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Genetic diversity of Indian rice germplasm reveals importance of green revolution gene for rainfed breeding

Prashant Vikram

International Rice Research Institute, Philippines

Abstract

The major paradigm shift through green revolution was achieved through introduction of semi-dwarfing- gene, *sd1* into the locally adapted low yielding, low fertilizer responsive and lodging prone tall traditional rice and wheat varieties. Green revolution rice and wheat varieties became popular among farmers and led to a gradual replacement of the landraces and traditional varieties. Landraces and traditional varieties grown in the rainfed areas have immense genetic potential for adaption in drought prone environments. Their morphological, physiological, and phenotypic characterization for drought stress is an important pre-requisite. A total of 70 Indian rice cultivars including varieties, landraces as well as traditional donors were subjected to the genetic diversity analysis. Genotyping was carried out using a set of thirty six SNPs involving three SNP per chromosome. There were two genetic clusters, one with mostly '*aus*' cultivars and other with '*indica*' germplasms. These cultivars were phenotyped for drought related traits as well in dry and wet seasons of 2010. Genetic diversity analysis was also performed with three major drought QTLs published so far. One of them ($qDTY_{1.1}$) harbors the green revolution gene *sd1* as revealed in several reports. These germplasms were analyzed for the *sd1* gene also. Most of the well known drought tolerant landraces, traditional varieties or breeding lines had tall allele of the *sd1* gene and vice-versa for the dwarf allele indicating towards possibility of either (1) linkage or (2) pleiotropy or (3) both associated with this gene. This analysis indicated that “Looking beyond green revolution is in fact looking behind green revolution”. Study also indicated that drought QTL alleles are conserved in drought tolerant landraces/traditional varieties. Genetic information generated in the study would be useful in conventional as well as marker assisted breeding approaches for drought tolerance in rice.

Biography

Prashant Vikram has completed his Ph.D in 2011 from International Rice Research Institute, Philippines. Previously, he worked at two ICAR institutions- Indian Institute of Pulses Research, Kanpur and National Research Center for Plant Biotechnology, New Delhi. He is worked as Visiting Scientist at IRRI after completing his PhD for two years. He is working in the area of drought molecular breeding in rice.