

The Metabolic Basis of Low Biosynthetic Efficiency in an Oilseed

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Project goals:

The practical of this project is to increase the seed yield of *Camelina sativa* by engineering increases in the metabolic efficiency with which its seeds convert sugars and amino acids supplied by the plant into storage products. To accomplish this, we have used Metabolic Flux Analysis to understand the basis of metabolic efficiency in this oilseed crop.

Abstract:

Camelina sativa, a member of the Brassicaceae, has tremendous potential for oil production. It is resilient to limited water and fertilizer supplies, has a short maturation time, and is not widely used for food production compared to other oilseeds (eg. Soybean, Canola). However, its seed yields are currently lower than those needed for agricultural success as a biofuel/chemical feedstock crop in the US. Developing Camelina embryos have a carbon conversion efficiency (CCE) lower than sunflower and less than half that of Canola embryos. This is unusual because in green seed plants, such as camelina, light improves CCE and generates ATP and reductant for the developing embryo. CCE derives from central metabolic fluxes, for whose quantification steady state metabolic flux analysis (MFA) has proven effective in other systems. We applied MFA to quantitatively map internal fluxes in developing Camelina embryos under high, normal and no light, which demonstrated that high fluxes through the Oxidative Pentose Phosphate are responsible for Camelina seeds' low CCE.

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