

# Effect of Powdery Mildew Resistance on Phenolic Content of Inoculated *Vitis* Leaves

Lindsay Brown<sup>1</sup> and Ben Gutierrez<sup>2</sup>

<sup>1</sup> School of Integrative Plant Science & Viticulture and Enology, Cornell University, Ithaca, NY 14853

<sup>2</sup> USDA-ARS, Plant Genetics Resource Unit, Cornell AgriTech, Geneva, NY 14456

## Introduction

Genetic resistance to the economically damaging powdery mildew (*Erysiphe necator*) can improve the sustainability of viticultural control measures as demonstrated through the Ren3 and Ren9 resistance genes. These resistance genes trigger a hypersensitive response in tissues affected by powdery mildew.<sup>6</sup> The hypersensitive response also causes changes in the expression of phenolic biosynthesis genes.<sup>2</sup> Phenolics are defensive compounds that may prevent the spread of powdery mildew in vines.<sup>1</sup> The rate of phenolic expression is in part determined by the resistance genes.<sup>2</sup> This experiment explored how the resistance genotype relates to the post inoculation phenolic content.



Figure 1. Powdery Mildew<sup>3</sup>

## Materials and Methods

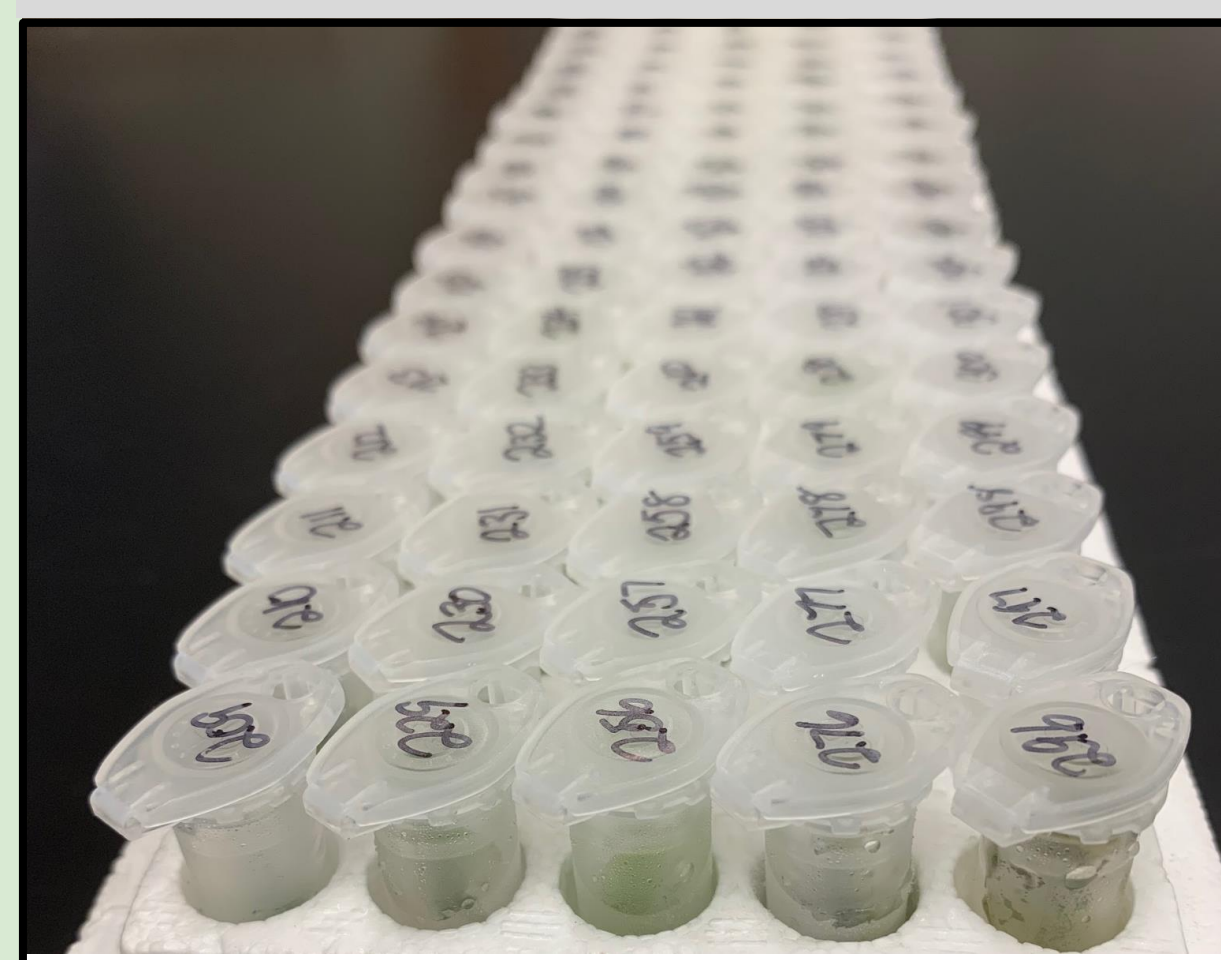


Figure 2. Samples in Eppendorf Tubes

Sample Collection

- The population of 103 individuals was divided into having both, either, or neither of the genotypes.
- Samples of analyzed leaves were taken at 8 days post inoculation (dpi) in duplicate with 2-3 leaf discs in each tube.



Figure 3. Vials Prepared for Extraction

HPLC Preparation

- These samples were
  - frozen in liquid nitrogen,
  - powderized,
  - suspended in a 1.5 mL solution of acidified methanol,
  - and filtered into amber vials for HPLC analysis.

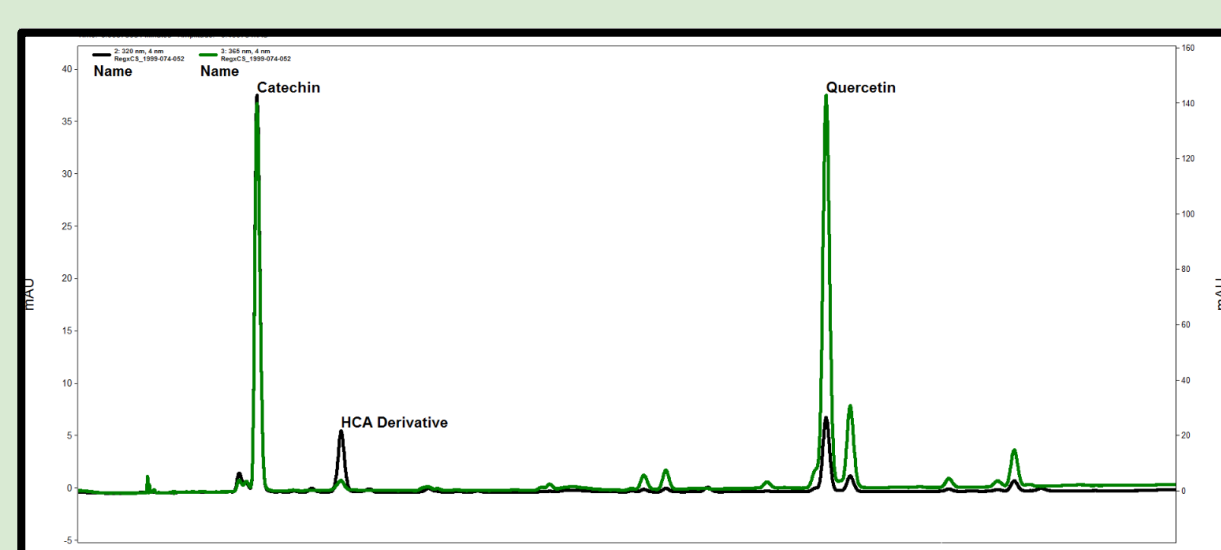


Figure 4. Multi Chromatogram Output

Analysis

- The major peaks found in the Multi Chromatogram were identified and quantified by peak area (mAU) and retention time.

## Results

- The major peaks include a catechin (A), a hydroxycinnamic acid derivative (B), and a quercetin (C).
- Ren3 had the highest overall phenolic content and Susceptible had the lowest.
- There is a strong correlation (>0.5) between the peak areas and the genotypes, respectively.

