

Functional complementation of green perilla *fad3* gene by sesame seed specific-*fad2* promoter

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In developing seeds of green perilla (*Perilla frutescens*), omega-3 unsaturated fatty acid (α -linolenic acid) accumulates up to 65% of total fatty acids. A seed-specific gene involved in the biosynthesis of linolenic acid was isolated from developing perilla oil seeds (Plant Cell Physiol. 40:114-118). Using four different cassettes expressing the perilla *fad3* (ω -3 fatty acid desaturase) gene under the regulatory system of sesame seed specific-*fad2* (ω -6 fatty acid desaturase) promoter which has been isolated from sesame (*Sesamum indicum* L.), we have conducted functional complementation experiments in *Arabidopsis fad3* mutant and wild-type *Arabidopsis*, and obtained some results from the transgenic *Arabidopsis* plants. Oil content and fatty acid composition in dry seeds from non-transgenic and transgenic *Arabidopsis* plants were compared by gas chromatographic analysis. From this study, two important results have been examined. One is that wild-type *Arabidopsis* showed the normal or suppressed activity of α -linolenic acid biosynthesis by the transformation with the expression cassettes, indicating that the inserted *fad3* gene may be inefficient for improved production of α -linolenic acid in the seeds. Another is that biosynthesis of α -linolenic acid was observed in *Arabidopsis fad3* mutant seeds by the transformation with one of four expression cassettes, suggesting that the cassette may be useful for genetic improvement of oil seeds with low levels of α -linolenic acid. Other cassettes are still under investigation. In addition, by an exogenous application of ABA in developing sesame seeds, it was identified that ABA is involved in the regulation of *SeFAD2* gene expression during seed development.

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