



Plant components as antimicrobials and antioxidants for CMC coatings for horticultural products

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1. Introduction

The atmosphere inside a package can be modified by passive packaging (MAP), where the rate of change and the final gas composition in the package depend largely on both the packaged product and the permeability of the packaging material. Edible coatings can be considered as a special form of MAP. Their application on the surface of horticultural products limits gas exchange and moisture transportation between the food and the surrounding environment and can be the vehicle to include antimicrobials or antioxidants in the edible film; besides these additional characteristics, they changes also the internal atmosphere. In the present work, oregano essential oil (containing 6.6 mg/mL timol and 0.7 mg/mL carvacrol) as antimicrobial agent applied into carboxymethylcellulose (CMC) edible films, were studied on fresh-cut carrots (var. Chanteney), and murta (*Ugni molinae* TURCZ) leaves extracts as the antioxidant agent, which applied on CMC films studied in apricots, were analysed for their glycosilated flavonol content and their antioxidant capacity.

2. Materials and methods

2.1. Chemicals: Carboximethylcellulose (CMC) (Prinal, molecular weight 280-400 kDa, substitution degree 0.7-0.9); glycerol 87% (Merck) and commercial sunflower oil.

2.2. Horticultural products: Carrots sticks (8 x 20 mm); apricot fruits

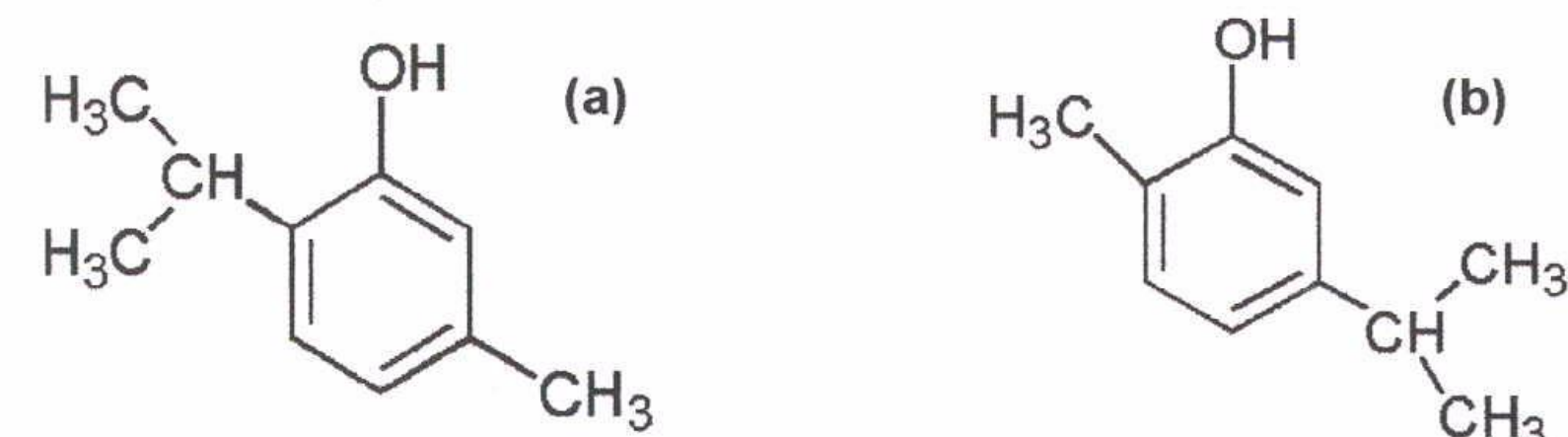
2.3. Coatings preparations: Edible coatings for carrots were made of CMC, water, sunflower oil/oregano essential oil (AE) at 1.5 % or 2.5 % and glycerol as plasticizer. Edible films for apricots were made of CMC, water/aqueous extracts of murta leaves, sunflower oil and glycerol as plasticizer

