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A Minirhizotron Method for Measuring Root System of Soybean Plants Growing in the Field

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Abstract:

In order to develop a simple and accurate system for measuring the root system of soybean plants growing in the field, a fiber-optic scope with a portable color video tape recorder was employed in a minirhizotron system. A transparent acrylic tube of 60 mm outer diameter and 54 mm inner diameter as the observation tube was installed into the soil at an angle of 30° from the vertical. The accuracy and the utility of the system were examined. (1) The length of all tap and branch roots at the observation tube-soil interface was measured with an accuracy of 5% using this system. (2) The observation tube did not significantly disturb root penetration into the soil. This was also suggested by the results that the changes in root length with the increase of soil depth showed a reasonable tendency without an unusual increase or decrease. (3) There was a significant linear correlation between the root length measured with the minirhizotron system and the root length density measured by a soil-core sampling method in the plants growing in the field. However, variation in the measurements taken with the minirhizotron system was as large as those by the soil-core sampling method, indicating that the root distribution in soil was extremely non-uniform. From these results, it was possible to estimate root growth in the field well using this system. Moreover, taking as many measurements as in the soil-core sampling method, root distribution in the field can be estimated quantitatively with less labor and time with the minirhizotron system than the conventional method.

Keywords:

Fiber-optic scope, Minirhizotron, Root length, Root length density, Root system, Soil-core sampling method, Soil moisture, Soybean

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