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EDITORIAL

Plant lipid biology and biotechnology

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Lipids function as the structural components of cell membranes, which serve as permeable barriers to the external environment of cells. In plants, lipids play especially important roles as signaling and energy storage compounds. Plant lipids include triacylglycerols, phospholipids, galactolipids, and sphingolipids. Extracellular lipids are especially important in plants and are comprised of cutin, suberin, and waxes. Jasmonic acid is a particularly important signaling compound in plants (Li-Beisson et al. 2013). In particular, storage oils that accumulate in seeds or fruits as triacylglycerol have been widely used for industrial applications including in paints, soaps, cosmetics, detergents, and pharmaceuticals (Dyer et al. 2008). In the bioeconomy, plant storage oils are used as renewables for the production of biodiesel and non-petroleum-based biomaterials (Durrett et al. 2008). Beyond bioenergy and industrial bioproducts, plant lipids are altered to improve the quantity and quality of oils for food and feed. Thus, our understanding about plant lipid chemistry and biosynthesis is necessary for downstream manipulation of lipids via biotechnology. This special issue focuses on current topics that are currently important for basic and applied plant lipid research.

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While plant lipid research has been active for centuries (Ohlrogge and Browse 1995), our understanding about plant lipid biosynthesis and metabolism has more recently been advanced by the availability of the *Arabidopsis thaliana* genome sequence, followed by genomics of crop plants. Genome-scale research has greatly facilitated the identification of genes that underlie acyl lipid biosynthesis and metabolism (Li-Beisson et al. 2013). Even more recently, technological developments in lipidomics have allowed the analysis of the complete lipid profile within cells, tissues, organs, and organisms (Horn and Chapman 2012).

In this special issue, papers sum up our current knowledge about plant lipids and present modern tools that will be of broad interest to plant researchers. McGlew et al. (2014) describe the integration of *Arabidopsis* mutant information within the ARALIP plant acyl lipid metabolism website (http://aralip.plantbiology.msu.edu). This tool allows facile and rapid access to information about each mutant. In addition, there is a compendium of literature sources that describe the basis for lipid composition of relevant mutants. Both Parveez et al. (2014) and Goold et al. (2014) review cover storage and neutral lipids in oil palm and microalgae, respectively. Parveez et al. describe advances in biotechnology of oil palm that includes biochemical studies, gene and promoter isolation, vector construction for transformation, and genetic transformation technology. Goold et al. report the biogenesis, structure, and function of lipid droplets in the green microalga *Chlamydomonas reinhardtii* and model microalgae, such as species in *Haematococcus* and *Nannochloropsis*. The three review articles written by Lee and Suh (2015), Vishwanath et al. (2014), and Molina and Kosma (2014) are related with the extracellular lipids, cuticular waxes, cutin, and suberins. Lee and Suh specifically describe recent advances in the understanding of the biological functions of genes involved in cuticular wax biosynthesis, transport, and the regulation of wax deposition from *Arabidopsis* and crop species. Vishwanath et al. focus on the transport of suberin components, polymer assembly, and the regulation of suberin deposition. Molina and Kosma outline our current understanding about HXXXD/BAHD acyltransferases that are involved in extracellular lipid biosynthesis. Lee et al. (2015) describe the current progress and barriers of metabolic engineering of plant seed oil for producing hydroxy fatty acid, which is an important industrial raw material. Morales-Cedillo et al. (2014) report on the function of membrane lipids on the activity of plasma membrane H^+-ATPase. Kobayashi et al. (2014) describe the roles of anionic phosphatidylglycerol (PG) in photosynthetic electron transport in thylakoid membranes by characterization of a PG-deficient *Arabidopsis* mutant (*pgp1-2*) under Pi-controlled conditions. Chen et al. (2015) describe the production of high oleic linseed oil for oxidative stability of oils and industrial applications via RNAi-mediated gene silencing technology. Kuntam et al. (2015) describe new fluorochromes for the investigation of dynamic oil bodies within living plant cells using fluorescence microscopy. Taken together, we believe that these 11 papers in this special issue will be useful for plant students and researchers for years to come.

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