UNIVERSITÀ di VERONA

Scuola di Dottorato
di **SCIENZE NATURALI ED INGEGNERISTICHE**

Corso di Dottorato in Biotecnologie

"Physiology Meets Hydraulics: Water Flows Interact with Grape Ripening"

May 17th, 2017 - h. 14.30

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Abstract

Irrigation supplements natural shortcomings of water from rainfall to enable grape production under dry conditions, especially in arid and semi-arid regions. By manipulating the timing and extent of water availability to grapevines, irrigation management can impact canopy growth, fruit yield, and quality. There is a widespread belief in the wine industry that irrigation close to harvest may increase grape berry size and cause a "dilution of fruit quality." In Europe this belief is often written into the law, and irrigation is prohibited or strictly regulated. Even in the New World wineries may request that growers withhold irrigation water at this time to avoid any perceived adverse effects. Surprisingly, there is little scientific evidence for this dilution myth. Berry size is determined by the balance of water flow into and out of the berries. Inflow occurs in both the xylem and the phloem, while outflow may occur by xylem backflow and berry transpiration. It has long been believed that ripening berries become dependent upon phloem water supply because xylem flow into the berries ceases at veraison due to rupture of vessels during rapid berry expansion. This seminar will discuss recent research from my laboratory, which has demonstrated that this hydraulic isolation dogma is no longer adequate, even though it remains prevalent in textbooks. Our work has shown that veraison is marked by a steep increase in phloem inflow to meet the sink demand of the ripening berries, which enables the berries to ripen even under drought stress conditions. Tracing and experimentally manipulating the movement of xylem-mobile dye into and out of the berries showed that xylem flow changes mainly due to changes in pressure gradients rather than changes in hydraulic resistance. Hydraulic manipulations that curtailed berry transpiration or xylem flow decreased sugar and anthocyanin accumulation by the berries. Based on these results and on mathematical simulations using a simply fruit growth model, we propose a model in which surplus phloem water that osmotically follows the sugar unloaded from the phloem to the berry apoplast is recycled directly to the xylem or transpired across the skin. Berry transpiration and xylem backflow may support each other in serving to discharge excess phloem water, thus facilitating berry ripening under diverse environmental conditions. Our physiological data are supported by field trials and show that irrigation close to harvest does not cause a dilution of fruit quality.

The lecture will take place **at 14.30 – Aula E – Cà Vignal – Strada Le Grazie, 15**

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For each hour of seminar, 1 CFR (provided for the specific activities of PhD Program in Biotechnology) will be recognized to students attending the event.