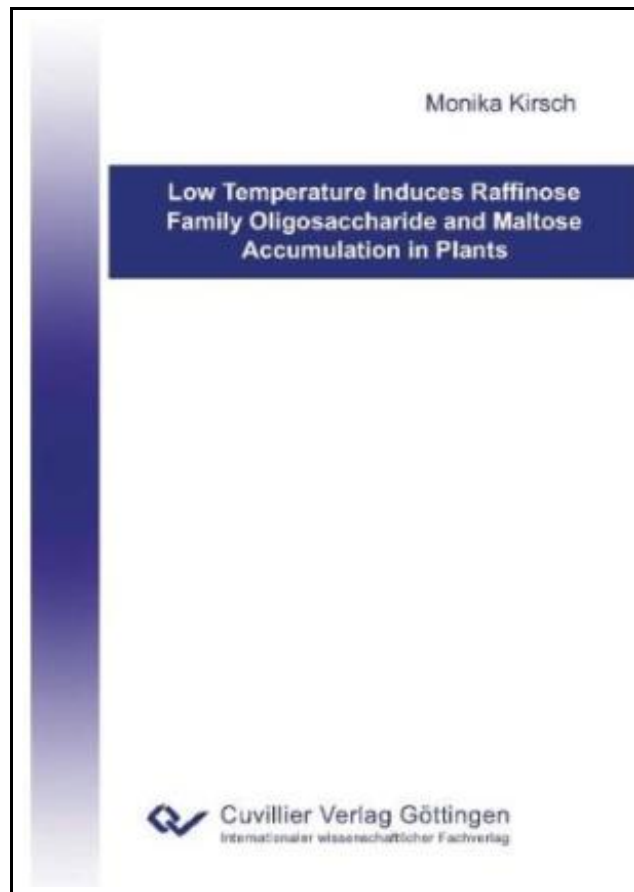


Low Temperature Induces Raffinose Family Oligosaccharide and Maltose Accumulation in Plants



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(Ms. Lora West Jr.)

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Cuvillier Verlag Dez 2009, 2009. Taschenbuch. Book Condition: Neu. 211x148x12 mm. Neuware - Cold stress is amongst the most important abiotic stress factors affecting growth and development of plants in temperate zones. It slows down many enzymatic reactions and may be deleterious to cells due to ice crystal formation. Plants respond and adapt to cold stress through various biochemical and physiological changes collectively termed cold acclimation; i.e. a series of genetically programmed adaptation mechanisms take place during low, non-freezing temperatures. Former observations made in cold-treated *Ajuga reptans* and *Arabidopsis thaliana* plants formed the basis of this thesis, consisting of three topics. (1) Cold treatment of *A. reptans* plants resulted in an increase of raffinose family oligosaccharides (RFOs; -1,6 galactosyl extensions of sucrose) and its biosynthetic enzyme activities in leaves. In this thesis, I investigated the effects of cold treatment on the RFO metabolism of roots of hydroponically-grown plants and hairy root cultures of *A. reptans*. The RFO concentrations increased about 5-fold (to 31 and 19 mg/gFW, respectively) in both root systems after 42 d in the cold (8/3C, 12/12 h). The RFO biosynthetic enzyme activities of galactinol synthase (GolS), stachyose synthase and galactan: galactan galactosyltransferase (GGT), but not raffinose synthase increased slightly in hydroponic roots after 42 d in the cold. All those enzymes showed more pronounced increases in activity in cold- treated hairy root cultures with GolS showing the highest increase and absolute activity (57-fold increase to 1 nkat/gFW). The activities of GolS and GGT correlated positively with the measured expression levels (only these two genes were investigated) in hydroponic roots, but not in hairy root cultures, where the opposite was observed. To my knowledge, the cold-induced RFO increase described here is the first report on the response of the primary metabolism in hairy root cultures. (2) Cold treatment...



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