

Carbon dioxide, light and water are the most important components in the life of plants. Their accessibility in the environment and the efficiency of their uptake is perceived and regulated by the stomata, which consist of two guard cells that regulate the size of a central pore in an impermeable cuticle. Closed stomata reduce transpiration during water deficiency. However, crucial to the development of stress tolerance is the maintenance of efficient photosynthesis, which is compromised when stomata are closed because the resultant limited availability of carbon dioxide. Thus, drought-resistant cultivars of many plants close their stomata late in the stress response compared to sensitive genotypes.

It is known that hydrogen peroxide is crucial signalling molecule regulating the closure of the stomata by both drought and the increased concentration of carbon dioxide. We found that CPK3 protein regulates both of these signalling pathways and that CPK3 cooperates with SOD1 protein, which is responsible for hydrogen peroxide generation.

We intend to examine how cooperation between CPK3 and SOD1 changes the functioning of SOD1, the production of hydrogen peroxide and stomatal closure in response to both drought and the changing concentration of carbon dioxide in the atmosphere. We aim at finding mechanisms of the cross-talk between the drought- and carbon dioxide-regulated signalling pathways in stomata. Our research is important to understand the mechanisms that enable efficient photosynthesis with the lowest possible water loss. In further perspective presented research may contribute to improvement of crop plants (crop yield and resistance to water deficiency).