

A Platform to Quantify Phenotypic Responses to Root-Root Interactions Among Kin and Non-kin Common Beans

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Abstract

Quantifying phenotypes of root-root interactions would allow a greater understanding of how plants react to belowground competition through plasticity of architectural traits. Past research has shown that plants will over proliferate roots in the presence of competition, leaving less resources to allocate above ground, negatively impacting shoot growth and yields [1]. Further evidence highlights plants may recognize kin and non-kin relationships, responding by avoiding competing with close relatives and instead allocating root mass closer to non-kin neighbors [2]. In an attempt to visualize and quantify root architecture plasticity involved in these root-root interactions, we developed a modified mesocosm system. Within the mesocosm box common bean seeds were germinated 10 inches apart from each other. Mesh screens were placed on either side of each bean, in order to capture root growth towards each other and/or away from each other. Two treatments were involved, with mesocosms grown with either kin or non-kin plants. Plants will be harvested at the 6-week mark, when the root archtype will be developed and prominent. During harvesting one side of the mesocosm box will be removed and the soil will be washed away. We will quantify the degree of root competition by counting the number of roots passing the mesh screen. All general 2D root traits will be measured in DIRT2D. This experiment will shine light on an understudied section of crop science and will allow farmers and researchers a better understanding of an otherwise unseen phenomena.

Keywords: Architectural root traits, phenotypes, root-root interactions, root plasticity

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