Vinifera master thesis abstract (template 2013)

Thesis title: Use of FDR sensors and lysimeters to monitor water use in potted Merlot grapevines (*Vitis vinifera*) under different irrigation levels

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Confidential: ☐ **Yes** ☒ **No**

Abstract (max 300 words)

Topic position & objectives:
Increasing competition for global water supplies combined with the effects of global climate change has focused attention on increasing efficiency in irrigation systems. This experiment was undertaken with the goal of monitoring water use and physiological responses of potted *Vitis vinifera* L. cv. Merlot vines under both well watered and water deficit conditions. The study also attempted to evaluate the suitability of frequency domain reflectometry (FDR) volumetric soil water content sensors as tools for managing irrigation decisions.

Methods:
The study was conducted in 2014 at the University of Udine experimental station "A. Servadei," located in the Friuli region of northeastern Italy (46° 02' N, 13° 13' E; 88 m a.s.l.). The plant material consisted of 4-year old *Vitis vinifera* L. cv. Merlot (clone R3) grafted to SO4 rootstock in 40 L pots. The pots were filled with a mixture of 80% soil (49.0% sand, 31.5% silt, and 19.5% clay) and 20% perlite. The study monitored 32 vines total, divided into 8 blocks. Weighing lysimeters were employed to accurately measure vine evapotranspiration (ET) under two treatment levels, 120% of ET and 35% of ET with 4 blocks per treatment level. Stem and leaf water potential, along with stomatal conductance and pressure-volume curve analysis, were the primary physiological measurements taken.

Results:
Reduced irrigation resulted in a moderate stress response with significantly lower ($p < 0.05$) water potentials and stomatal conductance values observed, along with some adjustment of leaf osmotic potential. Water use in the well watered treatment was found to be dynamic, exhibiting a sharp decline midway through the study. The daily change in soil water content was significantly correlated ($p < 0.0001$) to lysimeter measured evapotranspiration. This relationship, however, was stronger in the well watered treatment ($R^2 = 0.86$ versus $R^2 = 0.47$ in the deficit treatment).

Main conclusions:
The results of this study demonstrate the dynamic nature of crop water use through the growing cycle. Additionally, FDR sensors, as tools for irrigation monitoring, were found to require calibration curves accounting for different irrigation levels

Keywords (5):
Crop coefficient; lysimeter; FDR sensors; soil water content; water deficit

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