3.1. Results and discussion of CMC-oregano oil coating on fresh-cut carrots



Air drying at 20°C, 2 h of coated fresh-cut carrots

Terpenes from oregano essential oil

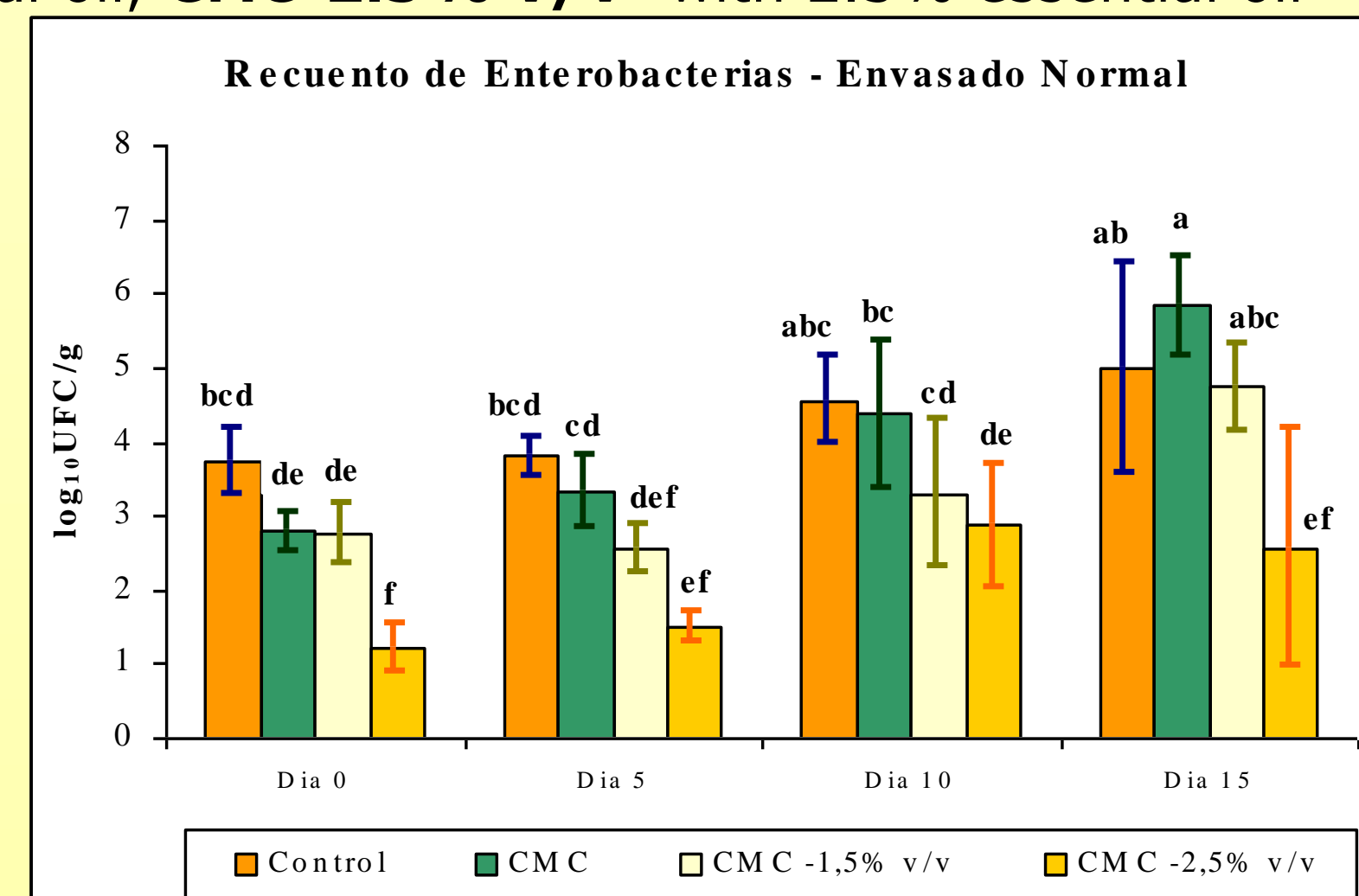
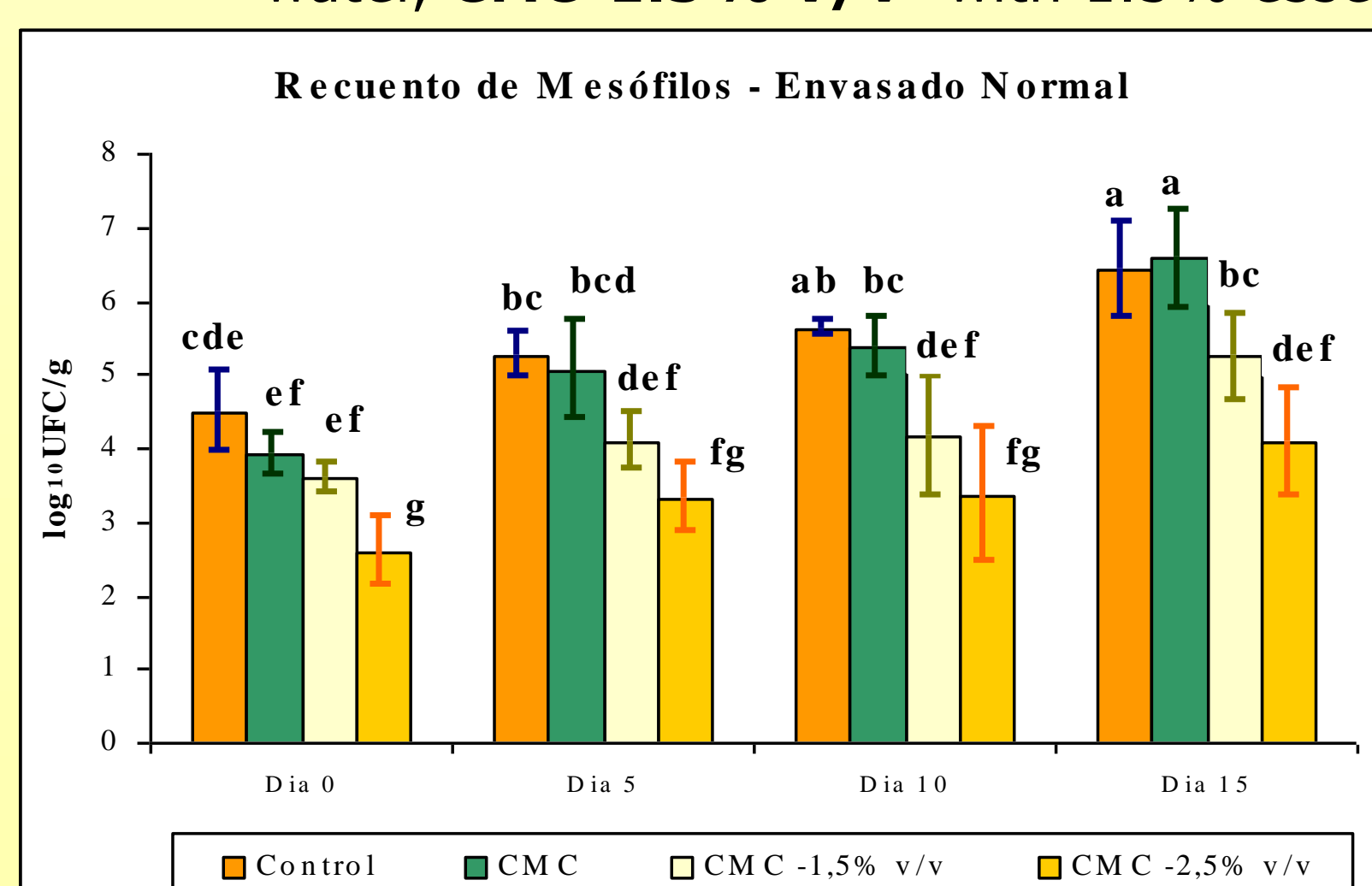


Principales compuestos aromáticos del aceite esencial y hojas de orégano, timol (a) y carvacrol (b).

