

Discovery of Genomic Regions and Candidate Alleles for Purple Leaf by Employing Next Generation Sequencing Based Qtl-Seq Approach in Rice (*Oryza Sativa* L.)

Authors : Jamaloddin Mohd, Devika Talwar, CG Gokulan, Maliha A, Raju Madhanala, Hitendra Kumar Patel

Abstract : Anthocyanin is one of the important health-promoting antioxidants due to its potential nutritional value. Purple color is observed in several organs and tissues of rice, such as the pericarp, flower organs, leaves, leaf sheaths, internodes, ligules, apex, and stigma. Although many studies have been conducted on the color of rice hull and pericarp, little is known about the genes and mechanisms responsible for other organs, such as leaves, and its gene regulatory network has not been thoroughly investigated. In this study, Chinnar-20, a purple leaf color rice variety, was used as a donor parent and Improved Samba Mahsuri (ISM), a green leaf mega-variety, was used as a recipient parent. By combining bulk segregant analysis and the QTL-seq approach, the present study aimed to determine the Quantitative Trait Loci (QTL) involved in anthocyanin biosynthesis in the F2 population (n=125), which was obtained by a cross between Chinnar-20 and ISM. Genetic analysis showed that a single recessive gene controls purple leaf traits. The whole genome sequencing and subsequent QTL-seq analysis of purple leaf (n=15) and green leaf (n=15) bulks identified a locus on chromosome 4, approximately from 27 to 34 Mb, containing 401 genes to be linked to the trait. Subsequently, RT-PCR of two rice varieties was used to analyze the differentially expressed genes in the QTL interval. The analysis showed Os04g0557500 (Kala4) and Os04g0557800 (Pl), which were previously associated with pigmentation in rice, to be highly upregulated. Hence, we propose that the two upregulated genes, Kala4 and Pl, are potential candidate genes for the purple leaf trait in Chinnar-20. We also report the allelic variations in these two genes that can aid in marker development and trait introgression.

Keywords : rice (*Oryza sativa* L.), purple leaf color, mapping, QTL Seq, SNPs, ΔSNP-Index, next-generation sequencing

Conference Title : ICABBBE 2025 : International Conference on Agricultural, Biotechnology, Biological and Biosystems Engineering

Conference Location : Dubai, United Arab Emirates

Conference Dates : February 10-11, 2025