

Sucrose Metabolism of Perennial Ryegrass in Relation to Cold Acclimation

Pankaj K. Bhowmik^{a,b,*}, Ken-ichi Tamura^c, Yasuhara Sanada^c, Kazuhiro Tase^c, and Toshihiko Yamada^a

^a Field Science Center for Northern Biosphere, Hokkaido University, Sapporo 060-0811, Japan

^b Present address: Department of Agriculture, Food and Nutritional Science, Faculty of Agriculture, Forestry and Home Economics, University of Alberta, Edmonton, Alberta, Canada T6G 2P5. E-mail: pbhowmik@hotmail.com

^c National Agricultural Research Center for Hokkaido Region, Sapporo 062-8555, Japan

* Author for correspondence and reprint requests

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Sugar metabolism is one of the important factors involved in winter hardiness and since the discovery of sucrose biosynthesis, considerable advances have been made in understanding its regulation and crucial role. This investigation examined the changes in activities of sucrose metabolizing enzymes and sugar content during cold hardening of perennial ryegrass (*Lolium perenne* L.). Changes in acid invertase (AI), sucrose synthase (SS) and sucrose phosphate synthase (SPS) along with all the three soluble sugars glucose, fructose and sucrose were measured in leaves and stem base tissue during cold acclimation. Although fructans were the predominant carbohydrate the changes in glucose, fructose and sucrose were significant. All the three soluble sugars in both leaf and stem tissues started to decrease from the first day and continued up to day 7 and thereafter started to increase until day 28. AI in the soluble fraction showed a higher activity than that in the cell wall bound fraction. In both the leaf and stem bases soluble AI activity increased during the first week and after that it started to decrease gradually. On the other hand both the SS and SPS increased gradually throughout the acclimation period. Sucrose content was negatively correlated with AI and positively correlated with SS and SPS accounting well for the relation between the substrate and enzyme activity. These results suggest that AI, SS and SPS in ryegrass are regulated by cold acclimation and play an important role in sugar accumulation and acquisition of freezing tolerance.

Key words: *Lolium perenne* L., Cold Acclimation, Sugars