Proceedings of The World Avocado Congress III, 1995 pp. 362 - 365

EFFECT OF N,O-CARBOXIMETHYL-CHITOSAN, NUTRISAVE, ON AVOCADO FRUIT (PERSEA AMERICANA MILL) CV HASS DURING COOL STORAGE

Undurraga, P. L., Olaeta, J.A. and Taito, M.
Facultad de Agronomía
Universidad Católica de Valparaíso-Chile
Proyecto Fondef Al-04

Abstract

Avocado fruit cv Hass, harvested with 8 to 10 % oil content, was treated with four different formulas of N,O-carboximethyl-chitosan (Nutrasave) and stored at 5± 1°C during 30, 45, 60 and 75 days. Formulas studied were: NSV 1% (shrimp); NSV 2% (shrimp); NST 2% (krill); NSH 1,5% (other crustaceans). Results show that by using Nutrasave it is possible to extend the conservation period up to 60 days due to a reduction in the loss of water content during storage, and an extended time in which the green- epidermal-color and firmness are kept, without adversely affecting the taste, texture and natural characteristics of the fruits.

1. Introduction

Hass is the most important cultivar planted in Chile, due to of its sensory and productive characteristics. Thirty four percent of the total fruit production is sent to foreign markets, the majority to the USA and European markets.

The high respiration rate of avocado and high ethylene generation, together with the high polygalacturonase and pectin-methyl-esterase content make it difficult to keep fruits in cold storage for periods longer than 30 days, without significant fruit softening. This fact, produces a critical and monetary timer elements for export to foreign markets.

N,O-carboximethyl-chitosan is a derivative of chitina which is obtained from shrimp, other crustaceans, fungi and insects, commercialized as "Nutrasave" a natural, biodegradable, water soluble product which when applied on the fruits, produces a modified closed atmosphere. (Nova Chem, 1992).

To test the effectiveness of "Nutrasave", an experiment was designed whose objectives were to evaluate the effect of different formulas of "Nutrasave" on the physical and organoleptic characteristics of avocado warehoused up to 75 days in cold storage.

2. Material and Methods

Homogeneously sized Avocado fruits cv. Hass with an oil content of 8 to 10% (Olaeta, J. A. and Undurraga, P.L., 1994), were harvest from the Experimental Station of the Universidad Católica de Valparaíso, Chile. These fruits were treated with different "Nutrasave" formulas and stored at 5 ± 1°C and 95% relative humidity. Response measurements were taken every 15 days, starting at day 30 through day 75. After the cold storage measurements, the fruit was left for 7 days at room temperature in order to obtain commercial ripening. The Nutrasave formulas studied were: NSV 1% (shrimp); NSV 2% (shrimp); NST 2% (krill); NSH 1.5% (other

crustaceans). Each formula was tested for 30, 45, 60 and 75 days. A control group was also tested.

The treatment responses were evaluated with the following measurements: changes in epidermal color (Munsell), firmness (kg) at the end of cold storage and at commercial ripening, and moisture content. Flavor and external appearance were also measured using a hedonic scale with a sensorial evaluation panel: 1 desirable; 2 indifferent; 3 undesirable.

3. Results

3.1. Epidermal color evolution

For up to 45 days there were no differences among the treatment and the control groups. Beginning on the 45th day, all the treatments yielded better responses than the control, but NSH 1.5% retarded most chlorophyll degradation.

3.2. Fruit firmness

The control group showed less pulp resistance to pressure from day 45 and beyond. This was true both at the end of the cold storage as well as for the 7 days required for commercial ripening. All fruits treated with Nutrasave were in very good condition for up to 75 days in cold storage, plus 7 days of ripening (figure 1, 2).

3.3. Moisture content

All fruits treated with Nutrasave showed less moisture losses, from the 45th day forward.

3.4. Flavor and external appearance

The control fruit flavor was better until the second evaluation (45 days). From that point treated fruit flavor improved, becoming better than the control. The general appearance worsened with storage time however Nutrasave treatments always showed better conditions than the control (figure 3, 4).

