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Rapid and non-destructive estimation of leaf area on field-grown Concord (*Vitis labruscana*) grapevines

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• Non-destructive estimation of leaf area per vine –that is, coming up with a number, but leaving the vine intact- is often required in field experiments. Estimations of individual leaf area have used *leaf width* or *midvein length*. However, for extensive sampling, this is laborious and costly, and an alternative method for shoot leaf area, or vine total leaf area is needed.

• The authors' goal is to compare 3 vine measurements – *shoot basal diameter, leaf count per shoot,* and *shoot length* - for their suitability as "easy-to-get" parameters from which to estimate total leaf area.

• The work was done in Prosser (Washington), using Concord vines that had been pruned to 6- or 7-node spurs, which, as we know, can grow quite vigorously (99-160 shoots/vine, according to the authors). For 5 seasons (2002-2006), the authors measured *shoot lengths*, *leaves per shoots,* and *basal shoot diameters,* on a number of vines, biweekly. Sample shoots were then brought to the lab for accurate determination of leaf area with an area meter. Armed with both types of measurements –actual leaf area values and the more practical, simpler field vine parameters- , the authors evaluated which field parameter best approached the real leaf area with the help of the statistical computer program SAS.

• **Best field parameter to estimate leaf area**. *Shoot basal diameter* (the fastest measurement) was not a good predictor of leaf area, as it had the greatest variability (R^2=0.58). This is understandable, given the narrow range of the data, as well as the fact that the cross section of a cane is often times more of an ellipse that a circle –therefore the diameter changes depending how you take the measurement. The logarithm of the *leaf count* had slightly less variability (R^2=0.85), but **the best fit** (R^2=0.90) proved to be the square root of the ***shoot length***.

• The above result would point to shoot length as the best estimator of leaf area. However, the authors warn us that counting the leaves might actually be easier than measuring shoot length in situations when shoots are entangled (large, vigorous vines). An alternative option is to use a model that takes both leaf count and shoot length into consideration, which actually works the best (R^2=0.92). (See the article for the actual equation). In the authors' experience, it is often possible to count the leaves at the same time that one extends the measuring tape along a shoot to measure its length.

• **Year-to-year variability.** Shoot basal diameter had the largest seasonal variation, followed by shoot length. Leaf count per shoot was the most stable parameter of the three evaluated.

• **Within-year variability.** The authors were able to reduce the variability for all parameters by using **degree-days** instead of calendar days to calculate their equations. This is because vine growth is less sensitive to calendar time than to "thermal time", which is able to capture more within-season variability.

In brief, *shoot length* had the highest linear correlation with total leaf area. This correlation could be improved by including *leaf count* in the model. This model was sensitive to between-year and within-year variability. By using degree-days instead of calendar days, the authors were able to reduce between-year variability. Even thought the authors found the results presented to be true for a wide variety of situations –different degree-days, pest pressures, irrigation regimes- they still caution it would be wise to validate the data for the local conditions.

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