

Xylem vessel blockages in grape pedicel growing in tropical climate observed by microtomography

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Abstract (250 words)

In grape berry pedicel, xylem hydraulic conductance can be impaired by blockage deposition in the lumen of xylem elements. However, the varietal difference of the interruptions has not yet been characterized. In this preliminary work, we utilized synchrotron x-ray computed microtomography experiments performed at MOGNO beamline (LNLS – Brazil) to identify possible blockage sites in natural grape pedicel xylem. For this, we imaged dehydrated pedicel's stem portion from the Niagara Rosada variety at Pre-veraison (PreV) and veraison (V). The reconstructed tridimensional images with a voxel size of 1.16 μm were segmented for the identification of xylem cell lumens. More than a thousand conduits were analysed, and a total of $33,33 \pm 10,13\%$ of the xylem cells were obstructed at V, compared to $12,07 \pm 8,35\%$ at PreV. We observed a decrease in lumen volume and thickness distribution between the unobstructed vessels at V stage. However, the opposite occurred when analysing the obstructed cells. The blockages origin remains unknown, however obstructed conduits have higher thickness and volume distribution at V. Because of that, we hypothesize that the blockage deposition in the lumen may correlate with the idea of a higher flux of blocking material being transported and consequently deposited in thicker xylem cells with the onset of ripening. These findings highlight the importance of tools that allow detailed tridimensional histological analysis of intact tissues. Furthermore, we expect to calculate and understand how the water transport throughout the stem pedicel is affected by the blockages, cell volume and connections between xylem cells.

Keywords: vascular occlusions, imaging analysis, grapevine pedicel.