Optimizing Wax Ester Production in Oil Seed-crops

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The use of plant oilseed crops for the production of chemicals of industrial value has received increased attention in light of diminishing resources of fossil hydrocarbons. Of particular interest for technical applications are lubricants that are characterized by thermic stability and constant lubrication properties over a wide temperature range. A class of hydrocarbon-based chemicals with desirable lubrication properties are wax esters. Only few plant species, such as jojoba (*Simmondsia chinensis*), naturally produce wax esters, so in order to produce wax esters on a large scale in oilseed crops a suitable reaction sequence must be established by transgenic technology. Wax esters can be formed from plant-endogenous fatty acids by action of fatty acid reductase (FAR), which reduced fatty acids to their corresponding fatty alcohols, followed by wax synthase (WS), which condenses a fatty acid and a fatty alcohol to form the wax ester. For different industrial applications, wax esters of varying chain lengths are desirable and, thus, one task is to isolate FAR and WS enzymes with suitable catalytic specificities. Another task is to ensure proper cooperativity of FARs and WSs in the host organism in order to maximize catalytic efficiency. Here, the interplay of FARs with WS is systematically tested to optimize wax ester production. Enzymes from different biological sources have been identified and introduced in yeast (*Saccharomyces cerevisiae*) to establish wax ester production. Rational modification of enzymes has been attempted to optimize the interplay of FARs and WSs with the aim to provide a range of possible combinations tailored to the production of different species of wax esters. This project is supported by the EC FP7 project “Industrial Crops producing added value Oils for Novel chemicals” (ICON).