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Engineering of plants for improved conversion into biofuels and bioproducts

Biomass consists of about 30% xylan, a polysaccharide composed of pentoses. Hexoses are more easily converted to biofuels and bioproducts, and therefore it is advantageous to develop plants with a higher ratio of C6 to C5 sugars in their cell walls. Another major component of biomass is lignin, which is an aromatic polymer that is responsible for biomass recalcitrance and is difficult to convert to fuels or bioproducts. Therefore, it is a goal to decrease the amount of lignin in biofuel feedstocks. However, both xylan and lignin are important components in plants and must be retained in vessels. We have developed strategies to reduce xylan content by at least 30% and lignin content by at least 50% in plant stems without any apparent effect on plant growth and development. The methods are based on dominant genes that can be easily translated to different plant species. Plants modified in this way were further modified to increase the accumulation of pectic galactan by overexpressing a galactan synthase, a UDP-galactose epimerase and a UDP-galactose transporter. The resulting plants are indistinguishable from the wild type under normal growth conditions. Changing the cell walls of plants may lead to altered environmental resilience and we have therefore tested the drought tolerance of some of the engineered plants. Surprisingly, many of the plants show increased drought tolerance.

Biography

Henrik V. Scheller is a senior scientist at Lawrence Berkeley National Laboratory, Adjunct Professor at Department of Plant & Microbial Biology, University of California Berkeley, and Adjunct Professor at Department of Plant and Environmental Sciences, University of Copenhagen. He earned his Ph.D. in Plant Biochemistry from The Royal Veterinary and Agricultural University, Copenhagen, Denmark, after completing a degree in biology at University of Copenhagen. Henrik V. Scheller was professor of molecular plant biology at University of Copenhagen until before joining Lawrence Berkeley National Laboratory to work at the Joint BioEnergy Institute where he is Head of the Feedstocks Division.

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