Enzymes in the Formation of Oxygenated Long Chain Fatty Acids for Plant Polyester

R. Franke, L. Schreiber, Bonn/D

The interface between plants and their environment is characterized by the occurrence of cell wall deposited polyester such as cutin or suberin. The physicochemical properties of these biopolyester provide physiologically important functions including the control of water and ion movement, barrier against pathogen attack and rapid sealing of wound sites. Chemically, the suberin polyester is largely comprised of oxygenated fatty acid derivatives, ranging in chain length from C16 to C34. Although, the chemistry has been well established in the last 30 years, only recently the first genes involved suberization, such as ketoacyl-CoA synthases and cytochrome P450 monooxygenases (CYP), have been identified. These reverse genetics approaches revealed chain-length specific reductions in long chain ω-hydroxyacids and α,ω-dicarboxylic acids in the suberin polyester of kcs2, cyp86a1 and cyp86b1 mutants. The chemical phenotype of the cyp86b1 mutant suggests the CYP86B1 protein preferentially functions as docosanoic acid and tetracosanoic acid hydroxylase, Biochemically, this enzyme activity has not been demonstrated in plants before. Furthermore, modifications in chain-length distribution of suberin and compositional alterations lead to significant changes in the barrier properties of suberized tissues.