Abstract

The effect of ontogenetic stage on intraspecific differences in photosynthetic and growth parameters of maize subjected to hypoxic and posthypoxic stress conditions

Abiotic stressors, including waterlogging, negatively influence many important plant functions on the subcellular, cellular, tissue, organ and whole plant level. Shortly after waterlogging plants change their metabolism, which affects to a lesser or higher degree almost all important physiological functions. All these complex changes generally result in the decrease of plant vigour, which finally leads to the reduction of plant growth, development, and biomass or grain yield. The search for the genotypes more tolerant to waterlogging based on screening for specific marker parametres and subsequent selection is fundamental for the breeding processes. In addition to studies dealing with waterlogging *per se*, the capacity of genotypes to recover from stress-associated damages should also be examined. Actually, the ability of plants to recover rapidly from the damages caused by stress can be equally (or even more) important as their efficiency in dealing with stress itself. The goals of my diploma thesis were i) to determine the changes in the selected morphological (length and weight parameters of leaves, shoots and roots) and physiological (chlorophyll *a* fluorescence emission, photosynthetic pigments content, relative water content, specific leaf mass) parameters of maize inbred lines (2023, CE704) and reciprocal F_1 hybrids. Subjected to hypoxic and posthypoxic stress conditions, ii) to detect whether and how these changes depend on the ontogenetic stage in which the plants are subjected to this type of stress.

The results of my experiments show that posthypoxic conditions damage plants far more than hypoxia itself. While fluorescence parameters Fo, FM and Fv/FM decreased slightly or didn't change at all during waterlogging, in posthypoxic conditions the decrease of these parameters was significant. The content of photosynthetic pigments decreased in all genotypes subjected to stress, mainly in older plants. However, there were a few exceptions in the younger plants group where, compared to the control group of plants, the value of this parameter slightly increased. There were no radical changes in RWC either during waterlogging or following recovery. More significant changes were found in morphological parameters, where the influence of the ontogenetic stage in both hypoxic and posthypoxic conditions was stronger. The parental line CE704 reached the lowest values of some morphological parameters, but the plants had the highest number of fully developed of leaves internodes compared to the other genotypes. The line CE704 seems to be the most tolerant to waterlogging and subsequent recovery. The younger plants were more sensitive to hypoxic and posthypoxic stress conditions compared to the older ones.