BIOCHEMICAL MODIFICATIONS IN SOME HORTICULTURAL PRODUCTS AS CONSEQUENCE OF THERMAL PROCESSING

MODIFICĂRI BIOCHIMICE ÎN UNELE PRODUSE HORTICOLE CA URMARE A PROCESĂRII TERMICE

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Abstract*. In all horticultural products, the majority of biochemical characteristics change as consequence of processing, especially of thermal processing. In the present article, we present Kapia pepper and cauliflower. Among the studied characteristics, we mention acidity, content of ascorbic acid and ascorbatoxidase activity.*
Key words: Kapia pepper, cauliflower, baking, blanching

Rezumat. *La toate produsele horticole se modifică majoritatea caracteristicilor biochimice în urma procesării, în special a procesării termice. În prezenta lucrare ne-am oprit la ardei roşu şi conopidă. Dintre caracteristicile studiate, menţionăm aciditatea, conţinutul în acid ascorbic şi activitatea ascorbatoxidazei.*
Cuvinte cheie: ardei Kapia, conopidă, coacere, blanşare.

INTRODUCTION

Thermal treatments are widely used in the food industry because of benefits like: destruction of microorganisms and inactivation of enzymes that may affect the products qualities by catalyzing different unwanted processes as oxidation and fermentation (Banu, 2008). Thermal processing can be achieved by many technological processes (as blanching, baking and others), adapted to the nature of the horticultural product and the expected characteristics of the final product (Cuciureanu, 2002, 2010).

Blanching, beside the inactivation of the microorganisms and the enzymes, also facilitate degassing of the product and the stabilization of the pigments and of the remaining ascorbic acid (Beceanu, 2010). Baking is a thermal treatment used mostly for peppers and eggplants, which, besides the other benefits, also confers special gustative qualities to the product.

As a consequence of thermal processing, the majority of biochemical characteristics of the horticultural products change. In the present article, we study the modifications of the humidity, soluble dry matter, malic acidity, content of ascorbic acid and activity of ascorbatoxidase in baked Kapia pepper and blanched cauliflower, compared to the raw material.

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MATERIAL AND METHOD

The analyzed materials were provided by the company S.C. Contec Foods S.R.L. Tecuci and consist in:

- Kapia pepper – raw material and Kapia pepper baked 30 minutes;
- Cauliflower cultivar Aviso – raw material and blanched cauliflower in hot water at 95°C for 8 minutes.

Water content (humidity) was determined by drying at 105°C (STAS 3183 – 90).

Soluble dry matter was determined refractometrically, using Zeiss refractometer (STAS 3183 – 90).

Acidity was measured titrimetrically and expressed as malic acidity.

Ascorbic acid content was determined by titration with 2, 6 – dichlorophenolindophenol, according to STAS 595.

The activity of ascorbatoxidase was determined by titration with potassium iodate (Artenie and Tănase, 1981).

Statistical analysis was performed using Student test (Snedecor and Cochran, 1984).

RESULTS AND DISCUSSIONS

According to previous studies (Bodea and Enăchescu, 1984), the Kapia peppers contains about 90 – 91 % water, which is confirmed by our results (90.48%).

After baking, the humidity decrease with 7.31% because of the water evaporation (fig.1).

We found the humidity of the fresh cauliflower 92.28%, value in concordance with the literature (Bodea and Enăchescu, 1984 - 92%). As consequence of the immersion of cauliflower in hot water for 8 minutes during the blanching process, the humidity increases with 1.86% (fig. 1).

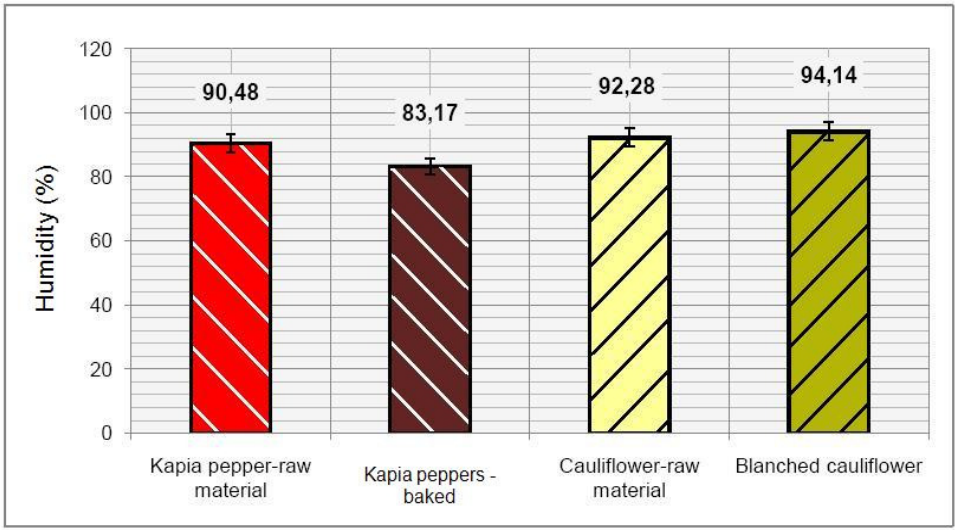

Fig. 1 - Modifications of the humidity determined by thermal treatments in Kapia pepper and cauliflower

The soluble dry matter contains soluble glucides and soluble non-glucidic substances. Its variation is correlated in each sample with the humidity. By baking the Kapia pepper loses the water and, as consequence, the soluble substances are concentrating and their content increases. Another possible explanation of the increase of the soluble mater could be the thermal transformation of some non-soluble compounds in soluble ones.

