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FATTY ACID COMPOSITION OF MEMBRANE LIPIDS IN SILVER BIRCH BUDS IN THE CRYOLITHIC ZONE

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The fatty acid composition of polar lipids, which are the structural and functional framework of cell membranes in the buds of *Betula pendula* Roth growing in cryolithic zone, was studied for the first time. Lipid metabolism has been found to play a major role in the winter-spring season, when the apical meristem is developing within the bud. At this stage, phospholipids and glycolipids in birch buds feature a prevalence of unsaturated over the saturated fatty acids. Under extremely low air temperatures (–40°C or lower), the double bond index (DBI) and the degree of unsaturation (U/S) were the lowest. A rise of negative air temperatures in the cryolithic zone to the winter-season values common for the entire silver birch range (–20°C and higher) (as a rule, happening in the cryolithic zone in March) causes a rise in the degree of unsaturation of membrane lipids. Phospholipids demonstrated a prevalence of dienoic fatty acids, whereas in glycolipids it was dienoic and trienoic acids, the latter reaching a maximum (80.7%

of total unsaturated fatty acids) by the onset of bud break. It is hypothesized that to secure the viability of the apical meristem in silver birch buds under the specific conditions of the cryolithic zone, two interrelated adaptive mechanisms had been formed, designed not only to protect the primordia against the sharp daily temperature fluctuations in the spring season, but also to safeguard them under exposure to extremely low winter temperatures (up to –60°C), which do not occur elsewhere in the species range. One of these mechanisms appears to be non-specific, and is associated with a shift toward a more unsaturated fatty acid composition, corresponding to a liquid crystal state of membrane lipids. The other adaptive mechanism probably protects the cells against dehydration through involvement of dehydrins as well as a number of other hydrophilic cryoprotectants in combination with elevated membrane lipid viscosity.

Keywords: cryolithic zone, *Betula pendula*, buds, glycolipids, phospholipids, fatty acids