

CONIFER TERPENES: MANIPULATING AN ANCIENT PLANT DEFENSE PATHWAY FOR PRODUCTION OF RENEWABLE CHEMICALS AND BIOFUELS

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Conifer terpenes were the first “industrial” chemical and today are feedstocks for the largest nonfood-based hydrocarbon industry. Terpenes are important defense compounds that help protect the stem against boring insects and their associated fungi. Conifers evolved specialized duct systems that synthesize and store oleoresin composed of monoterpenes and diterpenoids. In southern pines, sapwood typically contains 3-4% dry weight of terpenes. We are studying the genetics of resin duct formation and terpene synthesis in loblolly pine with the goal of increasing terpene content in the stem for improved resistance to southern pine beetles and as a better source of chemical feedstocks for renewable chemicals and biofuels. With loblolly pine, we are using three genetic engineering strategies to increase wood terpene content. The first strategy aims to increase flux through the plastid terpene biosynthetic pathway. We identified three genes that can increase wood terpene content 2-3 fold. The second strategy uses regulators of resinosis to promote terpene synthesis and resin duct formation. We have identified four genes that increase wood terpene content 2 fold. The third strategy is improve the activity of biosynthetic enzymes. We will report our progress towards increasing wood terpene content.

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