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Identification of QTL for Lodging Resistance using Cheongcheong/Nagdong Doubled Haploid Population in Rice

Dan-Dan Zhao¹, Kyung-Min Kim^{1*}

¹Division of Plant Biosciences, School of Applied Biosciences, College of Agriculture and Life Science, Kyungpook National University, Daegu 41566, Korea

[Introduction]

Lodging is the one of the most chronic constraints to crop production is the grain yield reduction near the crop harvest stage. Causes of the plant lodging including; legion, over plant population, soil density, sowing date, diseases, and seed type, are all mainly contributing factors to lodging in cereal crops. In the north, before the rice harvest, rice yield is reduced due to lodging severely during the frequent typhoon. Therefore, it is important to develop rice cultivar that are lodging resistance and to found the possible gene responsible to improve plant resistance against lodging.

[Materials and Methods]

The Cheongcheong/Nagdong Doubled Haploid (CNDH) population used for constructing genetic map were developed from a cross between Cheongcheong and Nagdong. Pushing strength of the lower part was measured when plants were bent to 45° using the digital force gauge (IMADA, Japan). To identify the putative QTLs (Quantitative trait loci), WinQTLcart 2.5 and genetic map that the average interval of markers is 10.6 cM made by Mapmaker version 3.0 using 222 DNA markers. Composite interval mapping (CIM) was operated for the entire genome by WinQTL Cart 2.5 at a threshold of LOD 2.0 after put in all required data.

[Results and Discussion]

The QTL analysis found one pushing lower part (*qPLP8*), detected on RM2197-RM23314 in chromosome 8, LOD value is 2.40 and phenotypic variation is 25%. And five stem diameter (*qSD1*, *qSD2*, *qSD8*, *qSD9-1*, *qSD9-2*), *qSD1* have the highest LOD value of 2.82, detected on RM3412-RM1287 in chromosome 1 and phenotypic variation is 36%. And two tiller numbers (*qTNI*, *qTNI1*), these are detected on RM8111-RM14323 in chromosome 1 and on RM287-RM27161 in chromosome 11, respectively. Each of LOD values are 3.30 and 3.10 respectively, explaining the phenotypic variation of 45% and 40%, respectively. The results of this study strongly suggest that pushing resistance of the lower part could be a new target which lay a scientific theoretical basis for rice breeding of lodging resistance.

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*Corresponding author: Tel. +82-53-950-5711, E-mail. kkm@knu.ac.kr