

# FORMATION OF FREE AND PROTEIN BOUND MAILLARD REACTION PRODUCTS IN CEREAL COOKIES MADE OF DIFFERENT WHOLEGRAIN FLOURS



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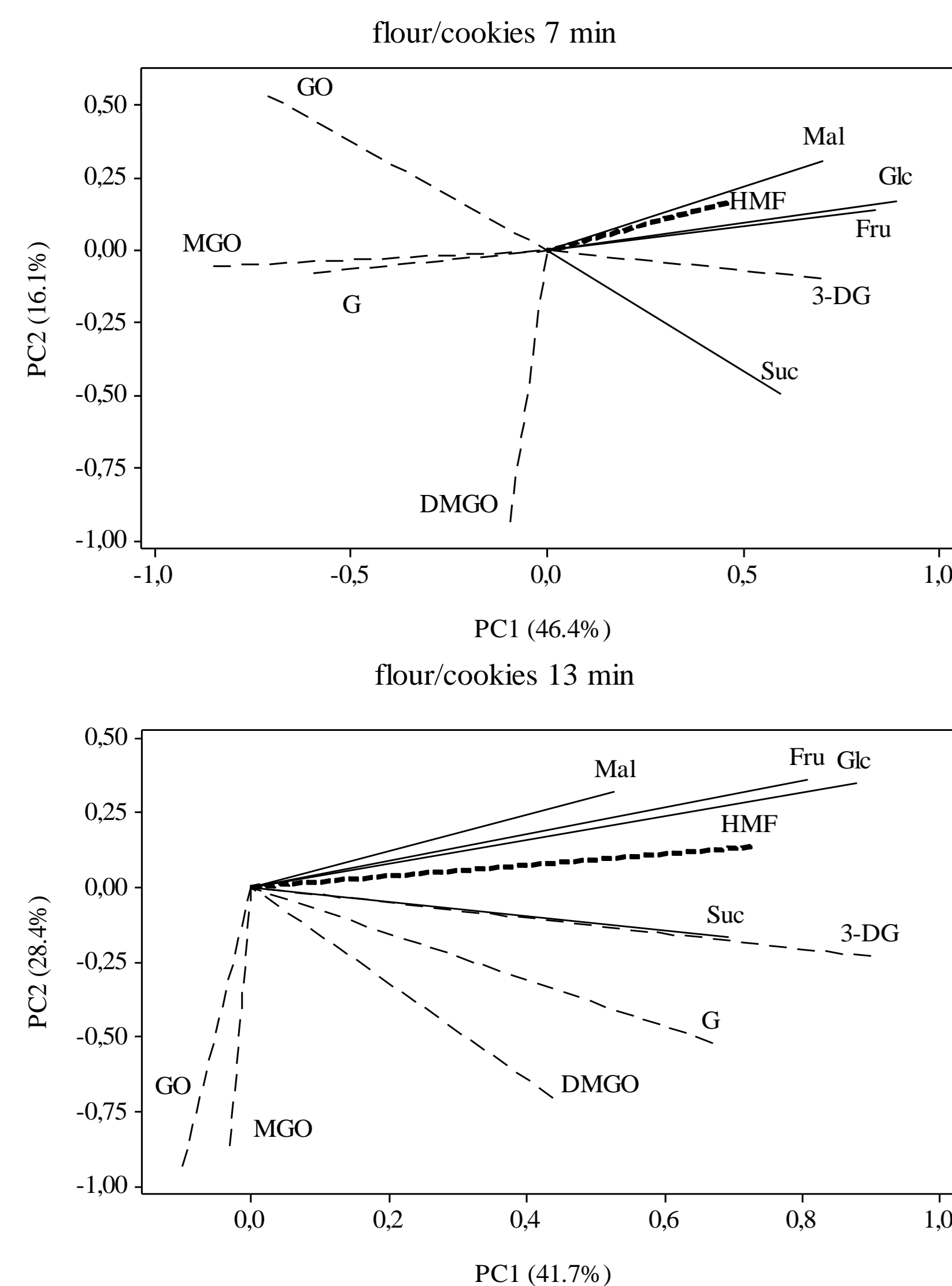
## Introduction

The Maillard reaction takes place in food during heating between reducing carbohydrates and amino structures in amino acids or proteins. It is well known that the Maillard reaction cause an overall decrease in the nutritional value of foods. The Maillard reaction does not result in one or few end products but proceeds through a complex reaction pathway resulting in a large number of structures. In this study, the content of Maillard reaction products (MRPs) from its initial, intermediate and final stages was measured in cookies made of different cereals. The aim of the present study was to investigate the effect of the different wholegrain cereal flours on the formation of free and protein bound MRPs.

