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Genome-wide Association Study for Flowering Date in Soybean Core Collection

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[Introduction]

Flowering date is one of the main agricultural characteristics and is closely related to latitude, photoperiod response, maturity, and yield. It is known that when soybeans are exposed to a long photoperiod after flowering, the R3-R6 phases are extended, and the number of seeds is increased. Currently, eight major genes have been identified in soybeans to be associated with flowering date, but their genetic factors for flowering are influenced by the ecological environment or multiple gene networks involved in biological processes. Therefore, we conducted a genome-wide association studies in consideration of the morphological characteristics of soybean to identify various genetic factors associated with flowering date

[Materials and Methods]

In 2021, 409 accessions (soybean core collection) were cultivated in the experimental field of NICS (National Institute of Crop Science), and the main agricultural characteristics such as flowering date, pubescent color, leaf shape, and growth type were investigated. The genome of the core collection was analyzed using Axiom[®]180k SoyaSNP. The markers associated with flowering were mapped using a linear mixed model, and candidate genes were identified within ±100 kb.

[Results and Discussion]

Soybean flowering date was found to be significantly affected by morphological characteristics ($p < 0.001$). The average flowering date of soybean varieties with gray pubescent, round leaf and determinate type was the latest with 41.5 days, and those with tawny, round leaf and indeterminate type had an earlier with 32.5 days on average. Therefore, two markers associated with the flowering date was mapped on chromosome 6 in consideration of the morphological characteristics, and candidate genes involved in transcription factor and O-fucosyltransferase were identified based on significant markers. In the future, these genes need to be verified through haplotype and functional analysis. These results are meaningful in that it tried to find the genetic factors associated with the flowering date in consideration of the morphological characteristics in soybeans.

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