

# QTL analysis of lodging resistance-related properties in paddy rice

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## Objectives

In the Jiangnan Region of China, direct sowing is rapidly spreading due to changes in industrial structure in recent years, and root lodging has become a serious problem. Therefore, it is necessary to investigate the lodging resistance mechanisms in relation to the root system and shoot morphology, for breeding lodging-resistant varieties. In this study, we performed QTL analysis of lodging resistance-related traits, including pushing resistance force and morphological characteristics of the root system, using 83 double haploid lines derived from ZYQ 8 (indica variety) / JX 17 (japonica variety) crosses.

## Results

The lodging degree was most highly correlated with the traits of the aboveground parts, followed by pushing resistance force per shoot weight, and finally TR rate. The correlations between the lodging degree and the root morphology or root activity were low. Pushing resistance was most highly correlated with heading date, followed by aboveground morphology and then roots morphology.

QTLs for the lodging degree resided on chromosomes 2 and 6. QTLs for pushing resistance were located on chromosomes 7 and 10. QTLs for plant height were located on chromosomes 4, 8, 10, and 12, and QTLs for height of the center of gravity were located on chromosomes 4, 8, 9, and 10. With regard to the other characters, more than one QTL was found for each character (Fig. 1).

These QTLs were classified by the sign of the correlation coefficient between each character and the degree of lodging into QTLs that increased lodging resistance and QTLs that decreased lodging resistance. The results clearly indicated that the QTLs that increased lodging resistance were located on chromosomes 3, 5, 6, and 7, and those that decreased lodging resistance were on chromosomes 1, 2, 4, 8, 9, 10, and 12 (Fig. 1).



Fig. 1. QTL map in relation to lodging tolerance.

## References

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