PP SYSTEMS

Application Note

Physiology and vascular anatomy of different avocado genotypes relative to laurel wilt susceptibility

Laurel wilt, caused by the fungus *Raffaelea lauricola*, and carried by bark beetles, is a serious plant disease that has decimated members of the Lauraceae plant family in the southeastern United States since the early 2000s when it was first detected in the US. Originally found infecting forest trees, it was observed in a commercial avocado orchard in Florida in 2012, and now poses a grave threat to Florida's avocado industry. Infected trees wilt and usually die due to plugging of the vascular system. The disease has spread as far west as Texas and could pose a huge threat to the multi-billion dollar avocado industries of California and Mexico if it spreads to those areas.

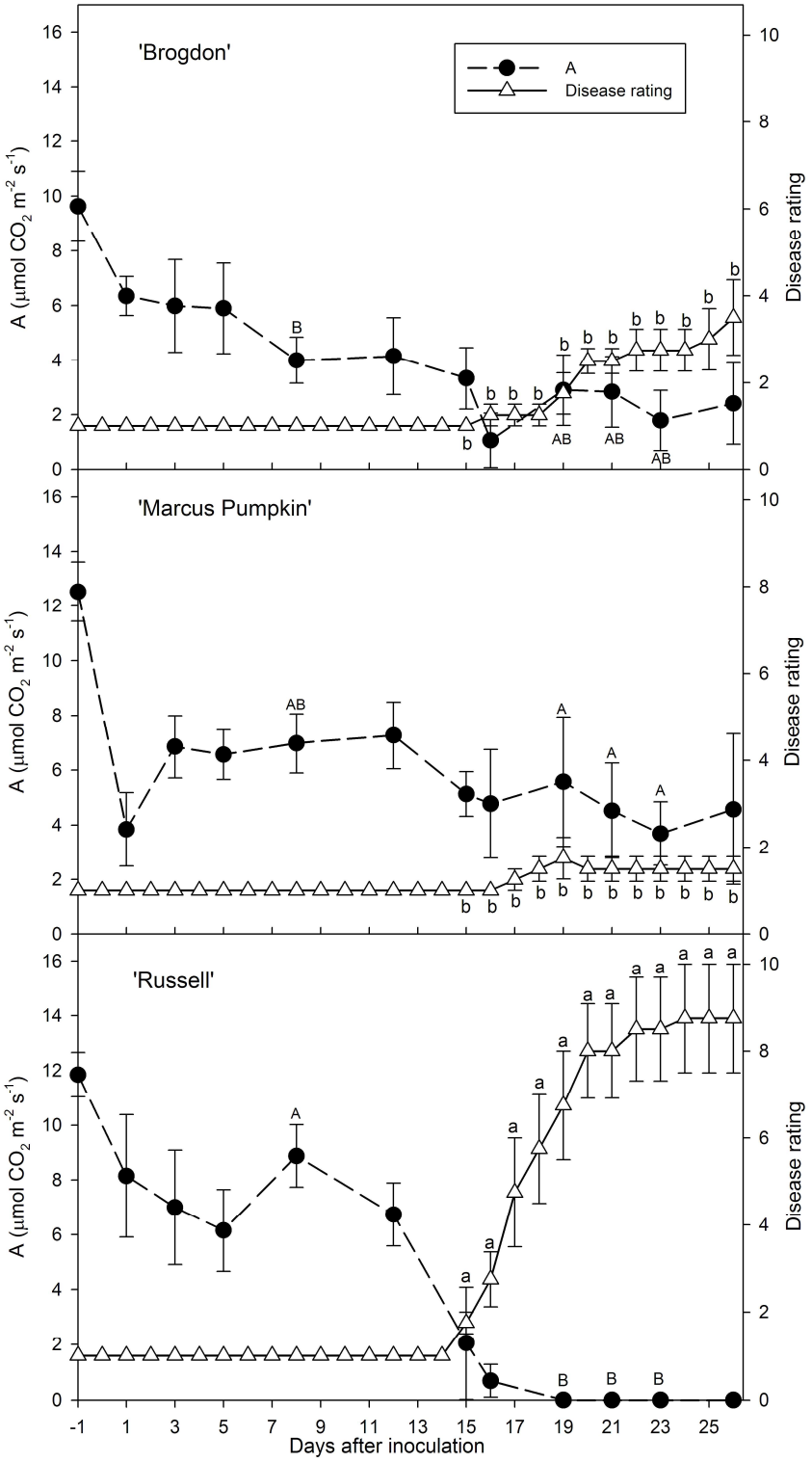
Raiza Castillo (University of Florida - Tropical Research & Education Center – Homestead, FL) performing measurements of leaf gas exchange and chlorophyll fluorescence using the **CIRAS-3 Portable Photosynthesis System**

Laurel wilt has become such serious concern that a large multi-state, interdisciplinary project, funded by a USDA Specialty Crops Grant is underway to help find a solution to the disease. One of the components of this project being investigated by Drs. Bruce Schaffer and Randy Ploetz, PhD student Raiza Castillo and Biologists Ana Vargas, Josh Konkol, Aime Vazquez, and Randy Fernandez, and collaborator Dr. Ed Etxeberria at the University of Florida, Citrus Research and Education Center, is to determine the relative susceptibility of different avocado races and scion/rootstock combinations in relation to differences in avocado tree physiology and vascular anatomy.

