

PA-05

Investigation of Root Morphological Traits in Diverse Soybeans (*Glycine max* L.) at Early Growth Stage

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[Introduction]

Root morphological traits are believed to be important for plant growth and yield increase under various stressful conditions according. The objective of this research was to evaluate 372 soybean cultivars for various root traits and determine whether the root traits are related with shoot growth and identify cultivars with contrasting root characteristics.

[Materials and methods]

Plants were grown under optimal growth conditions in a greenhouse. Single plant was grown in each polyvinyl chloride (PVC) pipes [6 cm (diameter) × 40 cm (height)]. Root samples were collected approximately after two weeks from sowing/planting date, when the seedlings attained (V2-V3) trifoliolate leaves. The two-dimension (2D) root images were used for identification of root morphological traits. The 2D root images were collected by a scanner using washed-root samples. The transparent plastic tray (30 cm length × 20 cm wide) was laid on the scanner and then clean water was added into the tray. Root area was annotated and then it was analyzed using WinRHIZO Pro software. Total six root phenotypes (total length, average diameter, surface area, link average length, link average diameter and link average branching angle) were investigated and they were used for identification of root morphological traits in diverse soybean cultivars.

[Results and discussion]

Significant variability of root traits was observed among the soybean cultivars. Substantial variability in the soybean cultivars was distinguished from a collection of 372 cultivars. According to our results, all of the root morphological traits showed normal distribution. Among 372 cultivars, we have listed 40 cultivars from the top and bottom based on root phenotypes. Overall, long- root length, diameter, surface area was ranked in IT165282, IT165432, IT165308, IT199127 and IT21812 while IT23305, IT208266, IT181034, IT165019 and IT203565 showed relatively short root morphological traits. In conclusion, the genetic variability of root morphological traits which were observed in this research was important factors for improvement soybean's root characters. In particular, the cultivars that ranked in the top and bottom 5% cultivars can be used as contrasting cultivars for soybean breeding programs as a genetic material to improve root systems, water and nutrient uptake and increase of productivity.

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