In the cauliflower case, because of the blanching process, a part of the soluble substances may diffuse in the hot water and consequently, their content in the sample decreases (fig. 2).

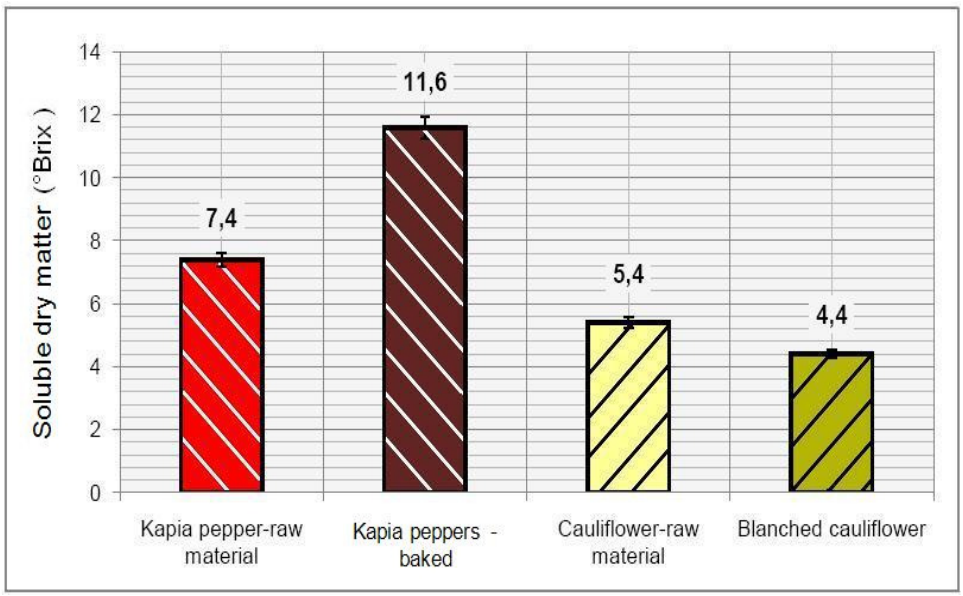

Fig. 2 - Modifications of the soluble dry mater content determined by thermal treatments in Kapia pepper and cauliflower

The acidity contributes to the right appreciation of the quality and physiological condition of the products. It can be influenced by a lot of factors as preservation conditions and duration and processing technologies.

The acidity decreases after the thermal treatments that we studied (baking and blanching), as it can be seen in the figure 3. In the case of baked peppers, the decrease is 25.9% and in the case of the blanched cauliflower, the decrease is 31.8%.

It is known that the ascorbic acid content decreases after the thermal processing of the raw material and our results confirm this affirmation (fig. 4).

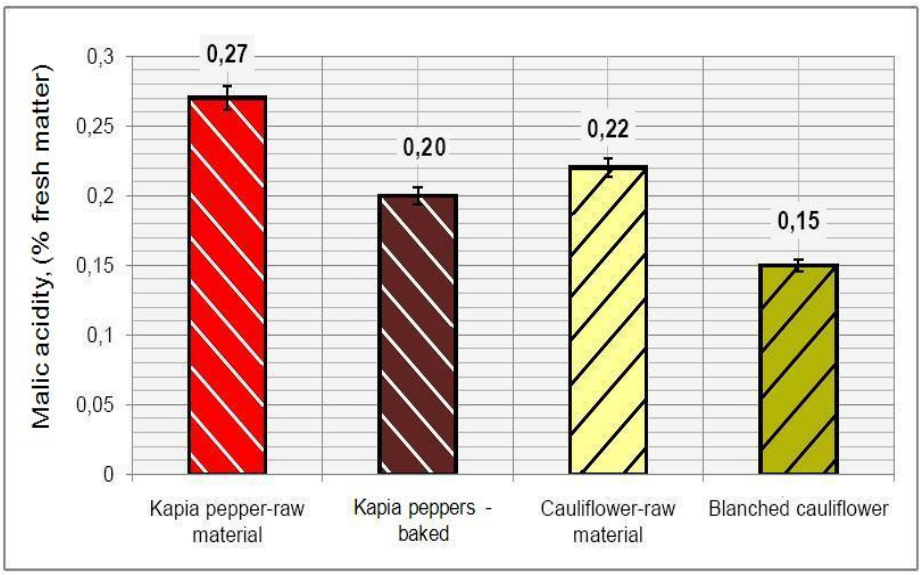

Fig. 3 - Modifications of the malic acidity determined by thermal treatments in Kapia pepper and cauliflower

In the case of baked Kapia peppers, the final ascorbic acid content is 58.25% compared with the raw material and in the case of blanched cauliflower, the final content is 56.51%. The benefit is that the ascorbic acid remained after this technological procedure keeps better in time than the ascorbic acid of the samples untreated thermal.

