Digital quantification and characterization of root architectural diversity across collard landrace varieties

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Abstract

Urban agriculture has been broadly acknowledged for its potential to reduce carbon emissions, increase food security, and improve economic growth in some of the most vulnerable communities in the United States. Collard (*B.oleracea* var. *viridis*) is a diploid leafy green, grown on urban farms and community gardens across the country, including the St. Louis Metro region. Beyond their nutritional importance, collards provide urban and commercial agronomic systems with a plethora of important ecosystem services. They scavenge nitrogen and available resources, suppress weeds, and act as a biofumigant to control soil-borne pests and pathogens. Recently, The Heirloom Collard Project characterized the above-ground growth habits of 18 landrace collard varieties across 250 organic gardens and farms. Little work has been published to investigate collard root system architecture, which influences both quality traits and ecosystem services that contribute to sustainable crop production. The objectives of this research are to 1) quantify root spatial and temporal diversity across 18 landrace collard varieties, and 2) evaluate the relationship between root phenotype and urban farmer crowd-sourced data for key traits such as germination rate, disease resistance, vigor, yield, flavor, and winter hardiness. This work will lead to the development of a participatory framework for urban farmers and chefs to select varieties with improved root architecture based on regional needs.