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Identification of quantitative trait loci for root development during seedling stage in rice

Jae-Hyuk Han¹, Joong Hyoun Chin^{2,*} and Soo-Cheul Yoo^{1,3,*}

¹ Department of Plant Life & Environmental Science, HanKyong National University, Anseong, 456-749, Korea

² Graduate School of Integrated Bioindustry, Sejong University, Seoul, 05006, Korea

³ Institute of Ecological Phytochemistry, Hankyong National University, Anseong, 456-749, Korea

* Correspondence: Joong Hyoun Chin (jhchin@sejong.ac.kr) and Soo-Cheul Yoo (scyoo@hknu.ac.kr)

Abstract

Vigorous root growth at the seedling stage in dry direct-seeded conditions is considered as a critical trait because it is involved in seedling emergence, early vegetative vigour, nutrient uptake as well as drought tolerance. In this study, we performed QTL mapping using the recombinant inbred lines obtained from the cross between Tongil-type Dasan and temperate japonica TR22183 (DT-RILs) to identify QTL underlying early root development. TR22183, which was previously reported to have high nitrogen utility and cold tolerance, showed vigorous root growth at the seedling stage in semi-drought conditions. Root length, fresh weight and dry weight of TR22183 were significantly higher than in Dasan. By QTL analysis with genotyping-by-sequencing method, we identified two QTLs for root fresh weight (RFW) in chromosome 7 and root dry weight (RDW) in chromosome 8, explaining phenotypic variances of 13.5% and 10.6%, respectively. These QTLs would be used to develop rice varieties adapted to direct-seeded cultivating system.

Keywords: Root development, Drought stress, Direct seedling cultivation, QTL, Recombinant inbred line

Corresponding author*

Jae-Hyuk Han

Tel : 010-4841-6573

E-mail : 0724jh@hknu.ac.kr