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Molecular cloning, expression and characterization of a squalene synthase gene from grain amaranth (*Amaranthus cruentus* L.)

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Abstract

A gene encoding squalene synthase from grain amaranth was cloned and characterized. The full-length cDNA was 1805-bp long and contained a 1248-bp open reading frame encoding a protein of 416 amino acids with a molecular mass of 47.6 kDa. Southern blot analysis revealed that the *A. cruentus* genome contained a single copy of the gene. Comparison of the cDNA and genomic sequences indicated that the amaranth *SQS* gene had 12 introns and 13 exons. All of the exons contributed to the coding sequence. The predicted amino acid sequence of the SQS cDNA shared high homology with those of SQSs from several other plants. It contained conserved six domains that are believed to represent crucial regions of the active site. We conducted qRT-PCR analyses to examine the expression pattern of the *SQS* gene in seeds at different developmental stages and in several tissues. The amaranth *SQS* gene was low levels of *SQS* transcripts at the initial stage of seed development, but the levels increased rapidly at the mid-late developmental stages before declining at the late developmental stage. These findings showed that the amaranth *SQS* is a late-expressed gene that is rapidly expressed at the mid-late stage of seed development. In addition, we observed that the *SQS* mRNA levels in stems and roots increased rapidly during the four- to six-leaf stage of development. Therefore, our results showed that the expression levels of *SQS* in stem and root tissues are significantly higher than those in leaf tissues. In present study provides useful information about the molecular characterization of the *SQS* clone isolated from grain amaranth. Finally, a basic understanding of these characteristics will contribute to further studies on the amaranth *SQS.*

Keywords: Amaranth, Squalene synthase, Cloning, Gene expression

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