

Impact of Multiple Computed Tomography X-ray Doses on Maize Root and Shoot Development

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Abstract

The maize root system architecture (RSA) influences the absorption of water and nutrients and plays an important role in determining grain yield. Selecting root traits could be an important consideration to improve maize productivity. Traditional approaches in root measurements are destructive, time-consuming and labor-intensive. Nowadays, the X-ray Computed Tomography (CT) technology has been widely applied for non-destructive root trait quantification of maize plants. The root-based imaging technique can be integrated with visible-near-infrared (VNIR) and short-wavelength-infrared (SWIR) cameras to monitor the root and shoot development in the cycle of maize growth. To evaluate the impact of X-ray radiation on maize development, twenty-eight (28) plants were grown in the Ag Alumni Seed Plant Phenotyping Facility (AAPF) at Purdue University and exposed to three different X-ray doses during the growth. The plant root CT and shoot hyperspectral images were collected several times from planting to harvesting. The dry weight/biomass was measured for each plant immediately after harvesting. The results showed that the plants under the three X-ray doses did not exhibit significant differences in root and shoot development. Since the plants were under different water treatments, the water impact on the maize RSA configuration was also studied.

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