BRC Science Highlight
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Expression of a Lychee *PHOSPHATIDYLCHOLINE:DIACYLGLYCEROL CHOLINEPHOSPHOTRANSFERASE* with an *Escherichia coli CYCLOPROPANE SYNTHASE* Enhances Cyclopropane Fatty Acid Accumulation in Camelina Seeds

Background/objective

Cyclopropane fatty acids (CPAs) are useful feedstocks for biofuels and bioproducts such as lubricants and biodiesel. The goal of this study was to identify factors that can facilitate the accumulation of CPA in seed triacylglycerol (TAG) storage oil. Adding enzymes from species that naturally accumulate CPA in their seed oil, such as lychee, can overcome poor CPA metabolism. A lychee *PHOSPHATIDYLCHOLINE:DIACYLGLYCEROL CHOLINEPHOSPHOTRANSFERASE (LcPDCT)* was cloned to catalyze CPA biosynthesis.

Approach

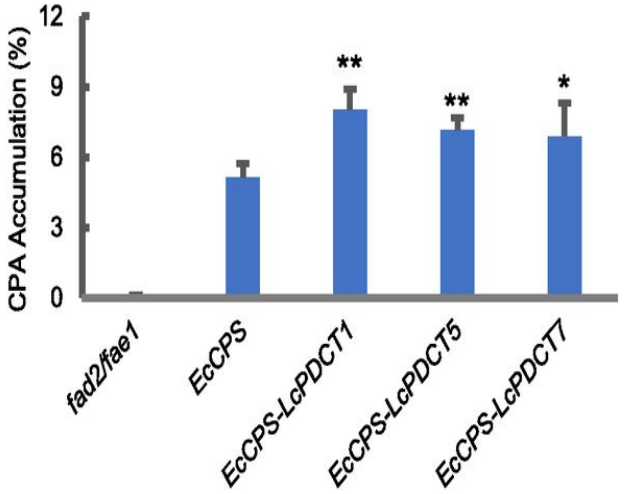
- *Escherichia coli cyclopropane synthase (EcCPS)* lines, using kanamycin resistance, were generated to study the expression of LcPDCT's effects on CPA accumulation.

Results

- When *LcPDCT* was expressed in *EcCPS*-expressing transgenic camelina seeds, it doubled the transfer of CPA and led to a 57% increase in CPA accumulation in TAG.

Significance

- Engineering transgenic crops to accumulate high levels of CPA and to produce them at low cost is necessary for adoption as alternative feedstocks for biofuel and bioproducts.
- The addition of PDCT facilitates more efficient movement of CPA and establishes LcPDCT as a useful factor to stack with other transcription factors to enhance CPA accumulation in plant seed oil.



CPA accumulation (%) in mature transgenic camelina seeds. CPA is expressed as a weight percentage of the total seed fatty acids. A mean of 5.1% to 8% represents an approximately 57% increase in CPA levels.

Yu, X., et al. 2019. "Expression of a Lychee PHOSPHATIDYLCHOLINE:DIACYLGLYCEROL CHOLINEPHOSPHOTRANSFERASE with an Escherichia coli CYCLOPROPANE SYNTHASE Enhances Cyclopropane Fatty Acid Accumulation in Camelina Seeds." Plant Physiology. 180: 1351-1361. DOI: 10.1104/pp.19.00396.

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