Hydraulic safety and xylem morphological traits in a panel of *Vitis vinifera* varieties

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1. BACKGROUND

- Water deficit can significantly impact grapevine physiology, growth, yield, and berry quality
- Due to climate change, more frequent and intense drought events are expected in future [1]
- Differences in water relations between cultivars is a known, yet not fully understood, phenomenon [2]
- The aim of this study is to investigate genotype-dependent differences in vessel morphology and xylem embolism formation

2. MATERIALS AND METHODS

Nine varieties were selected for their worldwide economic importance and hydraulic behavior. During drought, water potential in anisohydrics decreases, whereas isohydrics keep it relatively constant through stricter stomatal control.

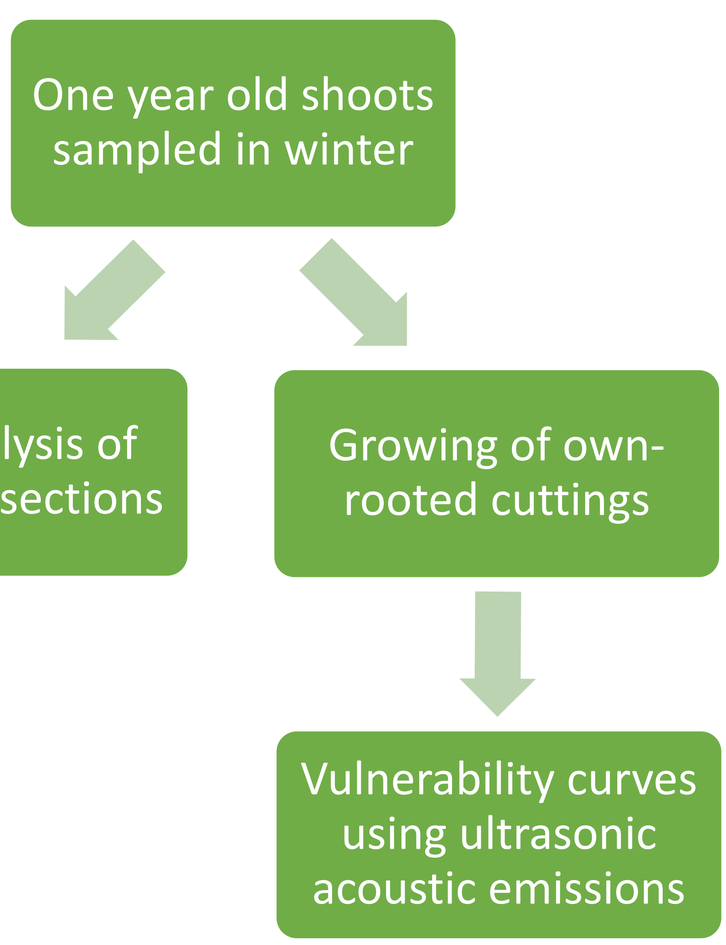

Figure 1: Methods used in this study

Table 1: Studied varieties

Variety	Origin	Hydraulic behavior
Cabernet Sauvignon	France	Isohydric
Chardonnay	France	Anisohydric
Gewürztraminer	France	
Grenache	Spain	Isohydric
Macabeo	Spain	Isohydric
Montepulciano	Italy	Isohydric
Riesling	Germany	Anisohydric
Sémillon	France	Anisohydric
Syrah	France	Anisohydric

Figure 2: Many wine regions are characterized by a Meditteranean climate with warm and dry summers [2]. Photo: Mario Wegher

3. RESULTS

- Significant differences ($p < 0.01$) between varieties were found in terms of:
  - Vessel number, area and diameter
  - Water potential, where embolism formation occurs
- P50 (50% embolized vessels) and mean vessel diameter were negatively correlated ($p < 0.01$) Varietal differences in xylem anatomy and vulnerability curves were not related to the classification as isohydric/anisohydric

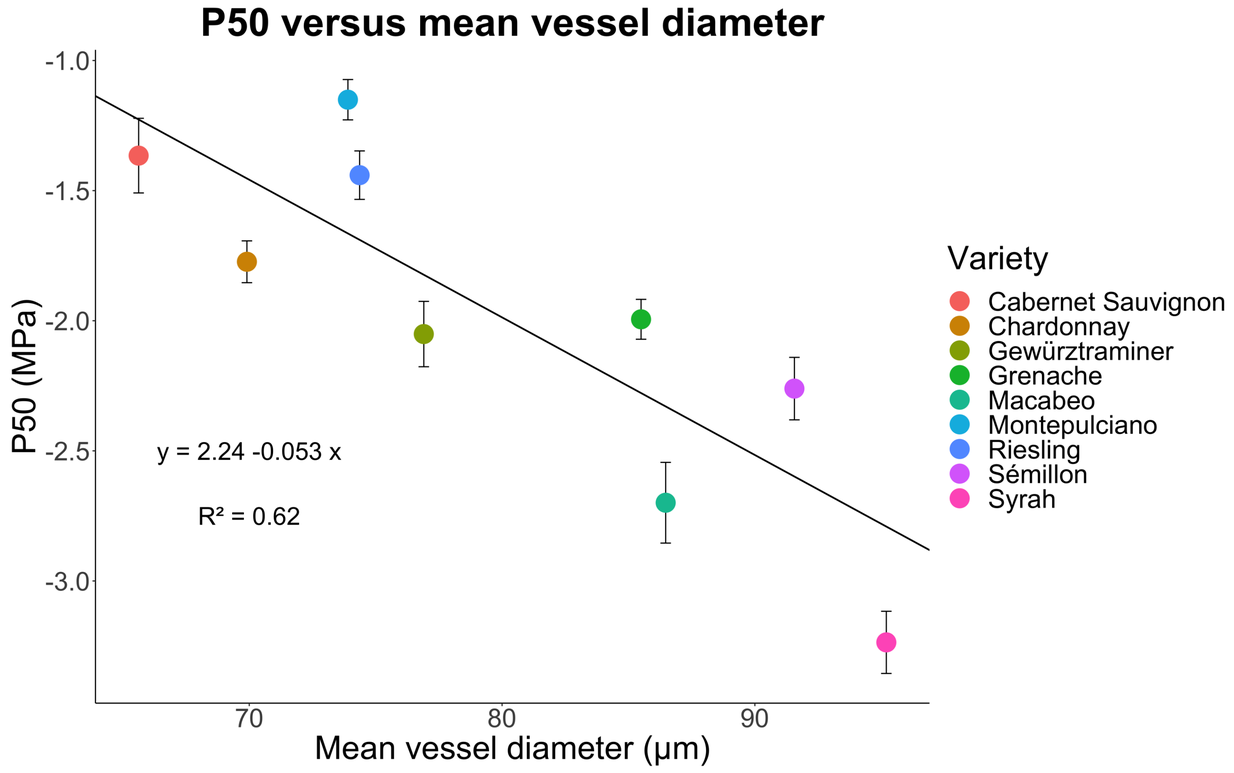

Figure 3: P50 with standard error of the tested varieties in function of their respective mean vessel diameter

4. DISCUSSION

Our results indicate clear differences in traits related to drought tolerance between *V. vinifera* genotypes. However, these traits did not correspond to isohydric/anisohydric classification. Interestingly, we found a negative correlation between P50 and vessel size indicating varieties with larger vessels to be more resistant against drought-induced embolism formation. This is in contrast to other studies [3] and may be related to differences at the pit level [4].

Further understanding of the traits behind drought tolerance may play a key role in the breeding of new varieties, making our viticulture fit for future challenges.

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