Rye is one of the important cereal crops of the world, grown mainly in Europe on near 5 million hectares, yielding of approximately 15 million tones (FAOSTAT 2013). Rye is valued because of its nutritional and dietary advantages, especially by proponents of healthy food. Rye is a source of fiber, it contains more vitamins and microelements than wheat. It has a number of positive attributes, such as outstanding cold hardiness (tolerance to winter frosts, to -25°C, without snow cover), excellent drought tolerance and strong disease resistance. Some of these attributes may be due to the intense waxy bloom on the stem and leaf sheath. Thanks to this coating, rye plants have a distinctive bluish color.

The subject of our research are atypical plants - mutants lacking a waxy covering. We have four pairs of rye near-isogenic lines. Each pair represents two groups of plants - almost identical genetically but one of them with –, and the second without typical wax coat. It can therefore be expected that the differences detected within a given pair of lines will be related to the presence/absence of waxy coating.

These glaucous plants will allow us to search for genes responsible for wax formation. We are going to use for this purpose the latest molecular technologies, like next generation sequencing (NGS). NGS platforms give possibilities to produce hundreds of thousands of sequences in a massively parallel manner. In addition to information about diversity in the expression of the studied genes, the results gained by using NGS methods will enrich the general knowledge of the rye genome.

We plan to measure some morphological, biochemical and physiological parameters to accurately characterize the differences between plants covered with wax and deprived of such a protection. Biochemical studies will include detection of waxes chemical composition, using liquid and gas chromatography.

Physiological analysis will be aimed at searching for differences in plant reaction to different environmental conditions. Since plants lacking a protective wax coating can be more vulnerable to stress, we aim to discover to what extent the different types of defects of creating wax layer affect the plants’ response to water deficit. Photosynthetic effectiveness of the use of water is often a decisive index of productivity of plants under stress conditions. So we plan to define the connection between four genes encoding for the waxy seal and the photosynthesis processes, gas exchange, water balance and assimilation pigments. The physiological characteristics will be evaluated with the use of gas analyzer, porometer, spectrophotometer and fluorymeter.