

Phenylalanine Ammonia-Lyase in Loblolly Pine
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L-phenylalanine ammonia-lyase (PAL) is the first enzyme in the phenylpropanoid biosynthetic pathway of plant secondary metabolism. Products of this pathway in conifers include flavonoid pigments in foliage and stilbenes, tannins, polyphenols and lignin in wood. Lignin is the most abundant phenylpropanoid compound in conifers, and makes up about 30% of the dry weight of loblolly pine wood. Biotechnological manipulation of the phenylpropanoid pathway could change lignin content and yield wood with different properties. We have purified PAL from developing wood of loblolly pine, raised antibodies against the purified protein and isolated a partial cDNA clone of PAL. No evidence of heterogeneity has been detected in pine PAL at the protein level, in contrast to reports of multiple isozymes of PAL in herbaceous angiosperms. PAL appears to be encoded by a single gene in the pine genome, based on Southern blot analysis of genomic DNA using the pine PAL cDNA as a probe. We are now working to isolate genomic clones of the pine PAL gene and its associated regulatory elements. We plan to investigate the mechanisms that control levels of PAL activity in developing wood, to lay the foundation for later attempts to manipulate PAL during development.