Acta Biologica Plantarum Agriensis **11**(2): 14 (2023)
ISSN 2061-6716 (Print), 2063-6725 (Online) 6th CC 2023 Abstract, *Lecture*
https://ojs.uni-eszterhazy.hu/index.php/ABPA
https://doi.org/10.21406/abpa.2023.11.2.14

NON-STRUCTURAL CARBOHYDRATES OF BRYOPHYTES IN RELATION TO THEIR ENVIRONMENTAL RESILIENCE

A mohák nem-struktúrális szénhidrátjai összefüggésben a környezeti ellenállóképességükkel

Marianna Marschall

Eszterházy Károly Catholic University, Department of Botany & Plant Physiology, 3300 Eger, Leányka u. 6; E-mail: marschall.marianna@uni-eszterhazy.hu

Non-structural carbohydrates are photosynthesis products, provide substrates for growth and metabolism, and serve as energy storage components. Leafy liverworts (Jungermanniales) contain a diverse range of soluble carbohydrates, including sucrose, fructan and polyols such as mannitol, sorbitol and volemitol. Unlike leafy liverworts, mosses have a simple soluble carbohydrate pool consisting of sucrose, although *Sphagnum* species contain fructans. In both leafy liverworts and mosses, starch and reducing sugars are present at relatively low concentration. Carbohydrate composition of bryophytes in relation to their environmental resilience is discussed in the lecture. Sucrose and trehalose have shapes suitable for association with the polar head groups of phospholipids in place of water and for prevention of damaging phase transitions in membranes during desiccation. Additionally, these sugars maintain a vitreous phase in the cytoplasm of desiccated cells, which minimizes protein denaturation. Fructans can be inserted between the head groups of different kinds of phospholipids with some preference for phosphatidylethanolamine. They are the key regulators of adaptation to various environmental stresses, act as antioxidants, scavenging ROS and preventing cell damage under abiotic stress conditions. Fructan-accumulating species contain only traces (~1%) of starch, which means that fructan is a real alternative to starch. Fructans accumulate in the vacuole, where they play an important role in turgor regulation. More molecules mean that these cells are more resistant to osmotic pressure or even cold. The size of fructan polymers can be altered quickly; this could be an explanation for their role in osmotic adjustment. It is likely that fructans protect plants from various environmental stresses such as frost and drought by stabilizing membranes. Starch synthesis drops dramatically when the temperature decreases below 10°C, but photosynthesis and fructan production are much less sensitive to low temperatures, suggesting that fructan production benefits those plants, which actively photosynthesize during the winter and early spring. Reunion Sphagna generally increased the synthesis of fructans as the altitude increased. The soluble carbohydrate pool is well-balanced in bryophytes (sugar feeding, darkening, dehydration and cold have little effect), fructans are conserved at the expense of a substantial sucrose stock. Ultimately, desiccation, low and high temperature, salt and osmotic stresses all induce a water deficit at the bryophyte cell level. Accordingly, bryophyte resilience showed here share a common physiological basis.