

Cloning of the brown planthopper resistance gene *BPH26* from indica rice cultivar induces sucking inhibition

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Brown planthopper (BPH) is a serious pest of rice. A BPH-resistance gene, *BPH26*, was cloned from an indica rice cultivar. It was revealed that although the stylet of BPH could reach the phloem, it could not suck the phloem sap from the rice plants carrying *BPH26* and subsequently died from starvation.

Keywords: *indica* rice cultivar, brown planthopper, *Nilaparvata lugens* Stål, BPH resistance gene, sucking inhibition, *BPH26*, NBS-LRR

Background

The brown planthopper (BPH), *Nilaparvata lugens* Stål, is an important pest of rice (Fig. 1), which causes serious damage to rice cultivation by sucking the phloem sap until the plant dies. Since BPH strains showing resistance to insecticides such as imidacloprid have emerged, the issue of BPH damage to rice cultivation has become more serious. Although it has been reported that *BPH26* could confer resistance to BPH which has recently migrated to Japan because of the coexistence of *BPH25*, the *BPH26* has not been cloned yet. Development and utilization of BPH-resistant rice varieties will promote environment-friendly and low-cost agricultural practices involving limited use of pesticides.

Results and Discussion

1. The chromosomal location and nucleotide sequences, and functions of *BPH26* were analyzed, and DNA markers of *BPH26* were developed for marker-assisted breeding.
2. The *BPH26* was identified using transgenic rice lines with the gene. It was revealed that BPH could not suck the phloem sap from rice varieties carrying *BPH26* and died from starvation, although the stylet could reach the phloem (Fig. 2). When BPH was released on two varieties, one with *BPH26* and the other without *BPH26*, only the variety with *BPH26* survived the insect infestation (Fig. 3 and Fig. 4).
3. The *BPH26* protein closely resembles rice NBS-LRR proteins, which are involved in signal perception and transduction during infection by pathogens. This suggests that *BPH26* protein is a receptor involved in the signal perception and transduction activated during BPH attack.

Future prospects

1. The *BPH26* gene in coexistence of *BPH25* conferred resistance to the BPH biotype that neither *BPH26* nor *BPH25* was effective against.
2. DNA markers of *BPH25* for marker-assisted breeding are currently under development. A broad-spectrum BPH-resistant variety against some BPH biotypes can be developed by using two DNA markers for the two genes (*BPH25* and *BPH26*).