

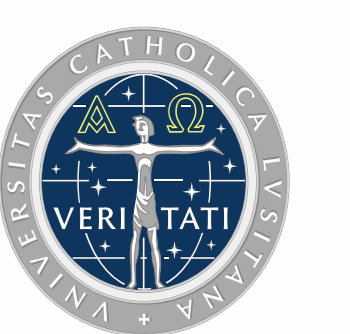
# Kinetics of quality changes in cantaloupe melon as affected by MAP and temperature conditions

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CATÓLICA  
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BIOTECHNOLOGY



## Introduction

Fresh-cut fruit quality and shelf-life are limited by minimal processing operations and storage conditions. Modified atmosphere packaging and refrigerated storage are frequently used to reduce the respiration rate without negatively affecting the physiology of the fruit and to enhance shelf life.

The effects of the production process upon the nutritional and phytochemical composition of cantaloupe melon was determined in order to validate the results obtained in real conditions and identify the critical points involved in the deterioration of the functional quality.

The aim of this work is determine the kinetics of quality changes of fresh-cut cantaloupe melon as a function of oxygen partial pressure and storage temperature.



## Materials and Methods

The kinetics of quality changes of fresh-cut melon are investigated during storage under different initial oxygen partial pressure (20, 10, 5 and 2.5 % O<sub>2</sub>) and at different temperatures (10, 5 and 0 °C).

Kinetic parameters were found by a linear regression for the orders 0, 1, and 2, as follows and through the minimization of the sum of squared errors:

$$\frac{C}{C_0} = \frac{k \cdot t}{C_0} + 1 \quad \text{for } n=0 \quad \frac{C}{C_0} = e^{(-k \cdot t)} \quad \text{for } n=1 \quad \frac{C}{C_0} = \frac{1}{1+k \cdot t \cdot C_0} \quad \text{for } n=2$$

where  $C$  is the quality attribute at time  $t$ ,  $C_0$  is the quality attribute at time 0,  $t$  is the time (days),  $n$  is the order of reaction and  $k$  is the constant of reaction.