Timol

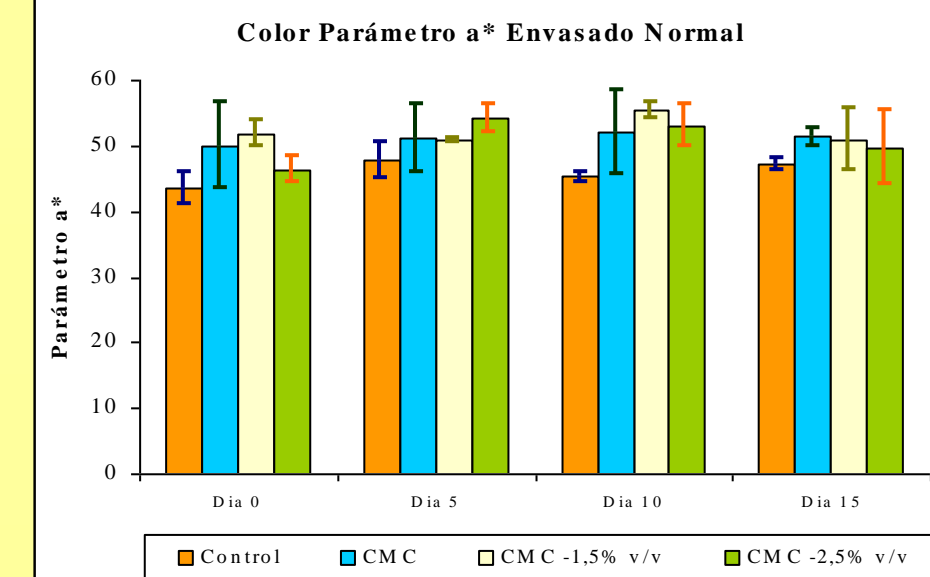
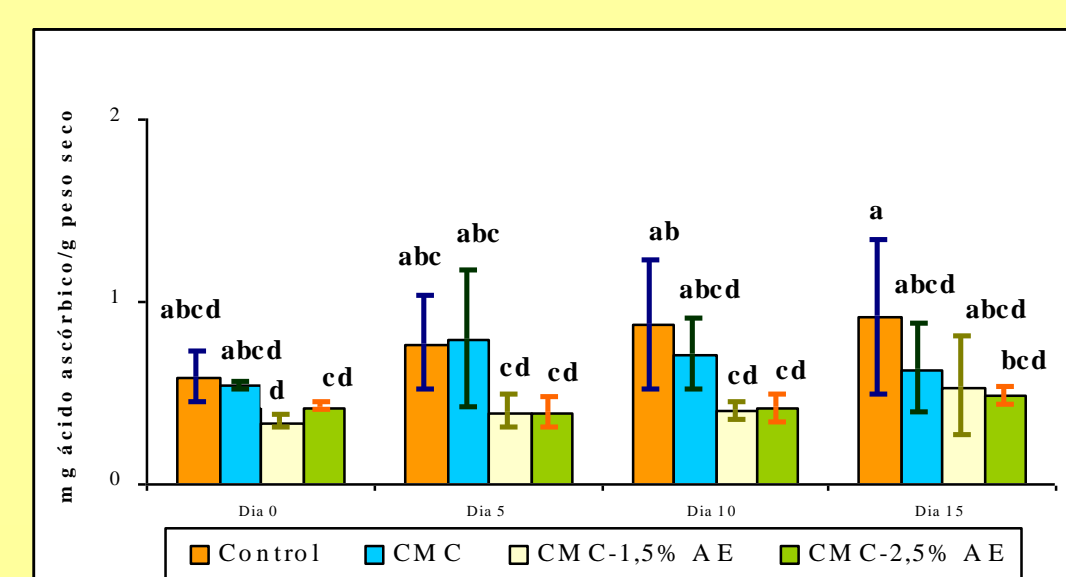
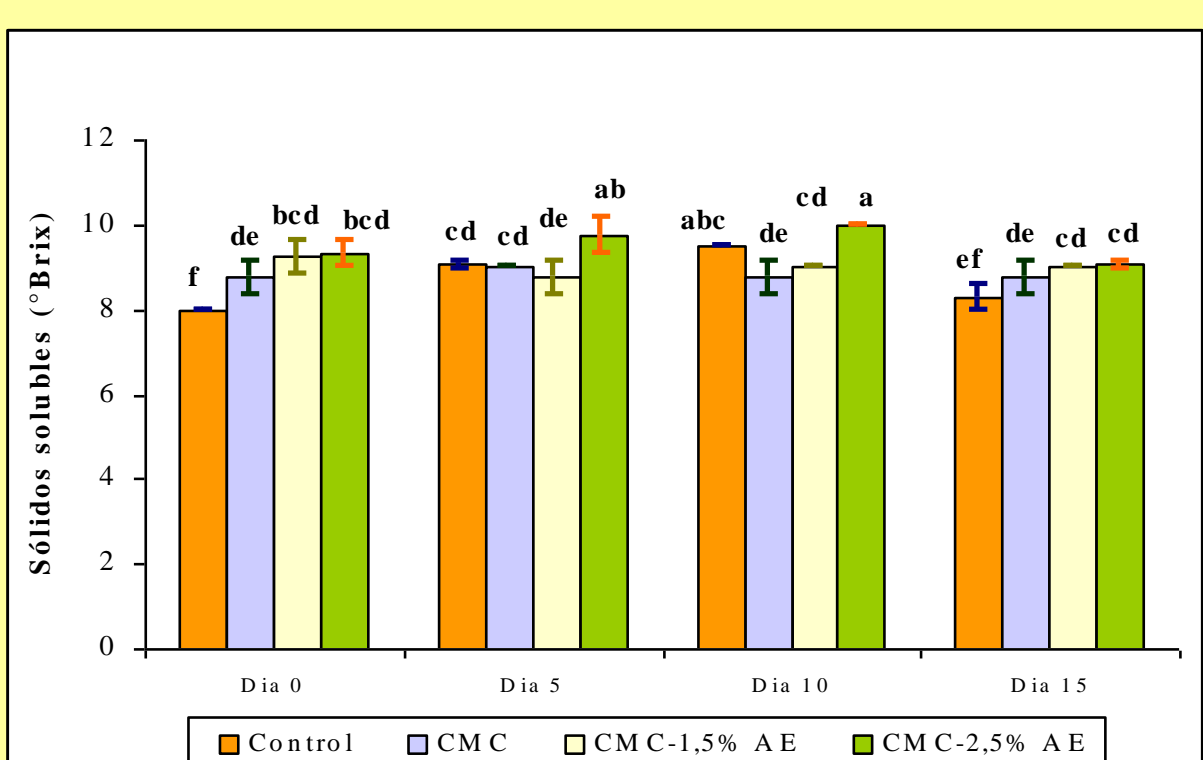
