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Abstract

Wheat grain-based products are important component of human diet. Due to the high content of carbohydrates they are considered as a good source of energy, but they also contain ingredients valuable from the nutrition point of view, such as dietary fibre, vitamins, minerals and low molecular bioactive compounds. The last group includes phenolic acids, alkylresorcinols, sterols, tocols and carotenoids. These compounds exhibit antioxidant capacity and may therefore play an important role in the prevention of diet-related chronic diseases such as type II diabetes, cardiovascular diseases and cancer. Among factors determining the variability of the content and composition of bioactive compounds in wheat grain are: species, variety and environmental conditions.

The aim of this doctoral dissertation was to determine the intraspecies variability for spelt grain, interspecies variability for several wheat species and the impact of cultivation technology on the accumulation of bioactive compounds and the antioxidant capacity of wheat grain. Taking into consideration fact, that relatively only small amounts of phenolic acids in wheat grain exist in the so-called free form, an additional research aim was to determine how the dough fermentation process affects the free phenolic acid fraction and the antioxidant capacity of the bread after the *in vitro* digestion process.

The conducted research showed that the extensive vs. intensive cultivation technology increases the accumulation of phenolic compounds (by 5%) and alkylresorcinols (by 7%) in wheat grain. In the grain of different wheat genotypes (common, spelt, durum, einkorn, persian, indian dwarf,), bioactive compounds were mainly represented by alkylresorcinols (approx. 695 μg/g), sterols (approx. 461 μg/g) and phenolic acids (approx. 415 μg/g). Tocols and carotenoids were minor bioactive compounds, with mean content of 24.2 μg/g and 2.96 μg/g, respectively. It has been found that intraspecies variability for spelt grain, defined as the coefficient of variation (CV) ranged from 9.0% for carotenoids to 37.2% for total phenolic acids. In turn, interspecies variability was greater and ranged from CV = 25.2% for the content of alkylresorcinols to CV = 64.1% for the content of carotenoids. Wheat grain antioxidant capacity analysed using ORAC and DPPH assays showed that the antioxidants present in the wheat grain act mainly through the mechanism of hydrogen atom transfer. It was also confirmed that bread and its hydrolysates were more abundant in free phenolic acids than the used flours. Also, it was found that production of sourdough bread favors increasing the antioxidant capacity based on the single electron transfer mechanism.