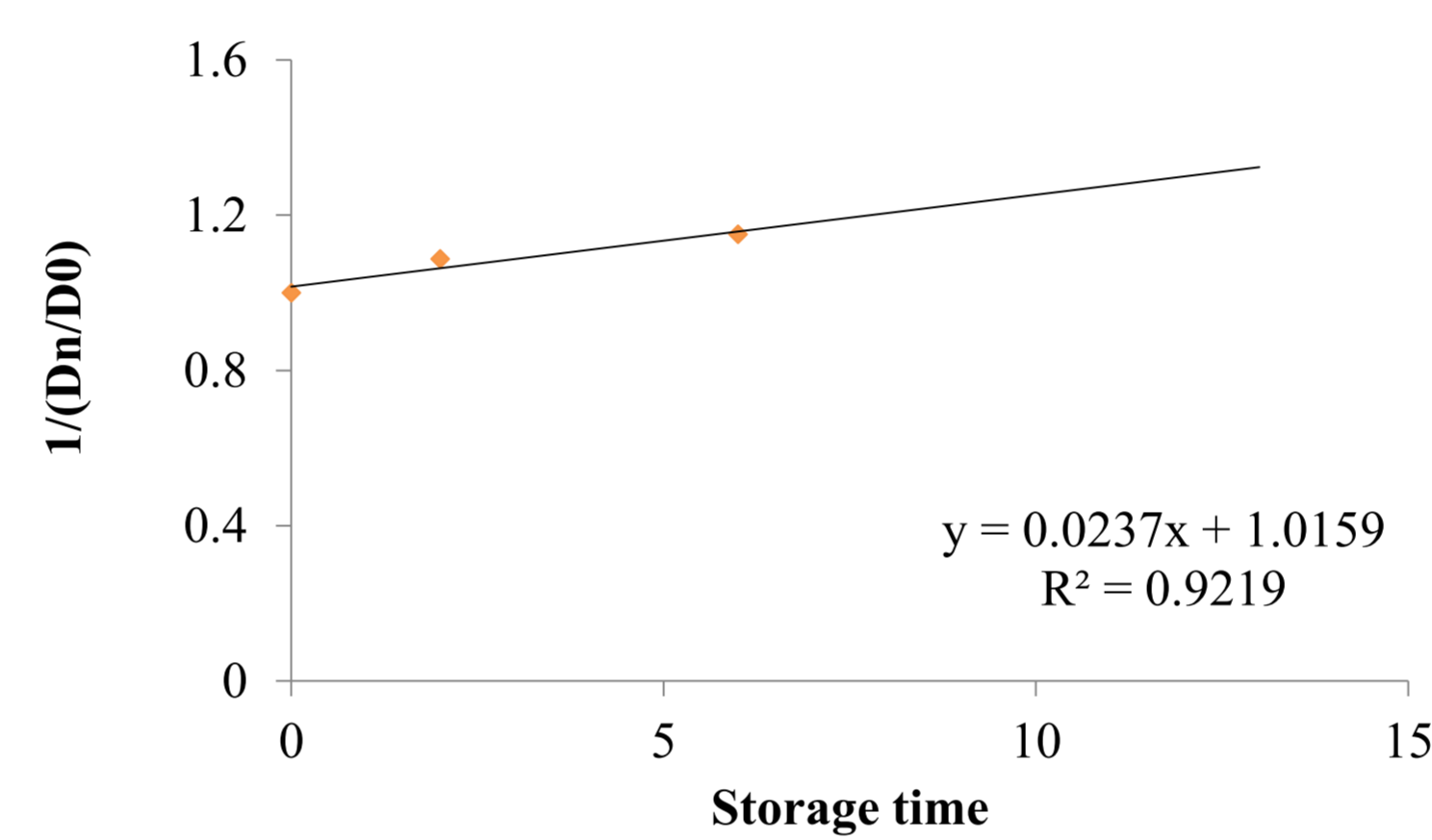
## Results

**Table 1** - Goodness of fitting of zero, first and second kinetics used to estimate some quality changes of fresh-cut cantaloupe melon with different storage temperatures (0,5 and 10° C).