The avocado species, *Persea americana*, is divided into three botanical races, Mexican (M), Guatemalan (G) and West Indian (WI). In Florida, all commercial avocado scions are grafted on seedling WI cultivars, primarily 'Waldin'. Commercially available clonal rootstocks (M and G) developed in California and elsewhere, not currently used in Florida, are being tested and compared with clonally propagated material of the seedling WI rootstocks currently used in Florida for their resistance to laurel wilt.

Physiological attributes of different avocado genotypes are being tested to identify tolerance to the laurel wilt. Prior work with commercial cultivars indicated that G and MxG hybrid cultivars were significantly more tolerant to laurel wilt than WI cultivars (Ploetz et al., 2012). The relationship between differences in laurel wilt susceptibility to host physiology among different avocado cultivars was recently investigated (Ploetz et al., 2015; Schaffer et al., 2014). Prior to inoculation, significantly higher xylem sap flow rates were observed in the most susceptible cultivar, 'Russell' (WI), but after inoculation sap flow rates were significantly reduced in 'Russell' relative to 'Marcus Pumpkin' (G) or 'Brogdon' (MxGxWI hybrid). Net CO_2 assimilation (A), stomatal conductance of H_2O (g_s) and transpiration (E) determined CIRAS 2 and CIRAS 3 portable gas exchange systems have been determined to be excellent non-destructive measures for disease-induced stress (Ploetz et al., 2013; Schaffer et al., 2014). Also, scanning electron microscopy is being used to assess xylem anatomy as it relates to tree physiology and disease susceptibility in avocado genotypes being evaluated.

The impacts of clonal rootstocks and root/stock scion combinations of different botanical races of avocado on the development of laurel wilts disease and the relationship between disease development and the xylem physiology and anatomy are being evaluated. From these studies, Information is being obtained about the relative susceptibility of different avocado races and influence of physiological variables on relative to disease susceptibility. This should lead to the identification of avocado rootstocks and/or the development rootstock/scion combinations that are resistant to laurel wilt disease.



Net CO_2 assimilation (A) and external severity of laurel wilt on 'Brogdon,' 'Marcus Pumpkin' and 'Russell' avocado trees before (-day) and after (+days) inoculation with *Raffaelea lauricola*. Different upper case letters indicate significant differences in A among cultivars and different lower case letters indicate significant differences in disease severity among cultivars. From Phytopathology 2015, 105:433-440.

References

Ploetz, R. C., Pérez-Martínez, J. M., Smith, J. A., Hughes, M. C., Dreaden, T. J., Yu, Y., and Inch, S. 2012. Responses of avocado to laurel wilt, caused by *Raffeala lauricola*. Plant Pathology 61:801-808.

Ploetz, R.C., Schaffer, B., Vargas, A.I.. Konkol, J.L., Salvatierra, J., Inch, S.A., Campbell, A. and Wideman, R. 2013. Physiological impacts of laurel wilt on avocado. Phytopathology 103(S):114 (abstract).

Ploetz, R.C., B. Schaffer, A.I. Vargas, J.L. Konkol, J. Salvatierra and R. Wideman. 2015. Impact of laurel wilt, caused by *Raffaela lauricola*, on leaf gas exchange and xylem sap flow of avocado, *Persea americana*. Phytophathology 105:433-440.

Schaffer, B., Ploetz, R.C., Vargas, A.I., Konkol, J. and Salvatierra, J. 2013. Laurel wilt differentially affects xylem sap flow of three avocado cultivars. HortScience 48:S322 (abstract).

We would like to thank Dr. Bruce Schaffer (University of Florida-TREC) and Dr. Randy Ploetz (University of Florida-TREC) and their graduate students for providing the content contained in this application note.

If you would like to learn more about this application or would like to speak with one of our experienced technical staff, please feel free to get in direct contact with us at:

PP Systems
110 Haverhill Road, Suite 301
Amesbury, MA 01913 U.S.A.

Tel: +1 978-834-0505 Fax: +1 978-834-0545

Email: sales@ppsystems.com
URL: www.ppsystems.com