Science Societies

Association of Pea Seedling Root Architecture With Nitrogen Fixation

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A pea root system nodulated by rhizobia, nitrogen-fixing bacteria, at an experimental site in Rosthern, SK, Canada. The pink nodules in- dicate active biological nitrogen fixation. Photo by Loveleen Dhillon.

Root system architecture governs water and nutrient acquisition in plants. Plasticity in root system architecture can be used as an adaptive strategy to optimize plant performance under variable environments. Variation in these traits and their impact on agronomic adaptation in peas is not well understood.

Researchers at the University of Saskatchewan in Saskatoon, SK, Canada used a 2D hydroponic root-imaging technique to quantify variation in seedling root architecture of 44 diverse pea varieties. This analysis showed a wide range of differences in root morphological, topological, and geometrical traits among the varieties. The strong correlations among traits indicate intricate relationships governing the overall root system architecture and crop adaptation. Pea varieties with deep root systems tend to be taller and more resistant to falling over late in the season. A larger root diameter was associated with higher grain yield and enhanced biological nitrogen fixation, and an increased number of lateral roots was associated with greater biological nitrogen fixation potential.

This study shows that certain root traits can serve as markers when breeding pea for better nitrogen fixation and higher yield.

Adapted from

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