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Overexpression of *Brassica napus DGAT*2 in *Chlorella sorokiniana* enhanced PUFA and neutral lipids potential for biodiesel production

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Abstract

Constantly rising energy demands, finite fossil fuel reserves and deteriorating environmental conditions have invoked worldwide interest for exploring the sustainable sources of renewable biofuels. Locally adapted photosynthetic oleaginous microalgae by tweaking with over expression of transgenes responsible for higher lipid production could be an ideal way producing the sustainable feedstock for biodiesel. Higher lipid biosynthesis is an important aspect for an economic viability of biofuel production using microalgae. To enhance lipid content, *Chlorella sorokiniana*-I was genetically engineered with a key enzyme diacylglycerol acyltransferase (*BnDGAT2*) from *Brassica napus*, responsible for neutral lipid biosynthesis. The transformed colonies expressing *aph*7 gene, were selected on hygromycin-supplemented medium after bombardment of algal cells using gene-gun. Higher rate of transformation frequency was observed and transgene integration and expression were confirmed by PCR, Southern blots, staining lipid droplets, proteins and spectrofluorometric analysis of Nile red-stained cells. The physiological parameters of transgenic *C. sorokiniana* like growth, lipid and FAME content were comparatively studied with non-transformed wildtype algal strain. The total lipid and fatty acid methyl esters (FAME) were observed 1.5 and 3-fold respectively higher in transgenic alga in comparison to wildtype. The heterogenous *BnDGAT*2 expression in *C. sorokiniana* has completely altered the lipid composition. The α-linolenic acid, an essential omega-3 fatty acid (PUFA) was observed 50% higher in transgenic cells. The neutral lipid is a major class (over 80% of total lipids) and most significant requirement for biodiesel production; was remarkably doubled in the transformed alga than wildtype control. The overexpression of *BnDGAT*2 significantly altered the fatty acids profile in the transformed alga. Results of this study offer a valuable strategy of genetic manipulation for enhancing polyunsaturated fatty acids and neutral lipids for biofuel production in algae.

Biography:

Ms. Prachi Nawkarkar is a Senior Ph.D. Student at International Centre for Genetic Engineering and Biotechnology. She is currently working on a fresh water green algal isolate, to determine its utility as a biofuel feedstock, in order to increase its biofuel efficiency through chloroplast transformation.