

Optimization of X-ray tomography scan parameters for root trait phenotyping using excavated maize root crowns

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X-ray tomography (XRT) is a powerful and versatile tool for generating detailed non-destructive three-dimensional (3D) image data of large and complicated structures. In particular, excavated, cleaned and dried maize root crowns can be rapidly scanned, and the resulting 3D volumes processed in a computational feature extraction pipeline to provide a wide range of root trait measurements. These measurements provide rich data that give insights into how roots occupy 3D space in ways not possible with any 2D imaging/measurement systems. Hundreds of root crowns can be scanned in a moderate-throughput system, and multivariate statistical analyses can provide valuable insight into the role that genes and quantitative trait loci play in selected root traits. Research presented will describe XRT scan parameter optimization and its impact on root trait data generated by the feature extraction pipeline.