BIOTECHNOLOGICAL APPROACHES TO INCREASE BIOMASS PRODUCTION IN TREES

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Nutrient use efficiency is one of the factors influencing growth and therefore of high importance for biomass production in trees. Poplar is a model tree widely used for molecular and functional studies and the characterization of transgenic poplars overexpressing structural and regulatory genes involved in glutamine biosynthesis has provided insights on how glutamine metabolism is involved in N economy and biomass production in woody plant models. Numerous studies have shown the relevance of GS isoenzymes in plant development, biomass production, and yield (Cánovas et al. 2006; Castro-Rodríguez et al. 2015). In this communication two examples of functional analysis of plant genes in poplar, and their potential interest for biotechnological approaches are presented (Pascual et al. 2018; Rueda-López et al. 2017). Overexpression of cytosolic $NADP^+$-isocitrate dehydrogenase (ICDH), one of the major enzymes involved in the production of 2-oxoglutarate for amino acid biosynthesis in plants, yields poplar trees with increased growth and enhanced vascular development in young leaves and apical stems. These plants also show an increased expression of genes associated with vascular differentiation and altered amino acids and organic acids content (Pascual et al. 2018). In other study, we observed that overexpression of *Dof5*, a transcriptional regulator of lignin production and the carbon-nitrogen balance, produced poplar trees with increased growth and biomass production when N availability in the soil is sufficient (Rueda-López et al. 2017).

Taken together, these results suggest a close relationship between carbon and nitrogen metabolism and highlights the relevance of glutamine and glutamate biosynthesis in the control of growth and development.

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