Hybrid breakdown (HB), the reduction of viability or fertility in the hybrid progenies which is one of the reproductive barriers occurring in genetically remote crosses, often arise in the progenies of inter-subspecific hybrids between *indica* and *japonica* in rice. HB lines which showed poor growth and fewer spikelets were found in an RI population derived from a cross between an *indica* variety, Milyang 23, and a *japonica*variety, Tong 88-7. Segregation of HB in BC_1F_2 populations from reciprocal backcrosses, HB-RILs/Milyang 23 and HB-RILs/Tong 88-7, revealed that HB was controlled by a complementary action of two recessive genes originated from each of both parents. Using a number of STS and SSR markers and bulked segregant analysis, thetwo recessive genes controlling HB were mapped on chromosomes 11 and 2, respectively. The *japonica* parent Tong 88-7 has a new hybrid breakdown gene, which was located between AC135398A and AC136843C on chromosome 11 with a distance of 0.362 cM and 0.361 cM, respectively, whereas the *indica* parent Milyang 23has another gene on chromosome 2. The locus was mapped between AP004083A and AP004053A with a distance of 0.932 cM and 0.434 cM, respectively.

Keywords: Hybrid breakdown; rice; mapping

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Functional analysis of rice phosphate transporter genes in transgenic rice

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Abstract

Since phosphate ion is essential in development and growth of plants, P (phosphate) fertilizer has been widely used to maximize crop production regardless of serious environmental pollution. In order to develop rice plants with high availability of P ion, we engineered 4 rice transporter genes, *OsPT1*, *OsPT4*, *OsPT7* or *OsPT8* to rice (*Oryza sativa* cv. Dongjin) via *Agrobacterium*-mediated transformation. We were able to obtain T_3 generation of homozygous transgenic lines constitutively expressing each *OsPT* gene. Dongjin (parental)and each transgenic line were grown in a large pot containing normal soil (N P K application plot) and P-limited soil (N K (-P) application plot) with 5 replications. Evident physiological changes were observed in *OsPT* transgenic lines such as height, number of tillers, root formation and heading date. P_2O_5 uptake at harvesting stage increased about 2-fold in the aerial parts from *OsPT1* and

*OsPT4*transgenic plants grown in normal soil with or without P fertilizationcompared to that of Dongjin. However, total grain yield was significantly higher only in *OsPT8* but not in other lines than Dongjin without P fertilization in normal soil condition. In summary, constitutive expression of *OsPT8* contributed to higher grain production than Dongjin without P fertilization in rice cultivation. This project was supported by a grant from the Crop Functional Genomics Center of the 21st Century Frontier Research Program (# CG 1510) and Biogreen 21 programs, Rural Development Administration, Republic of Korea.