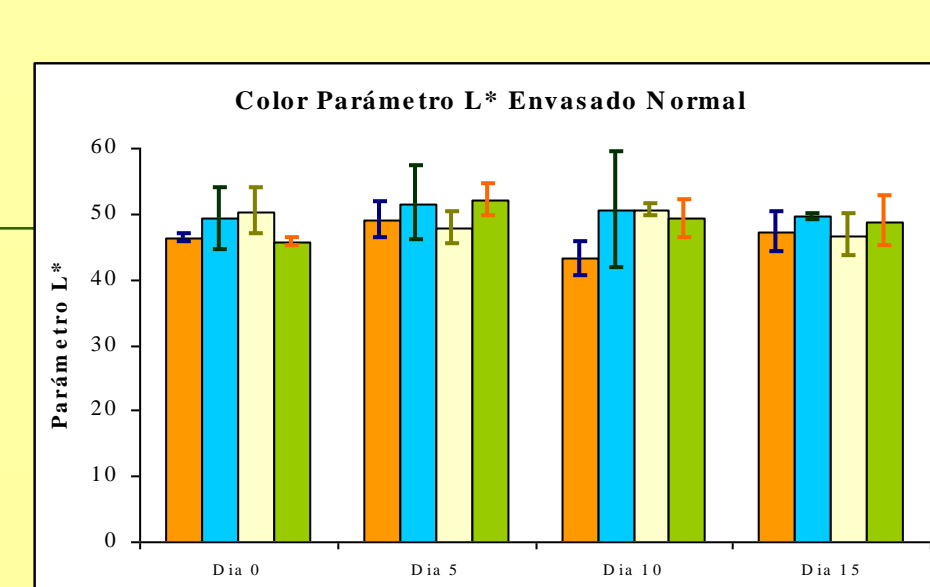
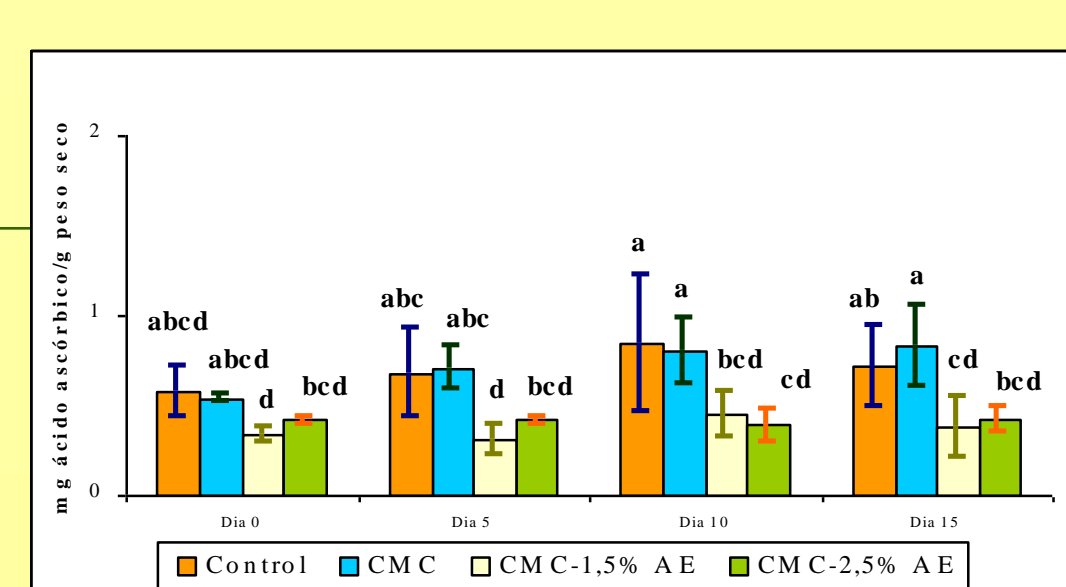
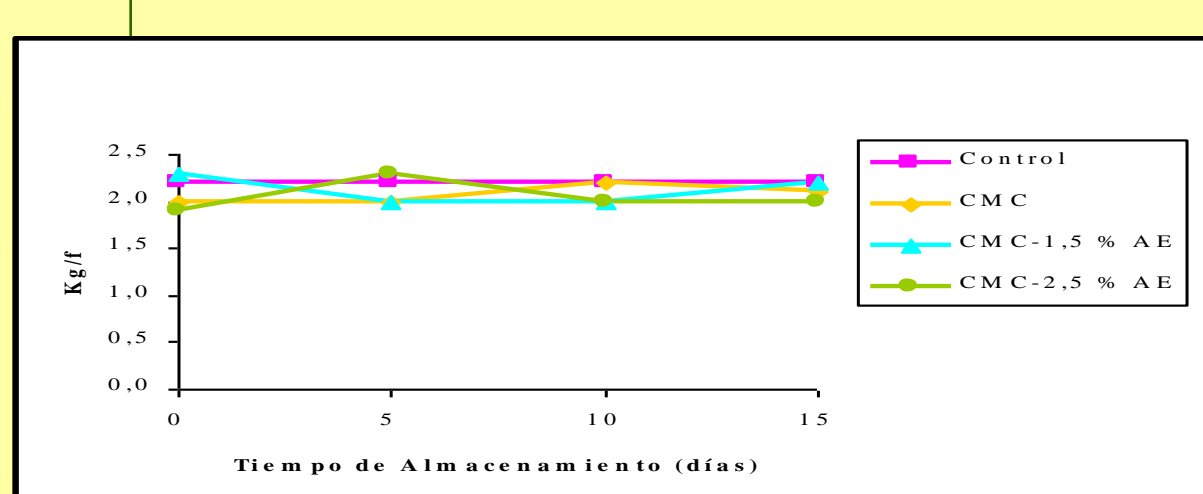
Carvacrol

