

Nucleotide variations of 9-cis-epoxycarotenoid dioxygenase 2 (NCED2) and pericarp coloration genes (Rc and Rd) from upland rice varieties

ABSTRACT

In this study, we analyzed the Rc and Rd genes that are responsible for the coloration of rice pericarps from six upland rice varieties. We also examined the association of pericarp coloration to the single nucleotide polymorphism in 9-cis-epoxycarotenoid dioxygenase 2 (NCED2), a key gene involved in abscisic acid (ABA) biosynthesis. Our findings demonstrated that all the upland rice varieties analyzed have a Rd gene which encodes a complete dihydroflavonol-4-reductase without early translational termination codon irrespective of their pericarp colors. However, the upland rice varieties with white pericarps were found to have a defective Rc gene with a 14-base deletion at exon 7 which could disrupt the function of a positive regulator of proanthocyanidin biosynthesis. In addition, the NCED2 genes from the upland rice varieties with white pericarps in this study have a C-allele while the NCED2 genes from Pandasan Red, Tomou and Taragang varieties that bear red pericarps were found to have a T-allele which was reported to be associated with a higher ABA level in upland rice. A better understanding of the gene sequences of upland rice varieties with red pericarp may provide important information for rice breeding programs.

Keyword: Abscisic acid; Proanthocyanidin biosynthesis; Rice pericarp colors; Single nucleotide polymorphism