

Phytoprotective compounds of non-traditional cereals

Magdaléna LACKO-BARTOŠOVÁ¹ – Lucia LACKO-BARTOŠOVÁ² – Ľubomír KOBIDA¹

1: Slovak University of Agriculture in Nitra, Tr. A. Hlinku 94976, E-mail: magdalena.lacko-bartosova@uniag.sk

2: University of Economics in Bratislava, Dolnozemska cesta 1, 852 35 Bratislava,

E-mail: lucialbartosova@gmail.com

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Introduction

The increasing demand for nutritionally healthy food products, the asserted therapeutic properties of foodstuff, the need for crop diversification have led to a renewed interest in ancient wheats such as einkorn, emmer or spelt (Arzani and Ashraf, 2017). Cereals are a good source of plant phenolics, the most common type of phenolic compounds in cereals are phenolic acids. Phenolics predominantly occur in the bran, i.e. the aleurone layer and outermost pericarp, which are usually eliminated during milling. In whole grain flours, the amount of polyphenols is highly variable and is mostly related to species and variety. Little information is available on polyphenols in different *Triticum* species, as well as on possible environmental effects (Brandolini *et al.*, 2013). The aim of this work was to explore differences in polyphenols concentration of different non-traditional cereals species, with focus on their free and bound fractions, distribution in different milling fractions, and changes caused by variable meteorological conditions.

Materials and methods

Winter spelt and emmer varieties were cultivated under organic farming conditions at Slovak University of Agriculture in Nitra (48°19'N, 18°07'E) as randomised block experiment in four replicates during three consecutive growing periods. Experimental area belongs to warm agro-climatic region, arid subregion, with continental climate. After manual harvesting, the samples were de-hulled, grinded with FQC – 109 laboratory mill (Kapacitív Kkt., Hungary) The whole grain flour, flour and bran were taken to the analyses.

Phenolic extracts were prepared according to the method of Wang *et al.* (2013) with slight modification. Free and bound phenols were determined using Folin-Ciocalteu's method according to Van Hung *et al.* (2009) with some modification. After samples preparation, the absorbance of clear supernatants was measured at 765 nm using spectrophotometer UV-1800 (Shimadzu, Japan). The content of free and bound phenols was calculated and expressed as ferulic acid equivalent (FAE) per gram of dry matter sample (DM). Analyses were carried out in four replicates. Collected data were subjected to multifactorial analysis of variance (ANOVA).

Results and discussion

One of the most occurring groups of phytochemicals in cereal grains are phenols. They are considered as a major group of compounds that contribute to the antioxidant activity of cereals. Phenols are often deficient in commercial wheat flours, because their highest concentrations are in aleuronic layers, endosperm, seed coat, which are usually eliminated by milling. The amount of phenols is highly variable and mostly related to species and varieties Adom *et al.*, 2005).

Statistical analysis confirmed significantly higher total phenols content of *Tr. dicoccon* than in *Tr. spelta* in flour, whole grain flour and bran fraction. Total phenols content in flour was 343.8 µg FAE g⁻¹ DM for spelt, and 409.7 µg FAE g⁻¹ DM for emmer, in whole grain flour the content was higher and accounted 1238.7 µg FAE g⁻¹ DM for spelt and 1298.7 µg FAE g⁻¹ DM for emmer. The highest content of total phenols was in bran (5495.2 µg FAE g⁻¹ DM in spelt; 6252.8 µg FAE g⁻¹ DM in emmer). Bound phenols content represented 86.9% in spelt and 86.4% in emmer flour; in the whole grain flour the share of bound fraction was 86.3% in spelt and 86.4% in emmer, bound phenols were in bran fraction represented 76.9% in spelt and 78.5% in emmer.

Conclusions

In our study, more abundant source of phenols was *Tr. dicoccon* than *Tr. spelta*, higher concentrations of free, bound and total phenols were detected. Significant effect of growing year was recorded, low precipitations and higher temperature resulted in increased concentration of all phenols.

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