Microorganisms during storage of fresh-cut carrots: **Control**= water washing; coating of **CMC**=with water, **CMC-1.5% v/v**=with 1.5% essential oil, **CMC-2.5% v/v**=with 2.5% essential oil



The Chilean Sanitary Reglament for fresh-cut vegetables (2006) allows 5×10^4 UFC/g for mesophilic aerobic bacterial counts (RAM) and 5×10^3 colony formation units (CFU)/g for Enterobacterial counts

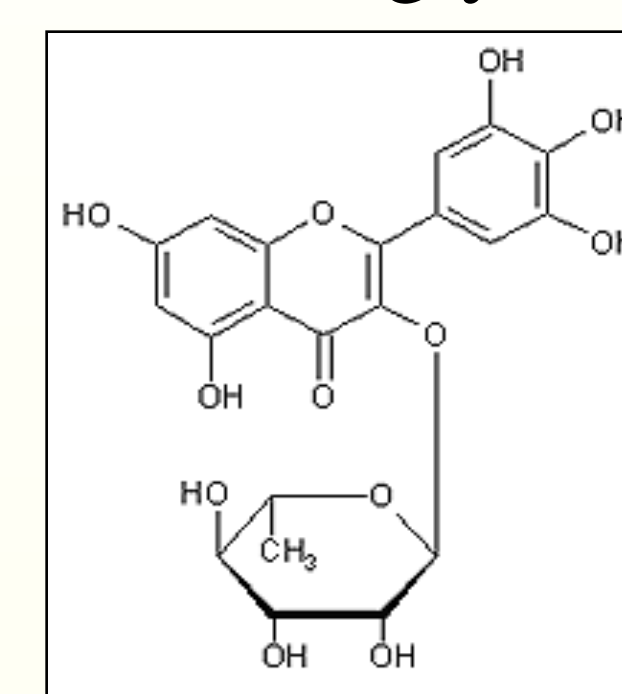
3.1.1. Conclusions: The carrot sticks coated with CMC-2.5 % essential oil could be considered safe as food during 10 days of storage, considering RAM and Enteric bacteria



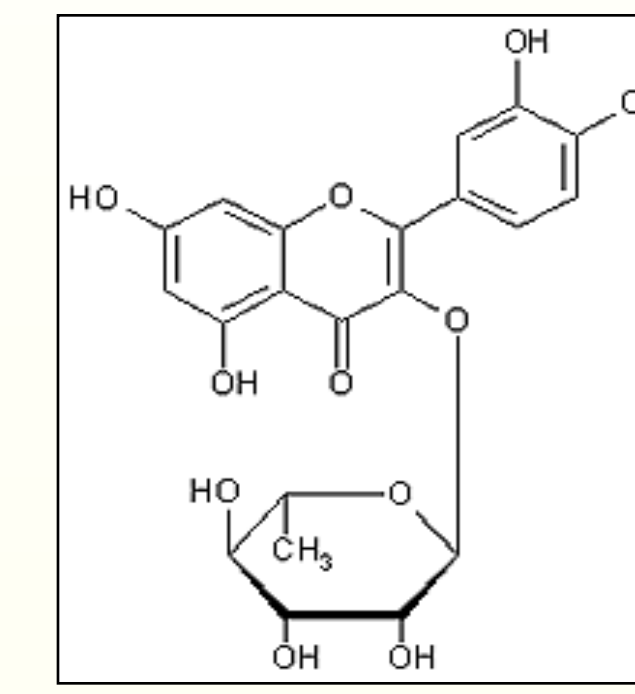
3.1.2. Conclusions: Treatments does not affect firmness, soluble solids, ascorbic acid content, color a*, b*, L* of fresh-cut carrots

3.2. Results of aqueous leaves extracts of murta

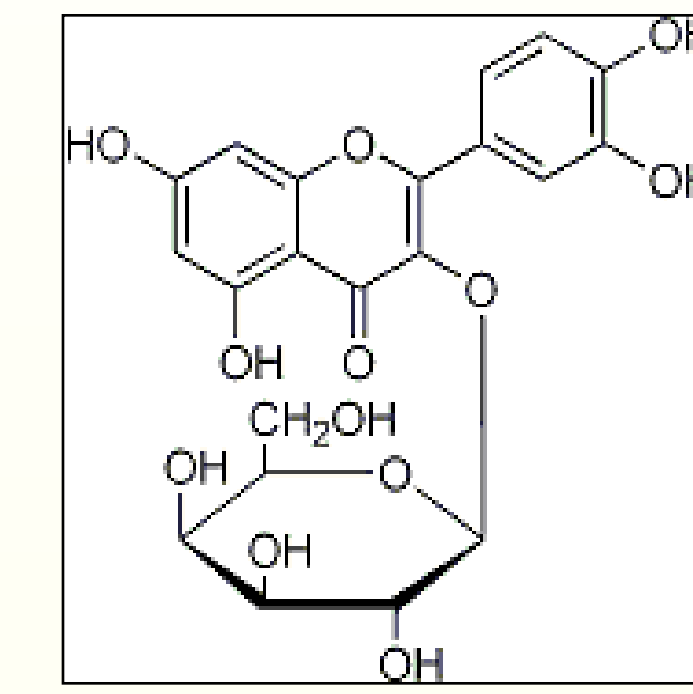
Flavonol glycosides of murta extracts



Myricetin 3-O-rhamnoside (Myricitrin)

