Root water transport measured with hydraulic conductance flow meter

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Scientists are seeking to learn more about the many environmental and physiological factors that can influence how plants take in and transport water. A study in *HortScience* contains new information about methods for measuring water flow, and reports on ways in which substrates containing wood may affect plants' water uptake and transfer abilities.

"The flow of water through plants has been commonly analyzed using the parameters of flow rate and the difference in water potentials between the rhizosphere, roots, and leaves," explained Brian E. Jackson, lead author of the study. "Alternative measures are root hydraulic conductivity and hydraulic conductance, physiological traits that describe the ease with which water can move through the below-ground vascular system of a plant. These traits are indicators of plant performance and adaptability to a given environment."

Jackson and scientists Lesley Judd, William Fonteno, and Jean-Christophe Domec investigated the hydraulic conductivity of root systems grown in substrates containing wood components using a hydraulic conductance flow meter (HCFM), a commercially available technology that measures the hydraulic conductance of shoots and root systems by connecting the device to a branch, stem, or rootstock. The experiments were conducted using two herbaceous species and two semi-woody plants.

Chrysanthemum was grown in a greenhouse in four different substrates: peat amended with 20%, 30%, or 40% shredded pine wood and a

traditional 80 peat:20 perlite substrate (used as a control). A second study examined coleus grown in the 80 peat:20 perlite substrate. Experiments were also conducted with one liner of either hibiscus or buddleja grown in three substrates: 6-month aged pine bark as a control substrate, and pine bark amended with 25% or 50% shredded pine wood.

Chrysanthemum showed a positive response with increasing root hydraulic conductance with increasing root mass. "The substrates used in these studies only had an effect on root biomass of chrysanthemums, but substrates had no differential effect on root hydraulic conductivity," the authors said.

"Our initial evidence indicated that the hydraulic conductance flow meter is capable of measuring hydraulic conductivity on the container-grown herbaceous and semiwoody plants we tested," the scientists said. They added that the results showed "considerable variability" in conductance measurements within each plant species.

"More work is needed to better understand this within-species variation in hydraulic conductance. Since water movement through the plant is connected, from the root system to the leaves, a measure of hydraulic conductance through shoots or stomatal conductance of the leaves may provide a better picture of the complete water movement system through individual plants and provide the potential to lower the levels of variance in plants."

More information: *HortScience*, hortsci.ashspublications.org/c … nt/51/2/192.abstract

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