Devolopmental and growth temperature regulation of omega-3 fatty acid desaturase genes in safflower (Carthamus tinctorius L.)

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ABSTRACT. Three ω-3 fatty acid desaturase genes (CtFAD3, CtFAD7, and CtFAD8) were isolated from safflower (Carthamus tinctorius L.). Transcript analysis showed that the highest transcript levels were detected for CtFAD3 and the low transcript levels were detected for CtFAD7 and CtFAD8 in flowers. This result indicates that CtFAD3 enzyme activity is important for fatty acid desaturation in flowers. The low transcript level of CtFAD3 in developing seeds was consistent with the recorded high level of linoleic acid (18:2) and lack of linolenic acid (18:3) in safflower seed oil. At low temperatures, the induced transcription levels of ω-3 fatty acid desaturase genes in the stems and petioles were consistent with increased polyunsaturated fatty acids (PUFAs). In the roots, ω-3 fatty acid desaturase noticeably increased at low temperatures, whereas PUFA levels decreased.
Interestingly, C18:3\textsuperscript{\Delta9,12,15} alcohol was specifically found in safflower roots, and showed a significant increase, indicating a flux in the acid to alcohol ratio of this compound in safflower roots.

Key words: Safflower; Polyunsaturated fatty acids (PUFAs); Fatty acid desaturase; Real-time PCR; Gene expression