Examining metabolism of carbon and nitrogen metabolites during deacclimation of annual bluegrass and creeping bentgrass

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Previous research has shown that annual bluegrass (*Poa annua* L.) (AB) can exhibit greater sensitivity to freezing injury during cold deacclimation compared to creeping bentgrass (*Agrostis stolonifera* L.) (CB); however, the physiological mechanisms associated with interspecific differences in deacclimation capacities are unknown. Therefore, this study was conducted to compare metabolic changes of 'L-93' CB, a freezing-tolerant ecotype of AB (AB-T), and a freezing-sensitive ecotype of AB (AB-S) during cold acclimation and deacclimation. Following a cold acclimation period (20, 2, and -2 °C), plants were exposed to 8 °C for 0.5, 1, 3, and 5 d to induce deacclimation. Following each cold acclimation and deacclimation treatment, whole plants were sampled for freezing tolerance determination (lethal temperature for 50% of the population, LT50), and crowns were extracted for quantification of soluble sugars, amino acids, and soluble protein content . Among the total soluble protein content, changes in dehydrin proteins were also quantified. Overall, CB achieved better freezing tolerance following cold acclimation compared to AB-T and AB-S. In addition, greater levels of total soluble sugars, sucrose, and high molecular weight fructans were detected in CB along with the accumulation of an 18 kDa dehydrin. Deacclimation was detected in all both species, but CB maintained higher freezing tolerance at each of the deacclimation treatments. Overall, significant decreases in total soluble sugars and HMW fructans were detected in response to deacclimation of CB, AB-T, and AB-S.