

## **DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)**

Food of plant origin contains a number of compounds with health-promoting properties. Wheat grains, which are the main cereal raw material, are a good source of antioxidants. These compounds, due to the scavenging of free radicals, may reduce the risk of the incidence of chronic diseases, including cardiovascular diseases, obesity, tumours, metabolic syndrome and type 2 diabetes.

Antioxidants in wheat grains account for as much as 2% of the kernel weight. Both hydrophilic and hydrophobic forms are included in this group. They include phenolic compounds (mainly ferulic acid), sterols (mainly  $\beta$ -sitosterol), tocopherols (mainly  $\alpha$ -tocopherol and  $\beta$ -tocotrienol), carotenoids (mainly lutein) and phenolic lipids known as alkylresorcinols. These compounds provide the antioxidant potential of wheat, which, according to the literature data, falls within the range from 1  $\mu\text{mol TE g}^{-1}$  to 140  $\mu\text{mol TE g}^{-1}$ . These differences depend on the variety, environmental conditions, place of cultivation and the interactions between environmental factors and the genotype. All over the world, attempts are being made to identify factors determining the concentration of biologically active compounds in wheat. However, the obtained results are still inconclusive. Researchers have found that each component may react differently to environmental conditions, which allows them to see the possibility for the optimisation of the content of these components through the proper modification of environmental conditions.

The research aim of the Project is to perform a comprehensive quantitative and qualitative analysis of low-molecular bioactive compounds in grains of domestic wheats. Additionally, the obtained results will help select wheat species and indicate cultivation conditions conducive to the accumulation of these compounds. The study will focus on common wheat varieties (winter and spring), spelt, durum wheat, einkorn wheat and emmer wheat. Both organic cultivation and integrated production technology have been gaining more and more interest worldwide. We assume that in relation to the conventional (high-input) cultivation, they may induce changes in the accumulation of bioactive compounds. In addition to the characteristics of bioactive compounds, the antioxidant potential of grain extracts and correlations between these distinguishing features will also be determined. Moreover, a statistical analysis will help to determine the sources of the occurring variation between samples and the distinguishing features that affect them the most.

As part of the project, a study will be carried out on a total of 60 varieties of common wheat, einkorn wheat, emmer wheat, spelt and durum wheat. Varieties will be cultivated using three cultivation technologies – organic, integrated, and high-input. Preparation of the material will involve its unification to a standard moisture content, and milling. Laboratory analyses will include the determination of: phenolic acids (free and total), phenolic compounds (free and total), alkylresorcinols, tocopherols, carotenoids, sterols and squalene. Carotenoids, phenolic acids and tocopherols will be determined using high performance liquid chromatography (HPLC). Sterols, squalene, and the composition of alkylresorcinols will be determined using gas chromatography. The total content of phenolic compounds and alkylresorcinols will be determined based on the measurement of absorbance following the performance of a colour reaction using Folin–Ciocalteu reagent (phenolic compounds) and Fast Blue RR (alkylresorcinols), respectively. The antioxidant potential of wheat will be determined using three methods: one involving the reduction of the DPPH radical, an ORAC method and a Rancimat test. The obtained results will be analysed statistically using Statistica 12.5 PL software (Stat Soft).