Jirapong Jairin 2008: High-resolution Mapping of a Brown Planthopper (BPH) Resistance Gene, *Bph3*, and Marker-assisted Selection for BPH Resistance in Rice. Doctor of Philosophy (Plant Breeding), Major Field: Plant Breeding, Interdisciplinary Graduate Program. Thesis Advisor: Mr. Theerayut Toojinda, Ph.D. 148 pages.

The brown planthopper (BPH) is one of the most destructive insect pests of rice in Thailand. We performed a cluster analysis that revealed the existence of four groups corresponding to the variation of virulence against BPH resistance genes in 45 BPH populations collected in Thailand. Rice cultivars Rathu Heenati and PTB33, which carry *Bph3*, showed a broad spectrum resistance against all BPH populations. The simple sequence repeat analysis was performed to identify and localize the *Bph3* gene. Based on the linkage analysis of 208 BC_1F_2 and 333 BC_3F_2, from crosses of PTB33×RD6 and Rathu Heenati×KDML105, respectively, we were able to map the *Bph3* locus on rice chromosome 6. Physical mapping of *Bph3* was further performed using a BC_3F_3 population derived from a cross between Rathu Heenati and KDML105. According to the genome sequence database of Nipponbare, the *Bph3* locus was finally localized approximately in a 190 kb interval flanked by markers RM19291 and RM8072.

Introgression lines (ILs) with brown planthopper resistance and KDML105 grain quality characteristics were successfully developed by the integration of phenotypic and marker assisted selections in three generations of backcrossing. The linkage drag between the *Bph3* and Wx^a allele was successfully dissected and the BPH resistance gene was introgressed into the KDML105 genetic background. The improved lines were not only showed the excellent cooking and eating quality of the milled rice but they also expressed a broad spectrum resistance against BPH populations in Thailand. The ILs developed in this study will have an impact on the yield stability and sustainability in KDML105-producing areas. Additionally, the ILs can be used as genetic resources of BPH resistance to improve rice varieties with the Wx^b allele in breeding programs.

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