelf life (10+5).

Storage period (ST:Day)	Treatment	Weight loss (%)	Firmness (kg)	TSS (%)	pH	Acidity (g/100 ml)	Color (h°)
0			4.18	10.40	3.38	0.97	31.42
	Control	3.91	3.03	10.66	3.43	0.93	32.23
10	MAP	0.60	3.59	10.80	3.48	0.88	31.68
Shelf life (10+5)	Control	14.02	0.55	11.66	3.56	1.16	34.63
	MAP	7.58	0.67	11.00	3.66	1.08	35.12
Mean values of ST	Control	3.91 a*	3.61	10.93	3.41	0.95	31.83
	MAP	0.60 b*	3.88	10.60	3.43	0.93	31.61

\*Means with different letter are significantly different by Tukey's LSD at the  $P = 0.01$  level.

## Results

After 10 days of storage the highest weight loss was found in control fruits with 3.91% while it was 0.60% in MA packaged fruits. Also the shelf life results were similar. MA packaging had lower weight loss than control (Table 1). Differences were statistically significant ( $P < 0.01$ ). The experiments showed that the weight losses can be changed in a range of 1-3% depending on the treatments and storage conditions<sup>3,9</sup>. MA packaging reduced the weight losses comparing with control fruits.

Flesh firmness is very important parameter for market quality of nectarines. It is ample to be maintained in a constant level in order to extend the market life. The firmness of fruits was 4.18 kg in the beginning. Control fruits had 3.03 kg of firmness value whereas MA packaged fruits had 3.59 kg after 10 days storage. This decrease was more after 5 days of shelf life conditions (Table 1). The results showed that the more weight losses lead the more dramatic increase in firmness. It is known that 2-3 kg fruit firmness can be accepted as an eating quality<sup>10</sup>. Therefore the firmness was acceptable after 10 days of storage whereas the 5 days shelf life was too long to maintain the firmness and fruit quality.

The total soluble solids concentration of nectarines was not affected by packaging and storage time, but it was noticed slight increase after shelf life conditions. It can be result of changes of starch to sugars<sup>3,10</sup>. However, individual sugar contents were in a stable level after 10 days of storage or shelf life. Thus these changes may be caused from different maturation levels of nectarines (Table 2).

**Table 2.** Individual sugar amounts (%) after 10 day storage (10) and shelf life (10+5).

Storage time (ST:Day)	Treatment	Saccharose	Fructose	Glucose
0		2.37±0.40	2.07±0.12	5.74±0.28
	Control	2.19±0.26	2.01±0.15	5.35±0.39
10	MAP	2.38±0.35	1.99±0.16	5.18±0.21
Shelf life (10+5)	Control	2.24±0.37	2.87±0.12	5.29±0.85
	MAP	2.39±0.25	2.93±0.24	5.15±0.13

The acidity decreased after 10 days of storage while it was observed some increase after shelf life (Table 1). The pH of fruits increased after storage and during shelf life. In general, fruit juice acidity has been found to decrease and pH to increase with duration in storage.

Color is an important parameter since it is directly related with the visual appearance. This is one of the main factors affecting the consumer interest. There were no differences between MA packaging and control after short term of storage. However, color can be affected by postharvest treatments after long-term storage.

Individual sugar content of nectarin fruits was not affected significantly by MA packaging. There were decreases in glucose and fructose content after storage. There was a little increase in the same parameters after shelf life conditions. This result can be an effect of starch content of fruits<sup>10</sup>.

Nectarins are among the highly perishable fruits. So rapid cooling and postharvest cold chain are fundamental applications for this species. MA packaging is also known as a good application for perishable fruits to retard softening based on obtaining different gas levels inside the package. As a result both MA packaging and control were successful to maintain the postharvest quality of nectarines. However, MA packaging reduced the weight loss more than control and maintained the overall quality better even in short-term storage followed by 5 days self life. According to results MA packaging can be used successfully for 10 days storage of Maria Aurelia variety to keep overall quality.

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