4. Discussion

Results showed that N,O-carboximethyl-chitosan, formulated as Nutrasave, reduces humidity losses during cold storage when it is applied to avocado harvested with 8-10% of oil content. Mitchell and Dinamarca 1988, found a similar response with different products which act by decreasing the epidermal permeability to gas exchange.

Nutrasave also maintains fruit firmness for up to 75 days under cold storage, plus 7 days of room temperature to obtain commercial ripening. This is probably due to a reduction of the polygalacturonase, pectin-methylesterase and celullase production, which is associated to respiration rate and ethylene generation (Bower and Cutting, 1990). Furthermore, Nutrasave reduces chlorophyll degradation which goes along with ripening (Ryall and Pentzer 1974), and gives brightness and better appearance to fruits for up to 75 days.

5. References

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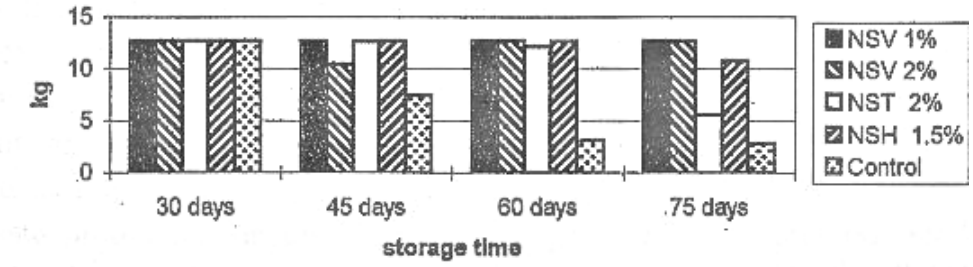

Figure 1 - Firmness after cold storage.

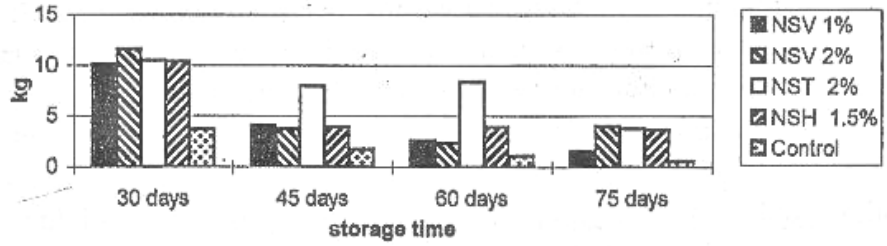

Figure 2 - Firmness after cold storage + 7 days at chamber temperature

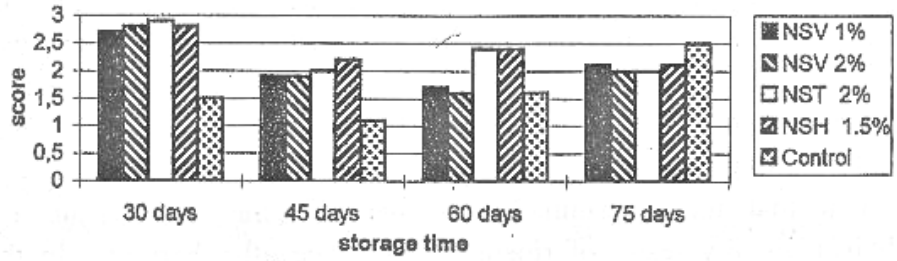

Figure 3 - Taste after cold storage + 7 days at chamber temperature

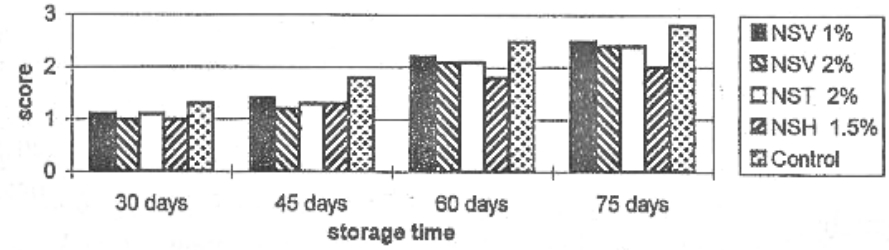

Figure 4 - External appearance after cold storage + 7 days at chamber temperature