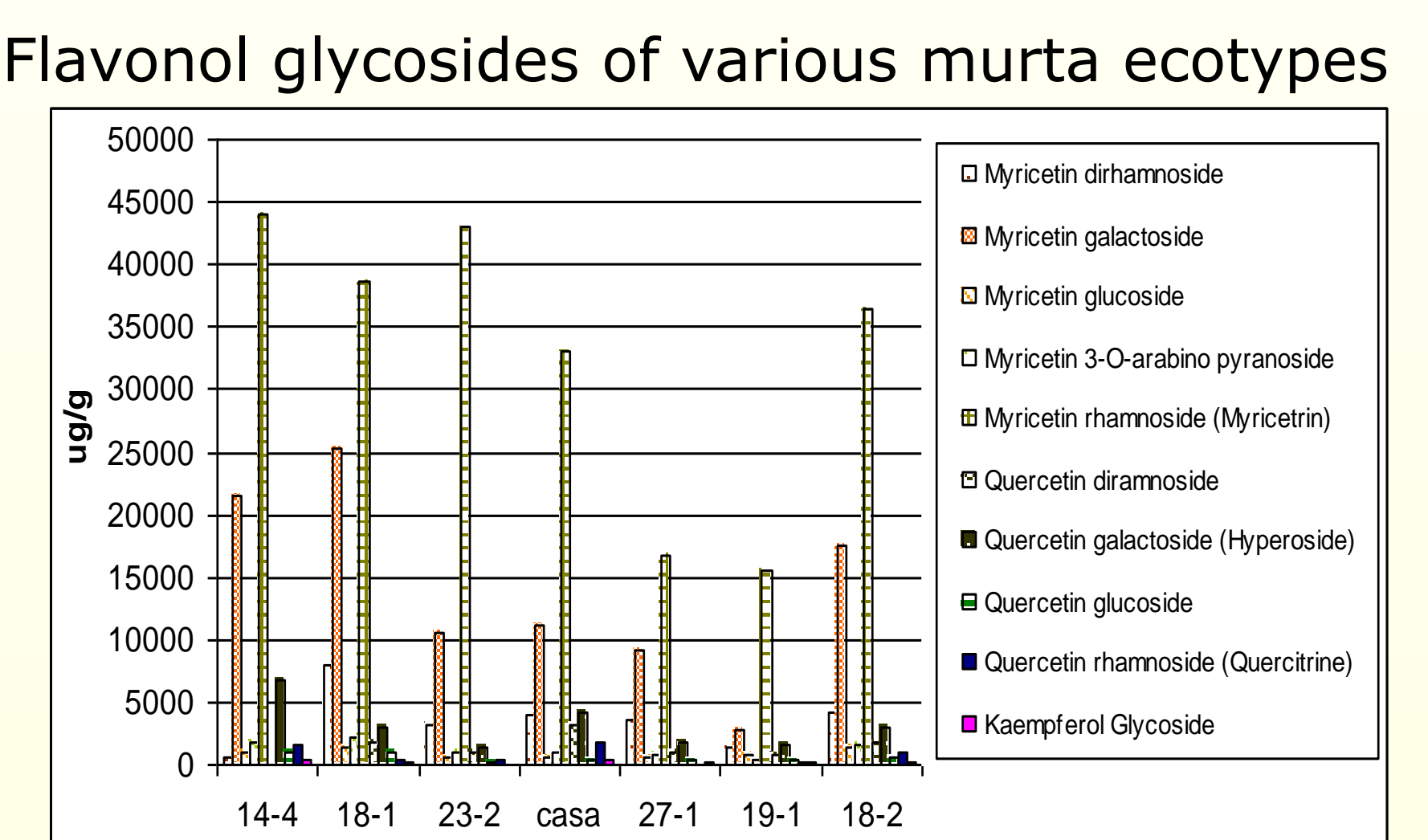
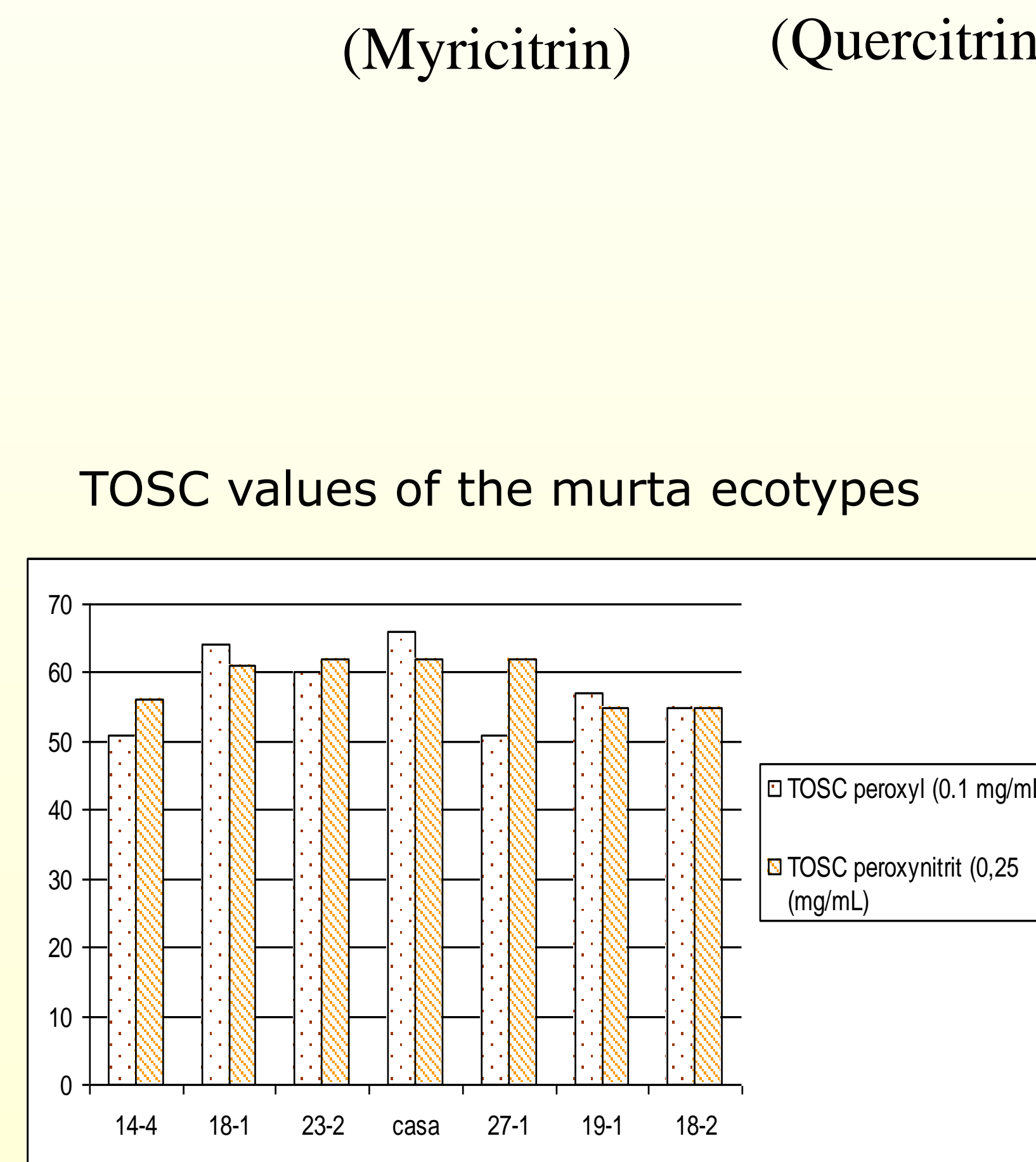


