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QTL Mapping of *qBK1^{WD}* to Improve Bakanae Disease Resistance in Rice

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[Introduction]

Bakanae or foot rot disease is a prominent disease of rice caused by *Gibberella fujikuroi*. This disease may infect rice plants from the pre-emergence stage to the mature stage. In recent years, raising rice seedlings in seed boxes for mechanical transplanting has increased the incidence of many seedling diseases; only a few rice varieties have been reported to exhibit resistance to bakanae disease. In this study, we attempted to identify quantitative trait loci (QTLs) conferring bakanae disease resistance from the highly resistant japonica variety Wonseadaesoo.

[Materials and Methods]

We generated 200 F_{2:4} RILs from a cross between Wonseadaesoo and Junam for QTL analysis. Rice bakanae disease pathogen, CF283, was mainly used for inoculation, and evaluation of disease was performed with the large-scale screening method developed by Kim et al. (2014). Statistical differences between means were analysed using Duncan's multiple range test for SAS 9.4 program (SAS Institute Inc., Cary, NC, USA).

[Result and Discussions]

A significant QTL associated with bakanae disease resistance at the seedling stage was detected on chromosome 1, and it was designated *qBK1^{WD}*. We identified that the QTL *qBK1^{WD}* is approximately a 1.59 Mb interval delimited on the physical map between chr01_13542347 (13.54 Mb) and chr01_15132528 (15.13 Mb). To identify the pyramiding effect of the two major QTLs *qBK1^{WD}* and *qBK1*, we further generated 314 F₄ RILs from a cross between Wonseadaesoo (harboring *qBK1^{WD}*) and YR24982-9-1 (harboring *qBK1*). The mean proportion of 31 healthy F₄ RILs that had no resistance genes (aabb) was 35.3%, which was similar to that of the susceptible check variety Ilpum. *qBK^{WD}* (aaBB) or *qBK1* (AAbb) was 66.1% and 55.5%, respectively. The mean proportion of the 15 healthy F₄ RILs harboring both *qBK^{WD}* and *qBK1* (AABB) was 80.2%, which was significantly higher than that of lines with only *qBK^{WD}* (aaBB) or *qBK1* (AAbb). Therefore, introducing *qBK^{WD}* or pyramiding the QTLs *qBK^{WD}* and *qBK1* could be a effective tool for resistant rice breeding of bakanae disease resistance to provides higher and/or durable resistance against bakanae disease.

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