## Summary

Species from *Lolium* (ryegrass) and *Festuca* (fescue) genera, including *L. multiflorum*, *L. perenne*, *F. pratensis*, and *F. arundionacea*, are the most crucial forage grasses in temperate regions. These species are characterized by a range of complementary agronomic traits, such as high forage quality of ryegrasses, and persistence and abiotic stress tolerance, including drought tolerance, of fescues. Species of both genera can be crossed relatively easily, and their homeologous chromosomes conjugate and recombine in intergeneric hybrids. Beneficial features of species derived from two genera can be combined in a single genotype through the introgression of desirable genes from one species to another by backcrossing of intergeneric hybrid to one of its parental species. Following the selection, the introgression forms distinct in their levels of drought tolerance can be obtained and further used as good models in the study on mechanisms of drought tolerance in forage grasses of *Lolium-Festuca* complex.

The main objective of this research was to recognize a physiological response of *F. arundinacea*, *F. glaucescens*, and *L. multiflorum/F. arundinacea* introgression forms to water deficit and further rehydration, as well as reactions of their photosynthetic apparatus and enzymatic antioxidant system to these conditions. In each of three plant populations, one genotype with relatively high (HDT) and one with relatively low drought tolerance (LDT), were selected for further experiments.

It was demonstrated that *F. arundinacea* and *F. glaucescens* were characterized by a similar physiological response to water deficit and subsequent re-watering, despite a different dynamics of water uptake and abscisic acid (ABA) accumulation. Moreover, *F. arundinacea* demonstrated a stable performance of the Calvin cycle under water deficit conditions, which could be crucial to maintain a relatively low level of $H_2O_2$ in the cell and to express drought tolerance in this species. On the other hand, *F. glaucescens* was able to adjust its enzymatic antioxidant system to water deficit conditions. A higher integrity of biological membranes and faster and higher accumulation of ABA under stress conditions were shown to be the attributes of HDT introgression form. Furthermore, the HDT introgression form was also characterized by the capacity to adjust the Calvin cycle as well as its enzymatic antioxidant system to water deficit conditions. On the other hand, the capacity to regenerate its biological membranes after rehydration and higher accumulation of triacylglycerol (TAG) under water deficit, were the attributes of LDT introgression form. The accumulation of TAG could be associated, at least

partially, with the initiation of metabolic processes leading to a reduction of oxidative stress in the LDT form. Moreover, it was shown that despite significant differences in the stomatal density and size observed between both introgression forms, each form was characterized by a similar level of transpiration and stomatal conductance.

The performed research proved that the adjustment of photosynthetic apparatus and enzymatic antioxidant system to the conditions of water deficit can be a crucial component of cellular metabolism associated with drought tolerance in *F. arundinacea*, *F. glaucescens*, as well as in *L. multiflorum/ F. arundinacea* introgression forms.