



Short Communication

Molecular cloning and characterization of *GbDXS* and *GbGGPPS* gene promoters from *Ginkgo biloba*

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ABSTRACT. Ginkgolides are key pharmaceutical components in *Ginkgo biloba* leaves. 1-Deoxy-D-xylulose-5-phosphate synthase (*GbDXS*) and geranylgeranyl pyrophosphate (*GbGGPPS*) genes are critical genes involved in ginkgolide biosynthesis. In this study, the promoters of *GbDXS* and *GGPPS*, with 676 and 570 bp in length, respectively, were cloned by chromosome walking. The cis-elements of *GbDXS* and *GbGGPPS* promoters were predicted and analyzed by the plant cis-acting regulatory element (CARE) database. We found some major cis-elements in the sequence of *GbDXS* and *GbGGPPS* promoters. The *GbDXS* promoter has 3 TATA boxes, 10 CAAT boxes, 6 GATA boxes, and 1 I box. The *GbGGPPS* promoter has 1 TATA box, 6 CAAT boxes, 6 GATA boxes, and 4 I boxes. Furthermore, some stress-related cis-elements in the promoters of *GbDXS*

and *GbGGPPS* were found to be light-regulated elements, including sequences over-represented in light-induced promoters (SORLIP1-AT), GATA box, and I box, a gibberellin-responsive element (WRKY), salicylic acid-induced (GT-1), cold- and dehydration-responsive (MYC-Core), and copper-inducible (CURE-Core). Further analyses of these cis-elements will aid in elucidating the molecular mechanisms regulating the expression of the *GbDXS* and *GbGGPPS* genes during ginkgolide accumulation in *G. biloba*.

Key words: Molecular cloning; *GbDXS*; *GbGGPPS*; Promoter; Cis-acting elements; *Ginkgo biloba*