

Khin Myo Win 2013: Identification of Non-Aged-Related Broad Spectrum Resistance and Marker Assisted Introgression of Multiple Genes for the Improvement of Bacterial Blight Resistance in Rice. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Faculty of Agriculture. Thesis Advisor: Mr. Theerayut Toojinda, Ph.D. 122 pages.

Bacterial blight (BB) caused by *Xanthomonas oryzae* pv. *oryzae* is one of the most devastating rice diseases. Large-scale and long-term cultivation of rice varieties with single gene may enable the pathogen easily to overcome their resistance. Therefore, identification of excellent genetic resources and resistance genes is need for an improvement of BB resistance in rice breeding program. In the first study, we would like to identify a non age-related broad spectrum resistance to BB in the rice variety IR1188. The genes confer the non-age-related broad spectrum resistance to BB (*Xa21* and seedling resistance genes) possessing by the IR1188 were introgressed into KDML105 through three rounds of marker assisted backcrossing (MAB) and phenotypic selection. Sixty KDML105 backcross introgression lines (KBILs), all carrying the *Xa21*, were challenged with 19 isolates. Three seedling resistance (SR) loci inherited from IR1188 were identified on rice chromosomes 1 (RM302-RM212), 8 (RM210-RM149) and 11 (RM287-RM224). Based on the data obtained from the rainfed lowland project, all KBILs and the original KDML105 were not significantly different in their agronomic performance. The information of seedling resistance identified in this experiment was lead to identify a non age-related broad spectrum BB resistance in KDML105.

In the second study, an improved Manawthukha rice line 'Yn 3248-2-128-76-4-3-75' (MK-75) that has high yield, good grain and cooking quality was used as recipient parent to improve its resistance to the BB. RGDU-07097-1-8M-9 (RG-9), an improved resistance line carrying the *xa5*, *Xa21* and *xa33* was used as donor parent. Three backcrosses and one selfing with the aided of marker assisted selection (MAS) were successfully transfered the resistant alleles of *xa5*, *Xa21* and *xa33* from RG-9 into the MK-75 while maintain the cooking quality of the MK-75. Twenty eight selected BC₃F_{2:3} introgression lines (MK75ILs) carrying different combinations of these loci were tested for BB resistance at the seedling and tillering stages against ten Thai *Xoo* and five Myanmar *Xoo* isolates. The triple and double resistance gene-introgressed lines (*xa5Xa21xa33* or *xa5Xa21* or *xa5xa33* or *Xa21xa33*) had higher resistance and wider resistant spectrum to BB than MK-75 against both Thai and Myanmar *Xoo* isolates. The single resistance gene-introgressed lines carrying the *xa5* had higher resistance than that carrying the *Xa21* and *xa33* against Thai *Xoo* isolates, while resistance gene-introgressed lines carrying *Xa21* showed higher level of resistance to Myanmar *Xoo* isolates followed by lines with *xa5* and *xa33* respectively. These results clearly indicated that pyramiding of multiple genes is a useful approach for improving BB resistance in MK-75. All MK75ILs had physical grain quality, fragrance and intermediate amylose content similar to the MK-75.

Student's signature

Thesis Advisor's signature