

## Selection of Cold Tolerance Elite lines Carrying *qSCT12<sup>UK</sup>* Using Marker-assisted Selection in Tong-il Type Rice

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### [Introduction]

Extreme temperature represents a key factor limiting global rice plant distribution. Super yield rice cultivars, Tong-il rice varieties, produce high yields in temperate climates but are frequently harmed by chilling stress. Especially rice is highly sensitive to low temperature below 15-20°C because of originating from tropical or subtropical climates. Seedling of rice is easily damaged to low temperature and result in yellowing, growth retardation, reduced tillering, which can cause severe yield losses. So, this study was developed cold tolerance elite lines by the advanced backcross and MAS in rice breeding programs.

### [Materials and Methods]

We used Hanareum2/Unkwang F<sub>8</sub> RILs and BC<sub>2</sub>R<sub>8</sub> NILs population to select elite line harboring *qSCT12<sup>UK</sup>*. We observed cold phenotype of 384 RIL population in the growth chamber conditions. We selected the most strong cold tolerance line, HU165, and then advanced backcross twice. We are fine mapping by using hetero in BC<sub>3</sub>F<sub>3</sub> generation. And then, chlorophyll content of this population was measured from these rice seedlings. For observation of cold tolerant phenotype of RIL population in the growth chamber, we treated cold stress (5~13°C) 9, 11, 13°C for 14 days and recovery for 4 days. QTL analysis was performed with QTL IciMapping program.

### [Results and Discussions]

We named QTLs as Seedling Cold Tolerant(SCT) in growth chamber. Three QTLs for SCT was detected on chromosome 11-1, 11-2, and 12. Among these QTLs, *qSCT12<sup>UK</sup>* on chromosome 12 showed 26.3 LOD score with 25.5% of phenotypic variation. We identified a gene pyramiding effect of three QTLs when *qSCT11.1<sup>UK</sup>*, *qSCT11.2<sup>UK</sup>* and *qSCT12<sup>UK</sup>* were combined, cold tolerant was most strongest in our experimental conditions. We developed 20 Indel marker for finding hidden cold tolerance gene. At the same time, we selected 48 cold tolerance elite lines carrying *qSCT12<sup>UK</sup>* using MAS 686 BC<sub>2</sub>R<sub>8</sub> NILs population. After that we observed 48 lines in treated cold stress. The major QTL that designated *qSCT12<sup>UK</sup>* was been mapping in 82kb region between InDel12-29 and InDel12-30. And after phenotyping, we can select 3 lines more strong cold tolerance than Hanareum2 and very similar to Hanareum2. Chlorophyll Content is over 160(mg/m<sup>2</sup>) and a phenotypic scale is 1 to 3. This results support that this elite line will be useful genetic resource developing for the adaptation of Tong-il type rice in the temperate regions.

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