

Vaiphot Kanjoo 2012: Development of Chromosome Segment Substitution Lines Related to Drought Tolerance in Rice (*Oryza sativa* L.). Doctor of Philosophy (Agricultural Biotechnology), Major Field: Agricultural Biotechnology, Interdisciplinary Graduate Program. Thesis Advisor: Mr. Theerayut Toojinda, Ph.D. 95 pages.

Drought tolerance (DT) in rice (*Oryza sativa* L.) is a complex quantitative trait and tolerance mechanisms are not fully understood. This study aims to develop plant materials particularly chromosome segment substitution lines (CSSLs) carrying single DT quantitative trait loci (QTL) by marker assisted backcrossing (MAB). The CSSLs can be used as genetic material to understand the genetic basis and mechanisms of DT in rice. Four genomic segments on chromosomes 1, 3, 4, 8 and 9 containing DT-QTL inherited from doubled haploid lines IR68586-F₂-CA-31 and IR68586-F₂-CA-143 are the target of introgression. Five rounds of MAB were conducted and a set of CSSLs was developed. In each CSSL, a different chromosome segment of DT donors was substituted in the genetic background of Khao Dawk Mali 105 (KDML105). The substituted chromosome segments of the 104 CSSLs covered most of DT-QTL regions located on the five target chromosomes, except for the middle region of DT-QTL on chromosome 9. A set of 131 polymorphic SSR markers were used for genome scanning to estimate the proportion of donor alleles in the non-target areas. CSSLs recover up to 96.30% of the KDML105 genome (individuals ranging from 88.50 to 100 %). The CSSLs were evaluated for agronomic performance under rainfed and irrigated conditions. Variations of agronomic traits were observed in both conditions. Some of the CSSL showed higher grain yield than the recipient parent, KDML105 under rainfed condition (mild drought stress). This result demonstrated that CSSLs can be a useful material to dissect genes underlay the DT. The CSSLs that show a good adaptation under drought stress can be used as genetic materials to improve drought tolerance in the rainfed lowland rice breeding program.

Student's signature

Thesis Advisor's signature