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Genetic Mapping for Flooding Tolerance at an Early Growth Stage of Soybean (*Glycine max* L. Merr.)

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[Introduction]
Soybean is highly affected by flooding stress, especially during germination, early vegetative, and early reproductive stages, resulting in a significant yield reduction. The objective of this study was to identify the quantitative trait loci (QTL) for flooding tolerance at an early vegetative growth stage of soybean.

[Materials and Methods]
A recombinant inbred line (RIL) population was developed from a cross between a tolerant 'Paldalkong' and susceptible 'NTS1116' cultivars. Flooding stress was imposed at V1-V2 stage by maintaining about 10 cm water from the soil level for 14 days and phenotyping was done under greenhouse condition in 2017 and 2018. IciMapping V4.1 was used to construct a linkage map using 180K Axiom® SoyaSNP markers and QTL Cartographer V2.5 was used for QTL analysis.

[Results and Discussion]
A total of 20 QTL with LOD scores 3.59－19.73 causing 5.8－33.3% phenotypic variation were identified on nine chromosomes under control, flooded and/or index (ratio of values at flooding to control) conditions. Although some of the QTL detected in control were not identified in flooded condition, they were detected for the index values. The QTL found on chromosomes 10, 12, and 13 were relatively more stable. The genomic regions of chromosomes 10, 12, and 13, which harbored relatively more consistent QTL, could be important for the improvement of flooding tolerance in soybean. Several candidate genes with annotated functions related to stress tolerance, chlorophyll content or shoot dry weight which is severely affected by the flooding stress have been identified in or near the identified QTL. The QTL identified in this study could be transferred into elite soybean cultivars to improve their flooding stress tolerance through marker-assisted selection technology. In the context of possible increment in flood events due to climate change, this study can be more applicable for the improvement of flooding tolerance and minimizing the yield loss of soybean.

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