The purpose of this project is to isolate and characterize of rye orthologous of genes coding for alkylresorcinol synthases, enzymes taking part in alkylresorcinols (ARs) synthesis. The hypothesis of these research is that genes coding for AR synthases (ARS) are presented in the rye genome.

The project concerns basic research and its planned final effects are: the isolation and sequencing of ScARS genes encoding proteins with alkylresorcinols synthase activity (ARS) using rye BAC library; mapping of identified genes on rye chromosomes; examination the expression levels of these genes in the different parts of the plant where ARs occur; correlating the expression results in various plant parts with AR content. Then, analyses confirming the function of the newly found genes using yeast expression system will be conducted. Yeast cells will be transformed with vectors sequences coding for ARS. The content of ARs produced in yeast cells will be examined. In the yeast transformed with vectors containing additionally GFP sequence, subcellular localization will be verified. Alkylresorcinols are compounds belonging to the class of phenolic lipids. The presence of these lipids was proved in higher plants belonging to: Anacardiaceae, Proteaceae, Poaceae, Myristicaceae, families and in some mosses, lichen, fungus, algae and bacteria. A rich source of ARs are cereal grains such as rye, wheat, triticale or barley. Their high concentration can be found in whole grain cereal products and especially in rye. ARs found in plants are characterized by a variety of biological properties like antimicrobial, antifungal and cytotoxic activity. ARs provide resistance against pathogenic fungi during germination and early stages of plant development. Moreover, ARs are proved to have a positive influence on human health. For example they inhibit the activity of the ω-tocopherol hydrolase and lead to the increased amount of the biologically active form of vitamin E (γ-tocopherol). This in turn results in a reduction of LDL cholesterol in blood and reduces the risk of cardiovascular system diseases. According to human studies, these compounds are adsorbed and at least partially metabolized, and due to their presence in significant amounts in grain products, they are currently investigated as biomarkers of whole grain intake. Unfortunately, despite much evidence of the beneficial role of ARs the knowledge about the structure of homologues of these important substances as well as the data about their synthesis and genes responsible for that process in higher plants are limited to several species.

Proposed experiments could explain many uncertainties connected with the synthesis of ARs. Project concerns analyses in rye, however obtained results should contribute to better understanding of their biosynthesis processes also in other species of the Poaceae family.