New non-destructive device measures root growth in smaller plants

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Researchers from North Carolina State University's Department of Horticultural Science recently introduced a new apparatus called the "mini-Horhizotron", a device used to non-destructively measure treatment and substrate effects on plant root growth in greenhouse production. "The mini-Horhizotron was designed to measure root growth of small plant material such as seedlings, herbaceous plugs, or woody plant liners normally grown in containers less than 3.8 L," explained corresponding author Leslie Judd.

Judd and fellow researchers Brian Jackson, Ted Yap, and William Fonteno said that the mini-Horhizotron gives growers a new, effective way to study a plant's root growth. "Considering the large portion of the green industry involved with growing plants in containers and the importance of understanding the physiology and morphology of roots, the factors that influence root growth in container production should be continually investigated," they wrote.

According to the report, the original Horhizotron was developed at Auburn University and Virginia Tech as a non-destructive technique to measure horizontal root growth from rootballs of plants grown in nursery containers, thus allowing for post-transplant assessment. Constructed of eight panels of glass attached to an aluminum base to form four wedge-shaped quadrants, the device is suitable for greenhouse or field use and fits a range of nursery stock rootballs. The Horhizotron works best with large-sized rootballs (3.8 to 11.4 L). "The intent of our work was to develop a new apparatus to measure root growth in a greenhouse

production setting using a system/technique similar to the Horhizotron but with a different purpose, design, and construction components," Judd said.

The scientists designed and tested an apparatus they call the mini-Horhizotron, which features three chambers extending away from the center that can be filled with the same substrate or with different substrates/treatments in order to observe the root growth response from a single plant. They then compared the effect of two experimental designs on plant root growth, and used mini-Horhizotrons to compare root growth of plants in different container substrates. The team selected herbaceous and woody plants (*Echinacea purpurea*, *Chrysanthemum*, *Rudbeckia hirta*, and *Ilex crenata*) for use in the experiments. Root growth of the plants was measured in three substrates containing by volume 70:30 peat:perlite (control), peat:pine-wood chips, or peat:shredded pine wood. Results showed that root growth equaled or exceeded that observed in the control substrate for the species grown in pine-wood chips or shredded pine wood-amended substrates.

"During our initial trial of the mini-Horhizotron, root dry mass of the herbaceous species tested and root length measurements showed little difference in growth between the substrate treatments or between the mini-Horhizotron and containers for the species tested at the end of the experiment," the authors wrote. "However, measuring root growth during the experiment revealed that the three plant species (coneflower, mum, holly) varied in their rates of root growth in the different substrates. These differences over time, not detectable with traditional root washings at the end of an experiment, would have been lost."

"The ability to repeatedly and non-destructively measure root systems in the mini-Horhizotron can provide valuable insight into the process of root growth and development and the factors that influence it," the scientists said. They added that the ability to observe plant roots, other

biological inhabitants or occurrences, or water movement within the substrate could expand the use of the mini-Horhizotron beyond its research function for use as a teaching tool.

More information: The complete study and abstract are available on the ASHS *HortScience* electronic journal web site: hortsci.ashspublications.org/c … /49/11/1424.abstract

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