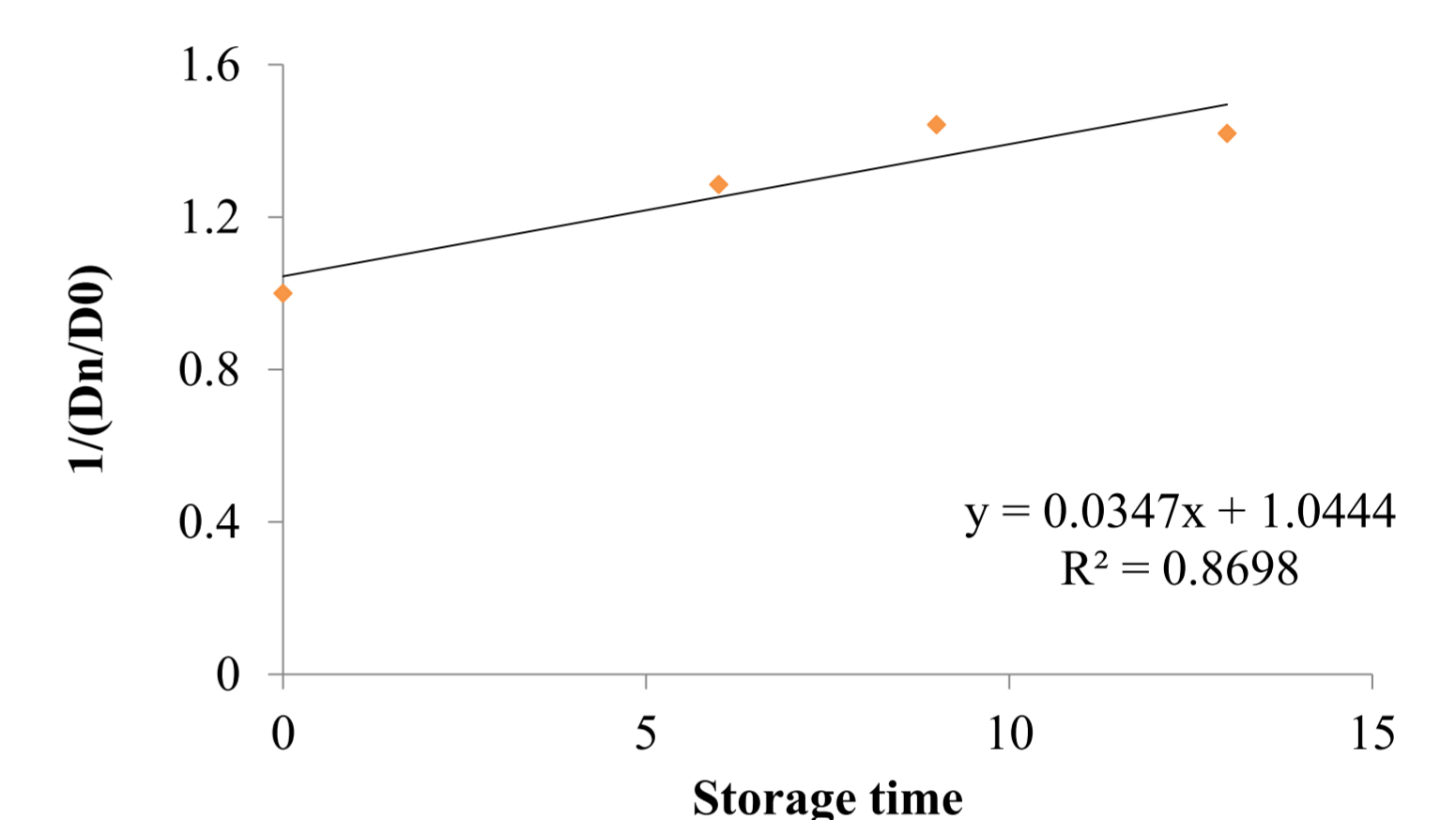
Temperature	Quality attribute	Model	Coefficient of determination (r <sup>2</sup> )	k	RMSE
0°C	Total Color Difference	Zero order kinetic	0.9393	0.0826	0.099
	Total Carotenoids	Second order kinetic	0.9251	0.0323	0.032
	Total yeast and molds	Second order kinetic	0.9091	-0.0909	0.261
	Ascorbic Acid	Second order kinetic	0.9873	4.702	1.331
5°C	Total Carotenoids	Second order kinetic	0.8891	0.0432	0.053
	Total yeast and molds	First order kinetic	0.9534	1.3284	1.459
	Ascorbic Acid	Second order kinetic	0.9812	5.4023	1.866
	Catechin	Second order kinetic	0.9919	-0.0706	0.026
10°C	Firmness	Zero order kinetic	0.9496	-0.0624	0.050
	Total Carotenoids	Second order kinetic	0.9095	0.0186	0.024
	Total yeast and molds	First order kinetic	0.8498	1.6153	7.081
	Ascorbic Acid	First order kinetic	0.9155	0.0912	0.097
	B-carotene	Zero order kinetic	0.9970	-0.1652	0.036
	Catechin	Second order kinetic	0.9859	4.5089	1.343

**Table 2** - Goodness of fitting of zero, first and second kinetics used to estimate some quality changes of fresh-cut cantaloupe melon with different storage temperatures (0,5 and 10° C).