Quercetin-3-O-rhamnoside (Quercitrin)

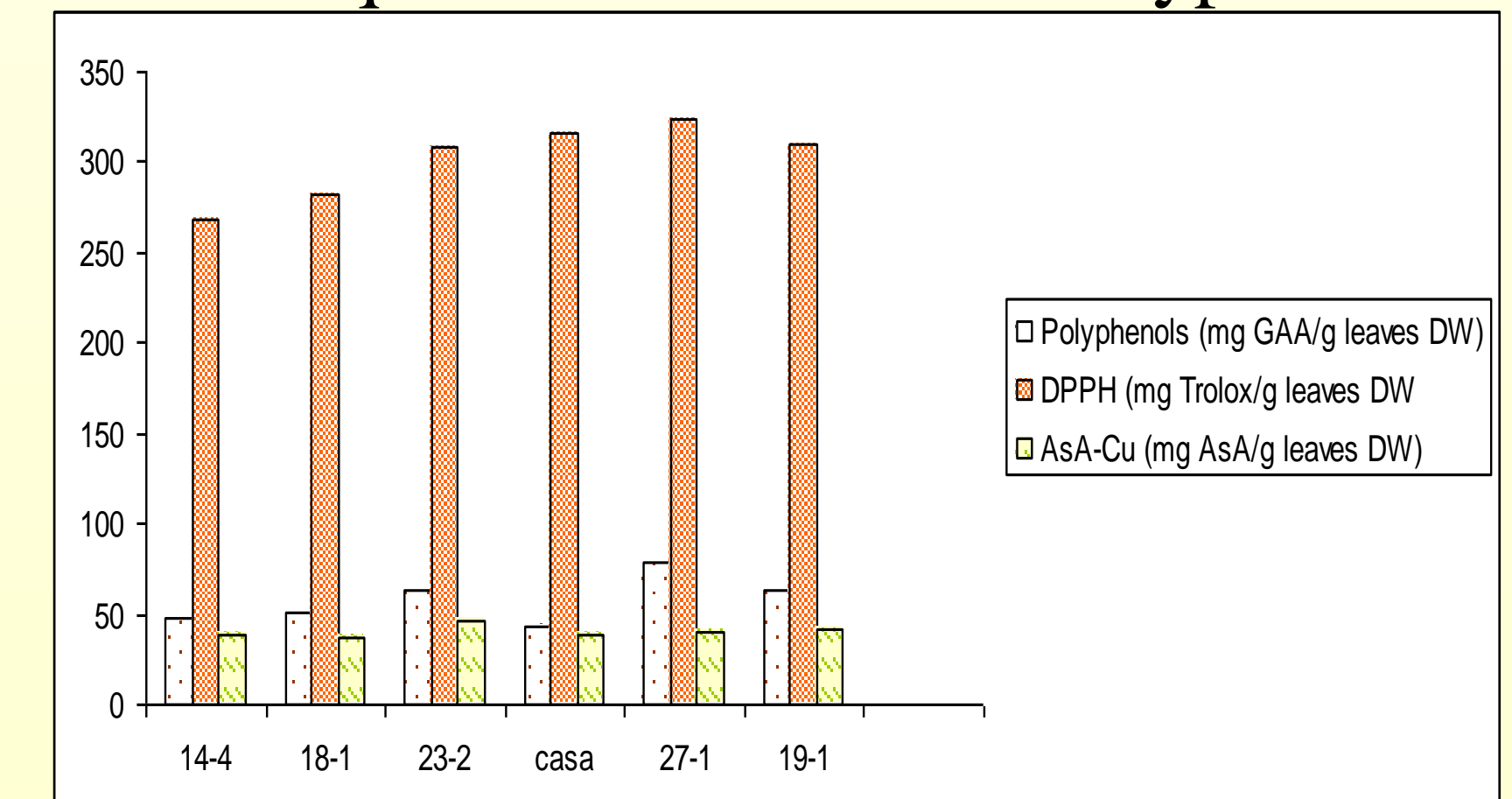


Quercetin galactoside (Hyperoside)

