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Identification of QTLs related to seedling cold tolerance in rice and improvement of seedling cold tolerance in indica rice using MAS

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Low-temperature stress is a serious constraint to rice production in high-latitude temperate and high-altitude tropical regions. Rice (*Oryza sativa* L.), which originates from tropical or subtropical regions, is sensitive to cold stress. Cold stress at the seedling stage is a major threat to rice crop establishment and subsequent productivity. Cold tolerance is controlled by complex genetic factors. We used an F_7 recombinant inbred line (RIL) population of 123 individuals derived from a cross between the cold-tolerant *japonica* cultivar Jinbu and the cold-susceptible *indica* cultivar BR29 for QTL mapping. All lines classed as cold tolerant were found to contain *qSCT1* and *qSCT11*, and in lines with only these two QTLs the R^2 value was 27.1%, while the presence of additional seedling cold tolerance QTLs increased the R^2 value. These two critical QTLs (*qSCT1* and *qSCT11*) on chromosomes 1 and 11 respectively were fine mapped. To improve the seedling cold tolerance of the *indica* cultivar BR29, Jinbu was backcrossed with BR29 using MAS. Two advanced backcross populations (BC_2F_4 and BC_3F_3) were developed and used to confirm these QTL effects against cold stress, individually and in combination (*qSCT1, qSCT11* and *qSCT1+qSCT11*). With 18 days of cold treatment, the average cold damage scores of lines with either or both QTLs had moderate tolerance (5.63-6.83) based on the SES (standard evaluation system for seedling cold) and the lines without the SCT QTLs demonstrated a susceptible reaction to cold stress similar to BR29. With additional cold exposure, there was greater damage to the seedlings and lines with *qSCT1* became susceptible after 21 days.

Biography

S M Kim completed his PhD from Kyungpook National University and Post-doctoral studies from National Academy of Agricultural Science in RDA. He has publications in some of the reputed journals.

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