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Molecular Dissection of the Relationships among Tiller Number, Plant Height and Heading Date in Rice

Kehui Cui[1)], Shaobing Peng[2)], Yongzhong Ying[3)], Sibin Yu[3)] and Caiguo Xu[3)]

1) Crop Physiology and Production Center, College of Plant Science and Technology, Huazhong Agricultural University
2) Crop, Soil and Water Sciences Division, International Rice Research Institute
3) National Key Laboratory of Crop Genetic Improvement,Huazhong Agricultural University

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Abstract: Appropriate plant height, tiller number and heading date are important traits for maximizing rice production. In order to understand the genetic basis of the relationships among these three plant traits, we mapped quantitative trait loci (QTLs) using a recombinant inbred population and detected two-locus interactions for plant height and tiller number at two growth stages and for heading date in two years. There were significant negative correlations between tiller number and plant height, and between tiller number at maturity and heading date. A significant positive correlation was observed between heading date and plant height at maturity. A total of 29 QTLs for the three traits were identified over the two years. Results show that QTLs and majority of two-locus interactions for plant height and tiller numbers at 35 days after transplanting were different from those at maturity, indicating that different genes and interactions control the traits at different developmental stages. A large proportion of QTLs and interactions could only be detected in one year, suggesting that QTLs and two-locus interactions for the traits were dependent on the environment. Results suggest that pleiotropy and/or close linkage of genomic regions and pleiotropy of common two-locus combinations may be the genetic basis for the close correlations among the three traits. A QTL with a large effect for heading date, which was located in RG424-RZ667 on chromosome 6, also showed large effects on tiller number and plant height at

maturity.

Keywords: Heading date, Molecular marker, Plant height, Quantitative trait locus (QTL), Rice, Tiller number

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