

## Rice RHS1 controls seed pod shattering and defense against bacterial leaf blight

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### [Introduction]

Seed pod shattering plays an important role in the domestication of rice. High seed shattering results in significant yield losses. The AP2 transcription factor seed shattering 1 (SHAT1) and the transcription factors related to quantitative seed shattering loci; qSH4 and qSH1 have been shown to be required for seed shattering in rice.

### [Materials and Methods]

In this study, we identified the rice high shattering (RHS1) Ac/Ds transposon knockout line of the locus LOC\_Os04g41250 in the Dongjin cultivar background. It exhibited high shattering of grains than in the wild-type plants. In a greenhouse screen involving 124 rice lines, high seed shattering was observed in rhs1 plants under normal conditions. Absence of RHS1, which encodes a putative armadillo/beta-catenin repeat family protein, resulted in high sensitivity of rhs1 plants to nitrosative stress. Interestingly, the basal expression levels of qSH1 and SHAT1 genes were significantly lower in these plants than in wild-type plants; however, nitrosative stress negatively regulated the expression of qSH1 and SHAT1 in both WT and rhs1 plants, but positively regulated qSH4 expression in rhs1 plants alone. Expression levels of genes responsible for NO production (OsNIA1, OsNIA2, and OsNOA1) were lower in rhs1 plants than in WT plants under normal conditions. However, under nitrosative stress, the expression of OsNIA2 significantly increased in rhs1 plants. Interestingly, rhs1 plants were found to be significantly resistant to the bacterial leaf blight pathogen *Xanthomonas oryzae* pv. *oryzae* with significantly higher expression of PR genes than in the WT plants before and after infection.

### [Results and Discussions]

In this study, a novel gene RHS1 was found to negatively regulate seed shattering and resistance to bacterial leaf blight in rice. However, the molecular mechanisms involved in the control of RHS1-mediated regulation of seed shattering and its interaction with nitric oxide and involvement in plant defense need to be investigated.

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