Molecular cloning and characterization of a chlorophyll degradation regulatory gene (ZjSGR) from Zoysia japonica

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ABSTRACT. The stay-green gene (SGR) is a key regulatory factor for chlorophyll degradation and senescence. However, to date, little is known about SGR in Zoysia japonica. In this study, ZjSGR was cloned, using rapid amplification of cDNA ends-polymerase chain reaction (PCR). The target sequence is 831 bp in length, corresponding to 276 amino acids. Protein BLAST results showed that ZjSGR belongs to the stay-green superfamily. A phylogenetic analysis implied that ZjSGR is most closely related to ZmSGR1. The subcellular localization of ZjSGR was investigated, using an Agrobacterium-mediated transient expression assay in Nicotiana benthamiana. Our results demonstrated that ZjSGR protein is localized in the chloroplasts. Quantitative real time PCR was carried out to investigate the expression characteristics of ZjSGR. The expression level of ZjSGR was found to be highest in leaves, and could be strongly induced by natural senescence, darkness, abscisic acid (ABA), and methyl jasmonate treatment. Moreover, an in
vivo function analysis indicated that transient overexpression of ZjSGR could accelerate chlorophyll degradation, up-regulate the expression of SAG113, and activate ABA biosynthesis. Taken together, these results provide evidence that ZjSGR could play an important regulatory role in leaf chlorophyll degradation and senescence in plants at the molecular level.

**Key words:** Zoysia japonica; SGR; Chlorophyll degradation; Leaf senescence