

Abstract:

Plants are exposed to many adverse factors during their life cycles. Abiotic stresses are significantly limiting plant growth and development. Abiotic stress response mechanisms involve compatible solute synthesis (e.g. sugars, sugar alcohols and amino acids). The aim of this study was to characterise the responses of plants from *Plantago* genus to different abiotic stresses (drought, salinity, cold and stress combination). The complete plants grew under in vitro conditions. I compared morphological parameters, selected metabolic parameters (carbohydrates balance and proline accumulation) under optimal conditions and stress exposure. This study was focused on plants from genus *Plantago*, because they differ from each other in their tolerance to the salinity. Both, the glycophyte and the halophyte species are described within this genus. Plantains produce besides widespread soluble carbohydrates (sucrose, glucose, fructose) also sugar alcohol sorbitol, which has been reported as a significant component of the stress response. In addition, the reaction of plants to different carbon and energy sources was tested. More severe growth inhibition of the glycophyte *Plantago lanceolata* compared to the halophyte *P. maritima* was observed under salt treatment. Significant accumulation of sorbitol was observed under prolonged abiotic stress in both species. Osmotic stress caused by non-penetrating osmoticum induced sorbitol accumulation as well, but did not increase the total soluble carbohydrate content. Moreover, the reaction of yet undetermined fraction of carbohydrate spectrum (in this study called RTOS) to the salinity and stress combination (salinity and cold) was observed.

Key words: abiotic stress, carbohydrates metabolism, glycophytes, halophytes, in vitro cultivation, *Plantago*, proline, sorbitol