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Isolation and characterization of hybrid poplar galactinol synthases

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The raffinose family of oligosaccharides (RFOs) likely fulfill at least few major physiological roles in plants, translocation of carbon in the phloem, storage in sink tissues, and as putative biological agents to combat both abiotic and biotic stress [1-3]. The synthesis of galactinol from *myo*-inositol + UDP-galactose, by galactinol synthase (GolS), is considered a key regulatory step in RFO synthesis [4].To investigate the functional roles of this class of compounds in trees, two cDNAs that encode galactinol synthase (GolS), were identified and cloned from hybrid poplar (*P. alba* × *grandidentata*). Phylogenetic analyses of the *Populus* GolS isoforms with other known galactinol synthases suggested a putative role for these enzymes during biotic or abiotic stress in hybrid poplar. The predicted protein sequences of both isoforms (PaxgGolSI and PaxgGolSII) showed characteristics of galactinol synthases from other species, including a serine phosphorylation site at position 266 and the pentapeptide hydrophobic domain ASAAP [5]. Kinetic analyses of recombinant Pa×gGolSI and PaxgGolSII resulted in K_m values for UPD-galactose of 0.79 and 0.65 mM and V_{max} values of 660.4 and 1245 nM min^{-1}, respectively. PaxgGolSI inherently possessed broader pH range and temperature sensitivity when compared to Pa×gGolSII. Interestingly, spatial and temporal expression analyses revealed that *PaxgGolSII* transcript levels varied seasonally, while *PaxgGolSI* did not, thereby implying a temperature-regulated transcriptional control of this gene in addition to the observed thermosensitivity of the respective enzyme. Based on this evidence, we suggest that Pa×gGolSI may be involved in basic metabolic activities (*i.e.*storage), while Pa×gGolSII is likely involved in seasonal mobilization of carbohydrates.

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References

1. Taji T, Ohsumi C, Iuchi S, Seki M, Kasuga M, Kobayashi M, *et al*: **Important roles of drought- and cold-inducible genes for galactinol synthase in stress tolerance in *Arabidopsis thaliana*.** *Plant Journal* 2002, **29(4)**:417-426.
2. Panikulangara TJ, Eggers-Schumacher G, Wunderlich M, Stransky H, Schoffl F: **Galactinol synthase1. A novel heat shock factor target gene responsible for heat-induced synthesis of raffinose family oligosaccharides in *Arabidopsis*.** *Plant Physiology* 2004, **136(2)**:3148-3158.
3. Philippe RN, Ralph SG, Mansfield SD, Bohlmann J: **Transcriptome profiles of hybrid poplar (*Populus trichocarpa x deltoides*) reveal rapid changes in undamaged, systemic sink leaves after simulated feeding by forest tent caterpillar (*Malacosoma disstria*).** *New Phytologist* 2010, **188(3)**:787-802.
4. Keller F, Pharr DM: **Metabolism of carbohydrates in sinks and sources: Galactosyl-sucrose oligosaccharides.** In *Photoassimilate distribution in plants and crops.* New York: Marcel Dekker;Zamski E, & Schaffer AA 1996:115-184.
5. Sprenger N, Keller F: **Allocation of raffinose family oligosaccharides to transport and storage pools in *Ajuga reptans*: The roles of two distinct galactinol synthases.** *Plant Journal* 2000, **21(3)**:249-258.

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