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Continuous monitoring of soil moisture and *VPD* to model plant water status

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Plant sensors monitoring water status provide accurate measurements but often only at discrete locations in a few plants. Generalising the relationship between key environmental conditions and plant water potential through a model might support real-time precision irrigation.

Continuous soil water content (*SWC*) and air vapour pressure deficit (*VPD*) were used to develop a dynamic model predicting trunk water potential (Ψ_{trunk}) in field-grown kiwifruit. The model replicates the dynamic of water movement from the soil to the atmosphere, considering resistances across the whole soil-leaf path and the trunk as storage compartment. The model employed *VPD* and *SWC* as input predictors, along with calibrated or newly defined parameters (e.g., storage capacitance, leaf area and transpiration). Soil water potential was also estimated. Predicted Ψ_{trunk} (Ψ_{model}) values were compared with those measured by means of microtensiometers (Ψ_{MT}) installed in fully irrigated and droughted vines.

The resulting Ψ_{model} values were closely related to those measured (median $R^2 \sim 0.95$). The satisfactorily fitting between Ψ_{MT} and Ψ_{model} was likely attributable to the model ability to reproduce the lag time existing between transpiration and Ψ_{trunk} peaks. The dehydration/rehydration dynamic was similar in both irrigation treatments, revealing that a droughted vine released 2.5 times more water than a well-irrigated vine. The volume of water released by the storage compartment (up to 0.22 m^3 ha^{-1} day^{-1}) suggests that the kiwifruit orchard examined would be almost entirely dependent on root water uptake which is challenging for irrigation management.

The proposed model is promising in combining model and sensors for easy and relatively low-cost monitoring of plant water status and in turn irrigation management.