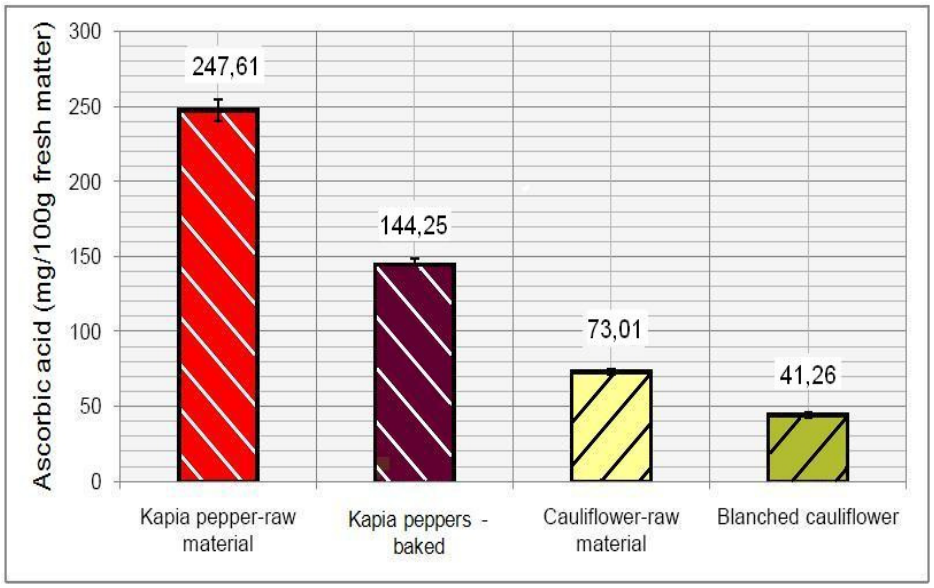

Fig. 4 - Modifications of the ascorbic acid content determined by thermal treatments in Kapia pepper and cauliflower

As we expected, we found a decrease of the ascorbatoxidase activity after the thermal treatments applied to both vegetables (fig. 5).

This decrease is beneficial because the activity of ascorbatoxidase (as well as other's oxidases) is extremely unwanted during the conservation, because of the instability of the formed dehydroascorbate and the diminution of the nutritive value of the products. In the case of the baked Kapia peppers, the decrease of the ascorbatoxidase activity is 14.16% and in the case of the blanched cauliflower, the decrease is 12.20%.

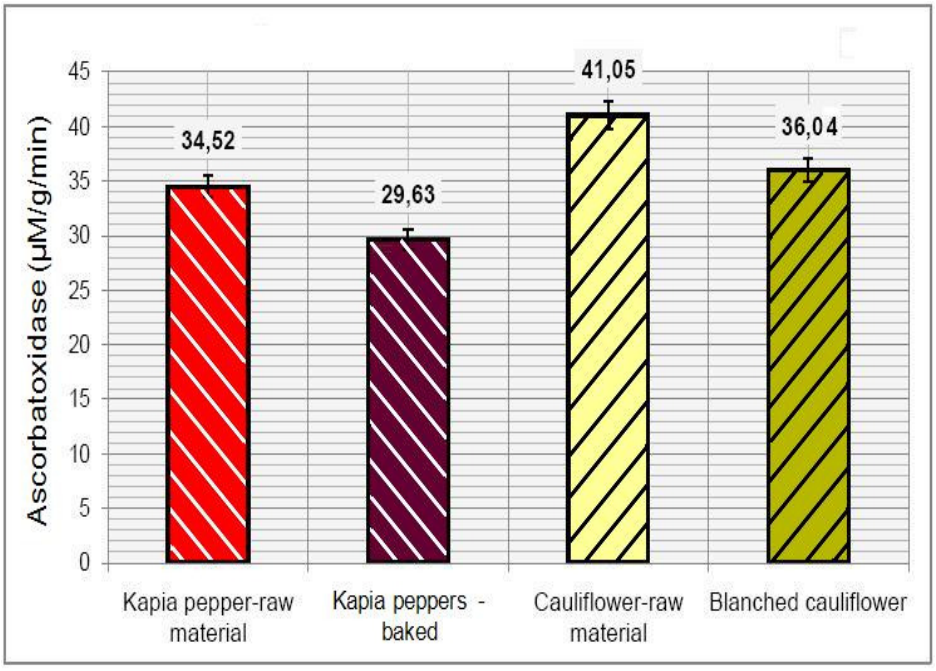

Fig. 5 - Modifications of the ascorbatoxidase activity determined by thermal treatments in Kapia pepper and cauliflower

CONCLUSIONS

1. Baking determines the decrease of the humidity and the increase of the soluble dry matter content at Kapia peppers, while blanching has an opposite effect: the increase of the humidity and the decrease of the soluble dry matter content at cauliflower.

2. Malic acidity, ascorbic acid content and ascorbatoxidase activity decrease for both types of thermal treatments.

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