

5-Hydroxymethylfurfural Content in Selected Food Products

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INTRODUCTION

5-hydroxymethylfurfural (HMF) is a common component of heat treated, drying or stored for a long time food products. It is an intermediate product formed in the Maillard reaction as a result of thermal dehydration of reducing sugars (1-2). HMF is also formed during caramelisation while degradation of carbohydrates at high temperature (3). HMF is responsible for the sensory properties of food, especially for the pleasant flavor. Although it is relatively safe food component, there are reports regarding toxic, mutagenic and carcinogenic properties of HMF, and of 5-sulphoxymethylfurfural especially, an allylic sulfuric acid ester metabolite from HMF (4-6). The content of HMF in the various products vary within a wide range and depends on the food group type as well as the type of processing. In present work, the HMF content in different types of breakfast cereals, cookies and muesli as well as in several types of bakery products commercially available in Poland was determined. In addition, the influence of flavor and taste additives (honey, cocoa, dry fruits) as well as the type of cereals (gluten or gluten-free) on the HMF content in the tested products was examined.

EXPERIMENTAL METHODS

Twenty-one commercial packaged breakfast cereals products (cornflakes, multigrain cereals, wholegrain oatmeal, with and without food additives), eight gluten-free or sugar-free dietary products (cookies, biscuits, sponge cakes and pasta) and twelve bakery products were tested for HMF content using HPLC method.

RESULTS AND DISCUSSION

The highest concentration of HMF was found in wheat bread with cranberries (210 mg kg⁻¹) and in breakfast cereals – honey wheat loops (85.099 mg kg⁻¹). In contrast, wholegrain oatmeal and gluten-free sponge cakes had the lowest HMF level of all tested samples, below the detection limit and 0.485 mg kg⁻¹, respectively. Group of eight dietary products samples, six of which does not contain gluten, were characterized by the lowest average HMF content of all analyzed samples (8.488 mg kg⁻¹). That indicates that the type of grain used in the product probably affects the content of HMF. However, the most noticeable observation is the impact of the type of sugar, especially glucose, on the HMF concentration in food. It is especially visible in the case of sweetened breakfast cereals for which the average content of HMF was 25.55 mg kg⁻¹, and was higher than it in dietary products (8.488 mg kg⁻¹) and bakery products (18.395 mg kg⁻¹), excluding wheat bread with cranberries. This is most likely results from the composition of cereals, most of which contained glucose or glucose-fructose syrup.

CONCLUSIONS

The most noticeable conclusion from present research is the impact of the type of sugar, especially glucose, on the HMF concentration in food. Significantly higher content of HMF was observed in products sweetened with glucose or glucose-fructose syrup. Our study also confirmed the role of food additives and fermentation of dough on the HMF concentration in the finished product.

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