## Results and discussion

## Materials and methods

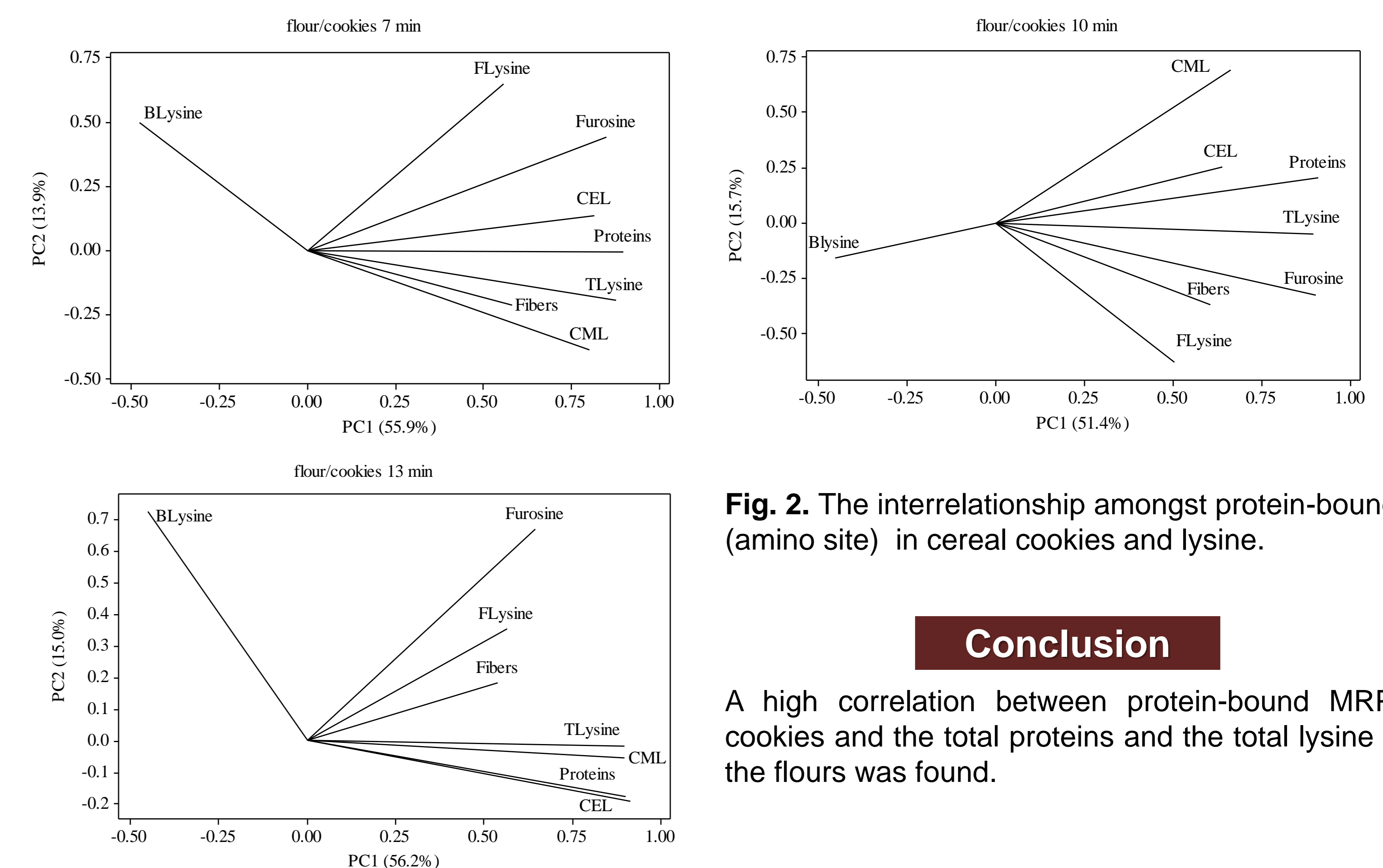
- Wholegrain flours** - bread wheat, durum wheat, soft wheat, hard wheat, triticale, rye, hull-less oat, hull-less barley, corn genotypes of standardised white-, yellow- and red-color kernel type, popcorn genotype with kernels of blue color.
- Chemical analysis of flour** – total proteins, total, free and blocked lysine, fructose, glucose, sucrose, maltose
- Cookies preparation** – AACC Methods 10-54. Dough was rolled out to disks with a diameter of 5.5 cm and a height of 3 mm, and baked in the convection oven (Memmert, UNE 400) at 180° C for 7, 10 and 13 min.
- Chemical analysis of cookies- Free MRPs**  $\alpha$ -dicarbonyl compounds (glucosone (G); 3-deoxyglucosone, (3-DG); glyoxal, (GO); methylglyoxal, (MGO) and dimethylglyoxal, (DMGO)) and 5-hydroxymethylfurfural (HMF). **Protein bound MRPs** (N<sup>ε</sup>-fructosyllsine (Furosine), N<sup>ε</sup>-carboxymethyllysine (CML) and N<sup>ε</sup>-carboxyethyllysine (CEL).



**Fig. 1.** The interrelationship amongst free MRPs (carbonyl site) in cereal cookies and sugars of cereal flours.

## Conclusion

The initial content of sugars in flour of cereals affected 5-hydroxymethylfurfural and 3-deoxyglucosone formation in the cookies.



**Fig. 2.** The interrelationship amongst protein-bound MRPs (amino site) in cereal cookies and lysine.

## Conclusion

A high correlation between protein-bound MRPs in the cookies and the total proteins and the total lysine content in the flours was found.