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Methabolic Engineering of Plant Biomass for Biofuel Production

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Growing demand for alternative energy sources can be partially fulfilled with a renewable supply of biofuel, plant-derived oil and ethanol. When grown for energy production, instead of smoking, tobacco can generate a large amount of inexpensive biomass more efficiently than almost any other agricultural crop. Toward the goal to significantly increase the oil content in harvested tobacco biomass, we develop a two-step metabolic engineering strategy based on the recent advances in understanding molecular mechanisms of plant oil biosynthesis and plant development. Transgenically enhanced lipid biosynthesis translated into the overall two fold increase of extracted fatty acids [1]. The observed increase in total fatty acid accumulation in tobacco leaves was accompanied by a drastic shift in the fatty acid composition. This shift makes tobacco biomass oil composition more similar to canola oil, a standard biodiesel fuel used in Europe. Following oil extraction, the remaining plant biomass could be used for ethanol fermentation.

- [1] Andrianov V., Borisjuk N. et al., *Plant Biotechnology Journal* **8**, (2010), p. 277. A.