TOSC values of the murta ecotypes

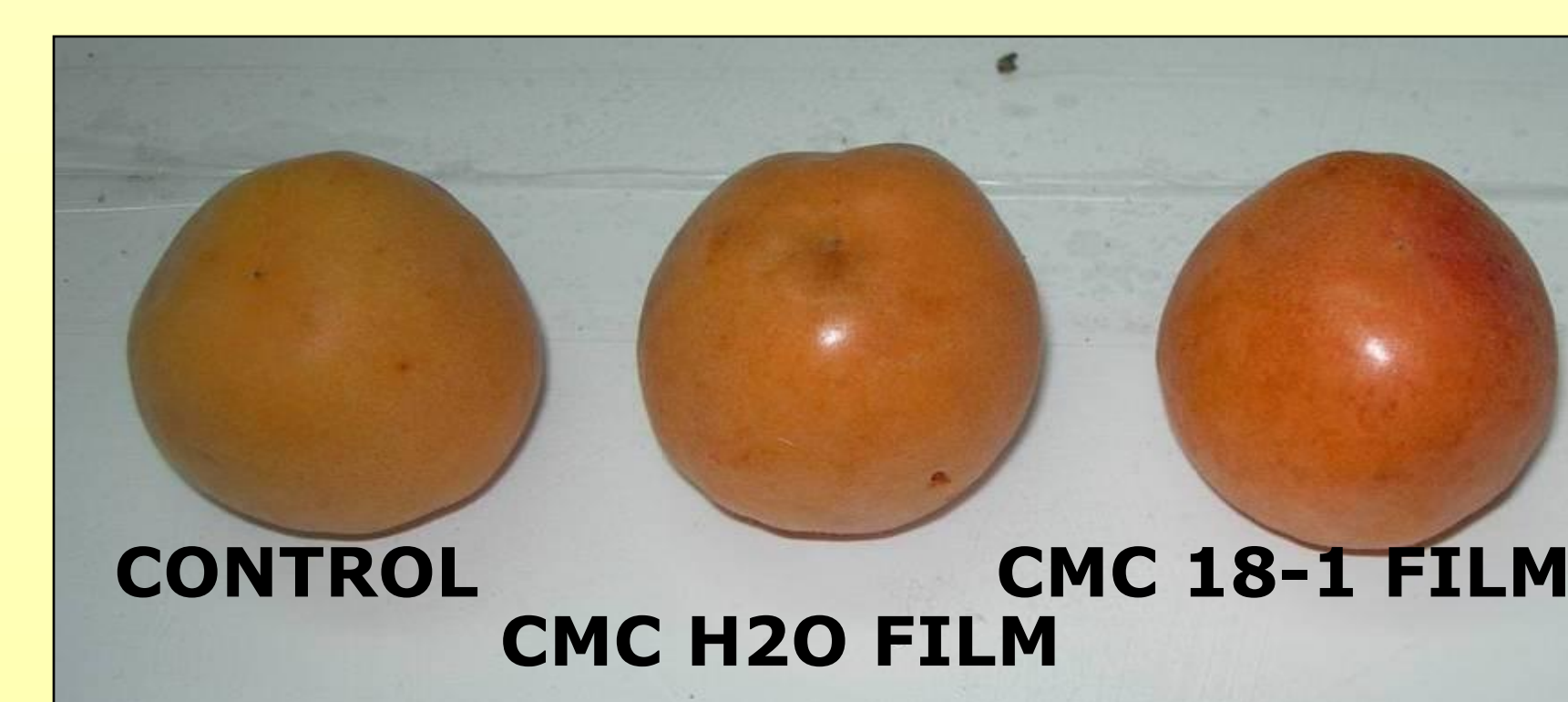


Polyphenols (mg), trolox and ascorbic acid equivalents of murta ecotypes:



3.2.1 Conclusions of murta ecotype extracts: Polyphenols show differences between ecotypes in relation to DPPH, but not to ascorbic acid (AsA). The probable reason: murta has big quantity of flavonols which act as free radical scavengers, but AsA functions in oxidoreduction reactions, were 2 electrons are involved and might be not so important in leaves. Oxygen radical scavenger (TOSC) peroxy differs more between ecotypes than peroxy nitrit.

3.3. Results of CMC-murta extracts as coatings for apricots



Apricots Treatments	Percent weight loss 0-14 days	Lightness at 14 days	Chroma at 14 days	Hue at 14 days
CMC 18-1 film	1.48±0.93 a	58.90±2.89 a	45.31±2.75 a	67.29±4.87 a
CMC H ₂ O film	1.77±1.06 a	60.53±2.77ab	45.70±2.70ab	68.60±5.13 a
CONTROL-F	2.04±0.98 b	62.17±3.34 c	48.25±3.06 c	69.86±4.85 b

3.3.1 Conclusions: After 14 days of storage, CMC coatings reduces weight loss of coated apricots, either with ecotype 18-1 or water. Othersides, ecotype 19-1 should be proven to improve weight retention

3.4. GENERAL CONCLUSIONS

CMC films with plant extracts improves quality and shelf-life of coated horticultural products