MOLECULAR CHARACTERIZATION OF A *CINNAMYL ALCOLHOL DEHYDROGENASE (CAD)* GENE FAMILY IN *LIRIODENDRON TULIPIFERA* L., A BASAL ANGIOSPERM SPECIES

Yi Xu,[1] Abdelali Barakat, Scott E. Schlarbaum, Haiying Liang

[1]Deaprtment of Genetics and Biochemistry, Clemson University, Clemson, SC

Cinnamyl alcohol dehydrogenase (CAD) is a key enzyme in lignin biosynthesis since it catalyzes the final step in the synthesis of monolignols. The *CAD* gene family has been extensively studied in several species, including *Arabidopsis thaliana*, *Oryza sativa*, and *Populus*. However, its role in basal angiosperm species and relationship with modern plants still remain unknown. In this study, we report this gene family in a basal angiosperm species, *Liriodendron tulipifera* L., which is an important timber tree species with great evolutional, ecological and economic values. We identified seven *CAD* family genes in *Liriodendron tulipifera* from a comprehensive EST dataset built from ten tissue types. The phylogenetic analysis grouped one of the *Liriodendron CAD* genes in Class I, one in Class III and the remaining five in Class II. qRT-PCR analysis showed that they have distinctive expression patterns in different tissue types, such as xylem, root, bud and leaf. *LtuCAD1* (Class I, *bona fide CAD*), predominantly expressed in xylem, was able to partially recover the lignin content loss in the *Arabidopsis CAD4/5* double mutant, suggesting that it is highly possible that *LtuCAD1* serves as a primary *CAD* gene involved in lignification. The intensive study of *CAD* gene family in *Liriodendron tulipifera* will not only broaden the knowledge of lignin evolution from the ancient gymnosperm to angiosperm, but also provide a new hotspot for manipulation of lignin biosynthesis in woody plants to facilitate its large-scale production of biofuels.