Examining Root System Variability in Soybean Using Imaging Technologies

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Abstract

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Keywords: Root imaging, root-system architecture (RSA), soybean, 2D-phenotyping & 3D-phenotyping

Roots are a major part of plant systems and are essential to obtaining water and nutrients. Despite their importance, roots have not been extensively examined as compared to their aboveground counterparts, due primarily to the difficulties of access and lack of standard methods to quantify root morphology. While there have been several experiments performed under controlled environments, comparatively fewer studies have examined root architectures under field conditions. Here, we apply two imaging techniques to characterize variability in Root System Architecture (RSA) in diverse soybean genotypes under field settings with two contrasting soil conditions. Thus, our objectives are to (1) quantify root system architecture using 2D image techniques (e.g., Winrhizo and Image J) and (2) evaluate a contrasting subset of these samples (n = 30) using a novel 3D phenotyping approach. The research seeks to meet the need for enhanced methods in root system architecture analysis across diverse field conditions potentially leading to more resilient, high-yielding soybean varieties.

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