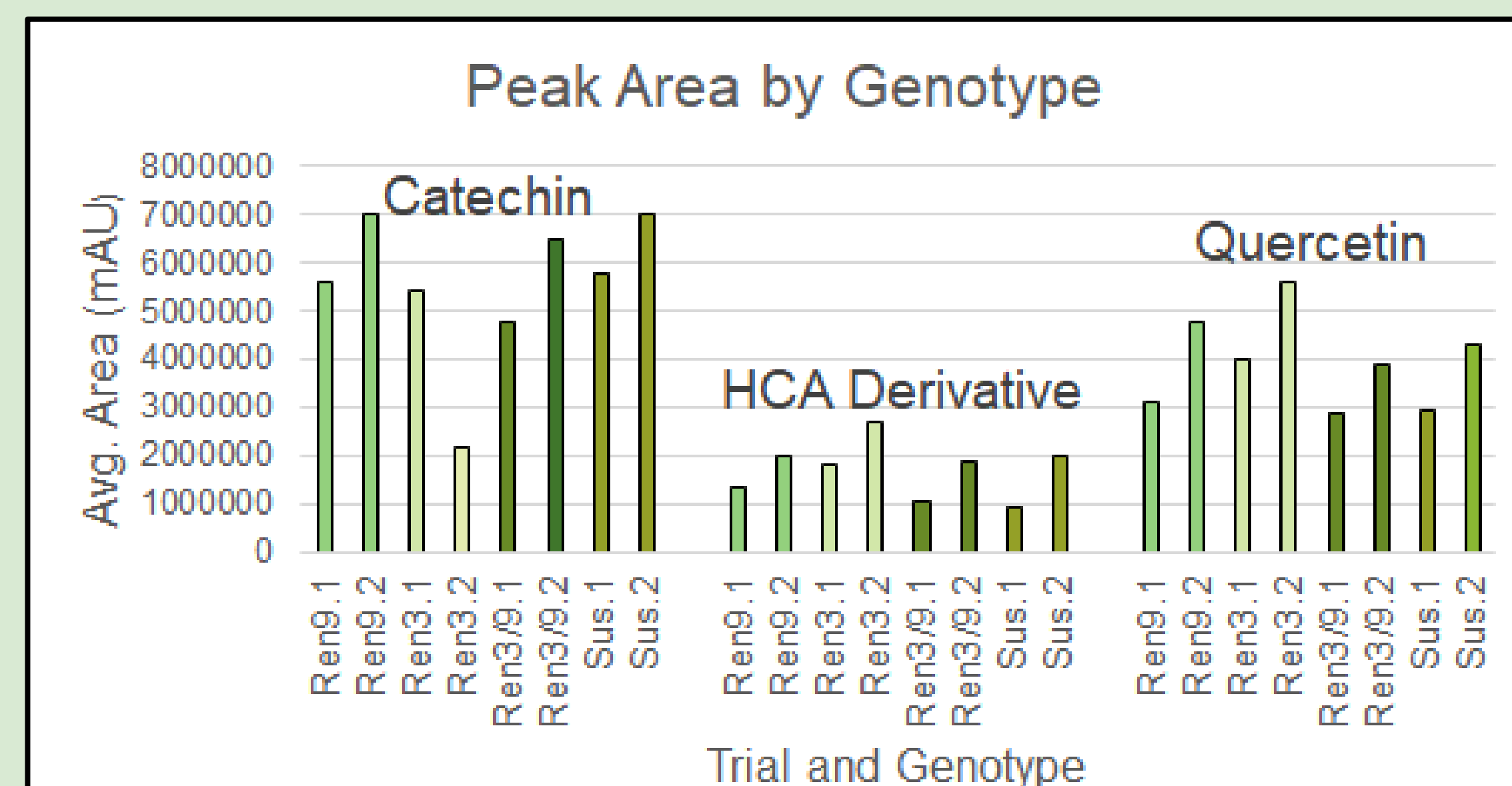


Figure 5. Area Comparison between Trials and Genotypes

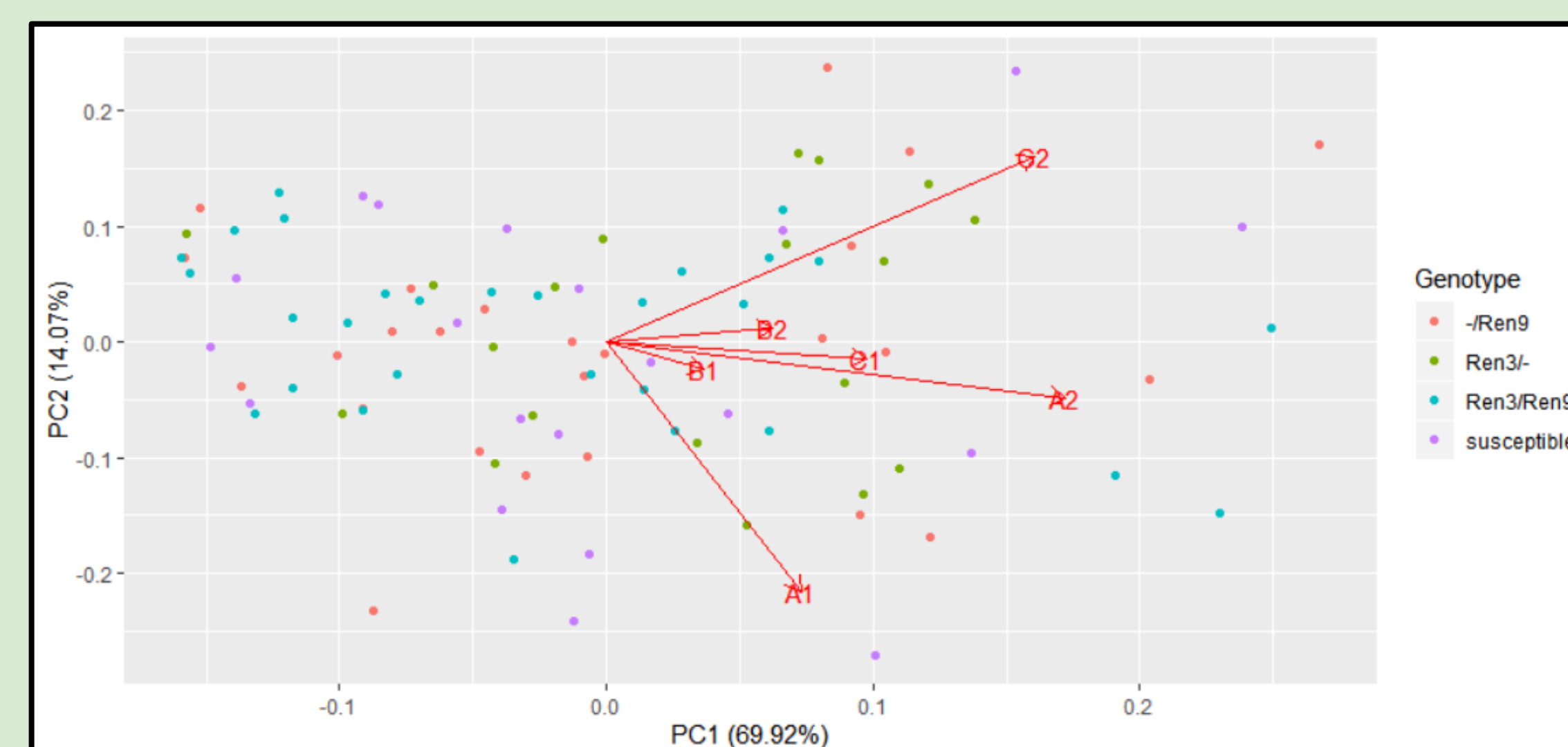


Figure 6. PCA Biplot  
The first two components account for 83.99% of the variation.

## Discussion

- There was a stronger correlation within the trials than between them as can be seen in the PCA Biplot.
- The phenols found in these samples are produced and used as a defense response to the inoculum.
  - The expression of phenolic biosynthesis genes peaks at 12 hours post inoculation (hpi).
  - By 8 dpi, the concentration of these compounds could have decreased as they were used for disease prevention.
    - Thus, the phenolic concentrations present in these samples can either be indicative of the production or usage heightened by the resistance genotype.<sup>2</sup>

## Conclusions

- An experiment with samples taken at 0 hpi, 12 hpi, 24 hpi, 72 hpi, and 120 hpi would encompass the most variation in the phenolic levels to fully demonstrate the impact of the genetic differences.
  - This would demonstrate endogenous differences, and the peak and decline of phenolic concentration.<sup>2</sup>

## References

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- <sup>6</sup>Zendler, D. Schneider, P., Töpfer, R. & Zyprian, E. Fine mapping of Ren3 reveals two loci mediating hypersensitive response against *Erysiphe necator* in grapevine. *Euphytica: International Journal of Plant Breeding*, 2017; 213, 68.

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