

PB-58

QTL Mapping of Alkali Digestion Associated with Rice Gelatinization

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[Introduction]

It is necessary to high quality rice to improve international competitiveness in preparation for the recent openness of the rice market due to international trade liberalization and meet consumer health demands. Since the gelatinization temperature of rice starch is related to the cooking time and texture of rice, the gelatinization temperature of rice is an important factor in determining the quality of rice. The alkali digestion value (ADV) is highly correlated with the gelatinization temperature, and it is a method used to test the quality of the rice grain.

[Materials and Methods]

120 Cheongcheong/Nagdong double haploid (CNDH) population are used for plant materials. The ADV was measured by the following method. Brown rice and milled rice of each CNDH line were place the 90×15mm Petri dish containing 20ml of 1.4% KOH. After that, incubate at 30 °C for 18 hours, and ADV is evaluated on a scale of 1-7 according to the investigation criteria of the International Rice Research Institute (IRRI). Each experiment was repeated three times for 4 years. Windows QTL Cartographer 2.5 and the genetic map with an average interval of 10.6 cM between markers created using Mapmaker version 3.0 using 222 DNA markers was used to analyze the QTLs. The threshold LOD score 2.5 or higher was used to perform the QTL analysis.

[Results and Discussion]

The ADV of brown rice and milled rice for 4 years showed a normal distribution, which means that the ADV is a quantitative trait. 4 QTLs (*qAb8*, *qAdb11*, *qAdb8-1*, *qAd2*) related to ADV of brown rice were detected in chromosome 2, 8, and 11. In particular, the RM223-RM1345 region of chromosome 8 was detected in both 2018 and 2019. 8 QTLs (*qAdm6*, *qAdm4*, *qAdm6-1*, *qAdm12*, *qAdm5*, *qAdm5-1*, *qAdm12-1*) related to ADV of milled rice were detected on chromosome 4, 5, 6, and 12, and the RM588-RM1163 region on chromosome 6 was detected in 2018, 2019, and 2020. In 2019, this QTL showed a high LOD value of 4.68. This result can be used as basic data for the development of high-quality rice cultivars with enhanced palatability of rice.

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