Leaf hydraulic conductivity in grapefruit and mandarin

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Citrus is one of the most important commercial fruit crops in the world, including southeastern Spain where climate is semi-arid Mediterranean. In these kinds of regions irrigation water is not always available due to water scarcity. Therefore, many orchards suffer severe drought periods. Stomatal conductance regulation is considered a major mechanism responsible for regulating the plant response to water stress. Among the main factors which regulate stomatal closure highlight the loss of plant hydraulic functioning. In this sense, the leaf has been demonstrated to be the major resistance that water has to overcome through the plant. However, few studies in *Citrus* accounted for leaf hydraulic conductance (K_{leaf}), even though this parameter affects plant water status, vegetative growth and gas exchange parameters [1,2].

The experiment was conducted during 2014 in a *Citrus* orchard located at the northeast of the Region of Murcia with 11 year-old 'Star Ruby´grapefruit trees (G) and 14 year-old mandarin trees (M). To measure K_{leaf}, leaves were cut from the stem under purified water. They were then rapidly connected to a flowmeter consisting of silicon tubing containing purified and degassed water. The tubing connected the leaf to a pressure transducer (PX26-005GV, Omega Engineering Ltd, Manchester, UK) which was, in turn, connected to a Campbell data logger CR1000 (Campbell Scientific Ltd, Shepshed, UK) to register and store readings every 1 s to calculate the flow rate through the leaf ($mmol \cdot s^{-1} \cdot m^{-2}$). Some stems were allowed to dehydrate before measurement for increasing periods to obtain a wide range of leaf water potential (Ψ_{leaf}) values.

Regarding leaf hydraulic conductance vulnerability curves, Figure 1A, grapefruit leaves showed values of K_{leaf} higher than mandarin leaves, especially when Ψ_{leaf} was higher than of -2.5 MPa. The best fitting were obtained with exponential curves showing a R^2=0.79 (P<0.0001) in G and a R^2=0.67 (P<0.0001) in M, respectively. The higher $K_{leafmax}$ were 13.48 and 3.97 $mmol \cdot s^{-1} \cdot MPa^{-1} \cdot m^{-2}$ for G and M leaves, respectively. Percentage loss of conductivity (PLC), Figure 1B, was calculated as PLC=100 ($K_{leaf}/K_{leafmax}$). As expected, M leaves showed a major loss of conductivity along the whole water potential range respect to G leaves. This higher hydraulic capacity in G than in M correlated with a higher photosynthetic capacity (10.23 and 6.42 $\mu mol \cdot m^{-2} \cdot s^{-1}$ for G and M, respectively) and stomatal conductance of leaves (0.121 and 0.071 $mol \cdot m^{-2} \cdot s^{-1}$ for G and M, respectively) according to [3] for olive and almond trees.

References

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