

Gene pyramiding effect of two major bakanae disease resistance gene using *qBK1* and *qBK^{WD}*

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[Introduction]

Bakanae disease is one of the most serious problems in rice production in Korea, and has become serious in the hybrid rice growing area, worldwide, where involves increased use of seed beds for the raising platelets. In a previous research, we identified *qBK1*, a major QTL for bakanae disease resistance, from YR24982-9-1 (BC₅F₅ resistant line) by using indica variety (Shingwang) as the donor and a japonica variety (Ilpum) as the recurrent parent (Hur et al, 2015). YR24982-9-1 was derived Shingwang harboring *qBK1* region on chromosome 1. In this study, two resistance region cross between Wonsedaesoo and YR24982-9-1. Resulting F₄ lines (YR31618) were used to identify gene pyramiding effect harboring both *qBK1* and *qBK^{WD}*.

[Materials and Methods]

The japonica rice variety Wonsedaesoo was selected as resistant donor to bakanae disease. Three hundred sixty RILs (F₄) were generated from a cross between Wonsedaesoo and other resistant variety, YR24982-9-1. Rice bakanae disease pathogen, CF283, was mainly used inoculation and evaluation of disease was performed with the method of 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]

We identified a gene pyramiding effect of two QTLs, *qBK^{WD}* and previously developed *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. The proportion of healthy plants of the lines with only *qBK^{WD}* (aaBB) or *qBK1* (AAbb) was 66.1% and 55.5%, respectively, which was significantly higher than that of the lines without resistance genes (aabb) and that of Ilpum. 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 provide effective tools for breeding rice with bakanae disease resistance. To our knowledge, this is the first report on a gene pyramiding effect that provides higher and/or durable resistance against bakanae disease.

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