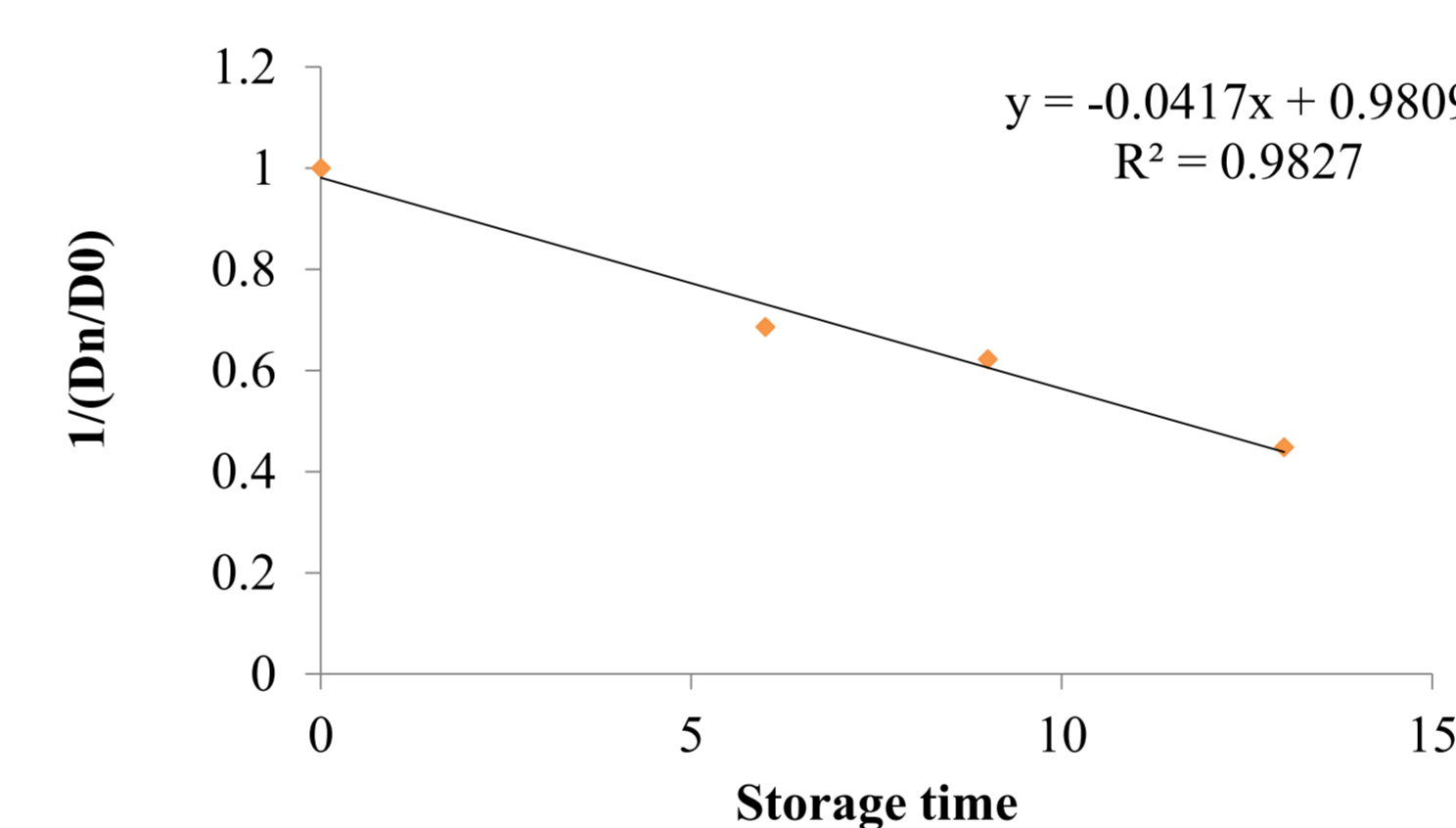
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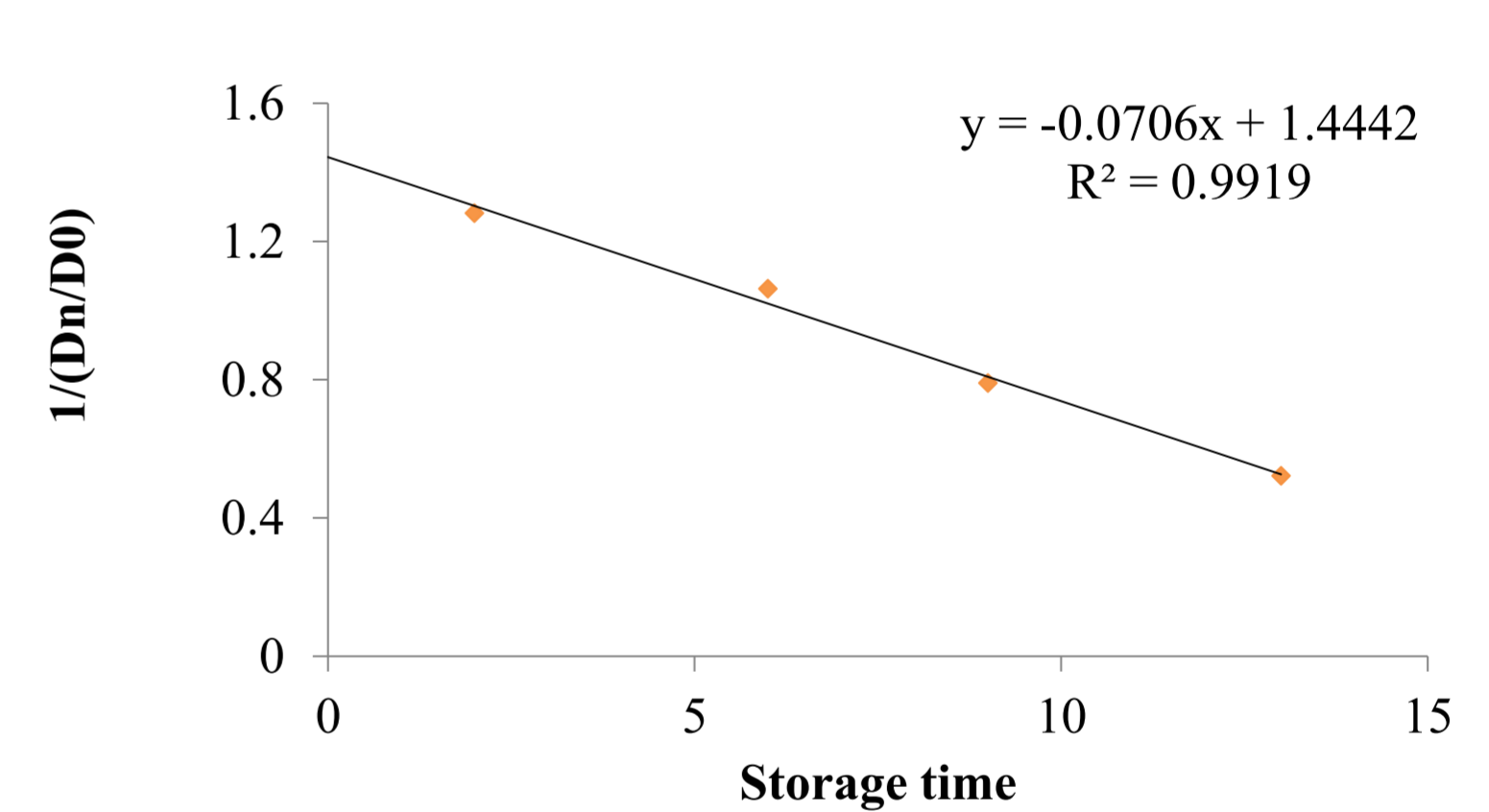
**Figure 1** - Goodness of fitting of second kinetics used in ascorbic acid in fresh-cut cantaloupe melon with 5%O<sub>2</sub>



