Availability of hydroxycinnamic acids from coffee after their supplementation to different kinds of food

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INTRODUCTION

In novel foods containing different health-promoting components such as protein hydrolysates as well as plant extracts rich in polyphenols it is possible that peptides and phenolics interact and as a consequence the bioactivity of both decreases. The aim of the study was to evaluate the availability of hydroxycinnamic and chlorogenic acids (all described as CHAs) from green coffee (water purified extract) after their interactions with protein hydrolysates derived from egg ovalbumin (EOH), whey proteins (WPH) and soy proteins (SPH) during food processing, depending on temperature during processing, food product composition and CHAs form (free or included in β-cyclodextrin (β-CD).

EXPERIMENTAL METHODS

The green coffee extract was obtained by pressure method, purified by centrifugal partition chromatography and freeze dried. It contained above 50% of CHAs. Inclusion complexes of CHAs with β-CD were obtained by mixing in water solution in ambient temperature and precipitation by cooling down. Products such as cookies, bread, meat and mushroom stuffing, nutty filling and caramel cottage were obtained as control and in four options of modification: with CHAs from green coffee, with protein hydrolysate, with both of supplements or with CHAs included in β-CD. The CHAs preparations were added to the food products in the amount of 1%, and the protein hydrolysates of 5%. The CHAs in the products were analyzed by LC/MS method. To determine the CHAs not interacted with products ingredients the sample of product was extracted with water in a shaker and further to determine the CHAs released after hydrolysis by digestive enzymes the sample was treated with α-amylase, amyloglucosidase and protease. The filtrate was analyzed in terms of CHAs concentrations.

RESULTS AND DISCUSSION

Availability of hydroxycinnamic acid found in supplemented foods was reduced by processing and further by enzymatic hydrolysis. The effectiveness of supplementation of food products with hydroxycinnamic acid depended on the conditions of the processing along with the food product type and in particular the high temperature used. For example baking caused greater losses of these compounds in comparison to the processing at room temperature. Furthermore the addition of protein hydrolysates led to a significant decrease of hydroxycinnamic acids availability. Hydrolysis with the use of the digestive enzymes contributes to the reduction of unbounded polyphenols in food products by their interaction with enzymatic proteins. Inclusion of hydroxycinnamic acids into β-cyclodextrin before food supplementation led to the increase of their availability in the products both after processing and enzymatic hydrolysis.

CONCLUSIONS

Enrichment of food product with the protein hydrolysate, regardless of its origin increases the losses of polyphenols during food processing. Therefore while designing new functional foods with a defined level of bioavailability of hydroxycinnamic acids or generally polyphenols both their losses due food processing, as well, as demonstrated in this research, further changes taking place after their ingestion must be taken into account.

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