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Easily Accessible Method for Root Length Measurement Using an Image Analysis System

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Abstract:

Convenient methods for root length measurement are highly demanding. In this report we demonstrated an easily accessible method of image analysis for this purpose consisting of a personal computer, a commercially-available image scanner, a public domain image analysis and processing software (NIH Image). Its performance, together with that of the root length scanner, was evaluated by way of a comparison with the directly-measured root length for soybean, maize and rice, all of which differ in root diameter and rooting density of lateral roots. Preliminary trials for the measurement of nylon threads and stainless wires with known length validated the accuracy of this method for the expected range of root diameters. This method measured length precisely for maize and soybean, while the root length scanner read 81% of the actual length for maize and 89% for soybean. For rice, the root system of which consisted very fine roots, the image analysis method gave an underestimation of about 7.5%, probably due to the fact that overlapping and clumping of thin lateral roots was unavoidable during the root sample preparation for image analysis. By contrast, the root length scanner measured only one fourth of the actual length. This method also saved time required for measurement from one-fourth to one-fifth compared with direct measurement.

Keywords:

Image analysis, Image scanner, NIH Image, Personal computer, Root length, Root length scanner

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