Synopsis of Original Research Paper

Modification of fatty acid composition by over and antisense-expression of a microsomal ω-3 fatty acid desaturase gene in transgenic tobacco

Koh Iba

Faculty of Science, Kyushu University

Vegetative oils are of economic importance as human and animal foods and m many industrial applications. As the fatty acid compositions of most vegetative oils are not optimal for these uses, there is a broad interest in controlling the fatty acid compositions of higher plants. ω -3 fatty acid desaturase, which catalyzes the conversion of linoleic acid (18:2) to Inolenic acid (18:3) in lipids, are located in the microsomes and plastid membranes. Transgenic tobacco plants were produced that express the transcripts of a tobacco microsomal ω -3 fatty acid desaturase gene (NTFAD3) in antisense and sense orientations under the control of the califlower mosaic virus 35S promoter. The antisense construct has the 0.5-kb fragment of the NTFAD3 cDNA containing a 31-flanking region and a part of the coding region in antisense orientation. The antisens-transformant lines showed decreases of the steady-state NTFAD3mRNA level to 30% of the control plants. In these lines, the 18:3 content decreased to about 80% in root tissues and to about 70-80% in leaf tissues when compared with the control plants. The sense construct has the 1.4-kb full-length cDNA of NTFAD3. In one of the sensetransformants lines, the 18:3 content increased by about 1.5-fold in root tissues and by about 1.1-fold in leaf tissues. These results indicate that the up- and down-regulation of the transcript level in the microsomal ω -3 fatty acid desaturase gene is useful to modify the 18:3 content in the vegetative tissues of higher plants.