**Figure 2** - Goodness of fitting of second kinetics used in firmness in fresh-cut cantaloupe melon with 5%O<sub>2</sub>



**Figure 3** - Goodness of fitting of second kinetics used in total color difference in fresh-cut melon stored at 5° C.



**Figure 4** - Goodness of fitting of second kinetics used in catechin in fresh-cut melon stored at 5° C.

- Undesirable storage conditions lead to physical and chemical quality loss in stored products, which affect their consumer acceptability. The determination of kinetic parameters allows products final quality prediction and, consequently, improvements may be attained.
- It is possible to conclude that lowering oxygen partial pressure inside the packages reduces the products metabolic rates and allows a better maintenance of physiological quality, namely visual quality. However, this decrease in metabolic rates resulted in lower levels of health-important phytochemical compounds.
- Lowering storage temperature also decreased metabolic rate of fresh-cut products, helped maintain ascorbic acid levels throughout storage but delayed significantly the production of important phenolic health important compounds.

## Conclusions

The integration of all these results contributes to the understanding of the effects of storage conditions on overall quality of fresh-cut cantaloupe melon and provide useful information for developing processes aimed at the prediction and modulation of nutritional quality and shelf-life. The best conditions found for the preservation of overall quality of fresh-cut cantaloupe melon are initial package atmosphere of 5 % oxygen and storage temperature of 5 °C.

## Acknowledgements

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