

Which grapevine rootstock performs the best for Mornington Peninsula Pinot Noir?

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Abstract: Phylloxera infestation is a critical risk faced by the Australian wine industry, and phylloxera-resistant rootstocks provides a viable solution. This project compared 14 different types of rootstocks on the physiological performance of Pinot Noir scion grown in the Mornington Peninsula. Preliminary data in the 2018-19 vintage showed clear differences in the timing of flowering, canopy size and plant nutrients, such as magnesium, sodium, potassium, calcium, phosphorus, sulfur, zinc, manganese, copper and boron. As the trial progresses, more insights to support rootstock selection will be found, benefiting the Australian wine industry.

Aims: This project was proposed to investigate the impacts of 14 different rootstocks on scion performance and grape/wine quality using *Vitis vinifera* L. cv Pinot Noir MV6 as model plant. Parameters on plant phenology, plant physiology and soil health have been measured at different stages of grapevine growth. The results can be used to evaluate and compare new rootstocks in their impacts on the physiological performance of scion, which reflects the resistance of rootstock to abiotic stress, especially their impacts on plant nutrition. This report summarizes the data in the 2018-19 vintage, which is the first phase of a multi-year research project. Upcoming work and future research directions are also included in this report.

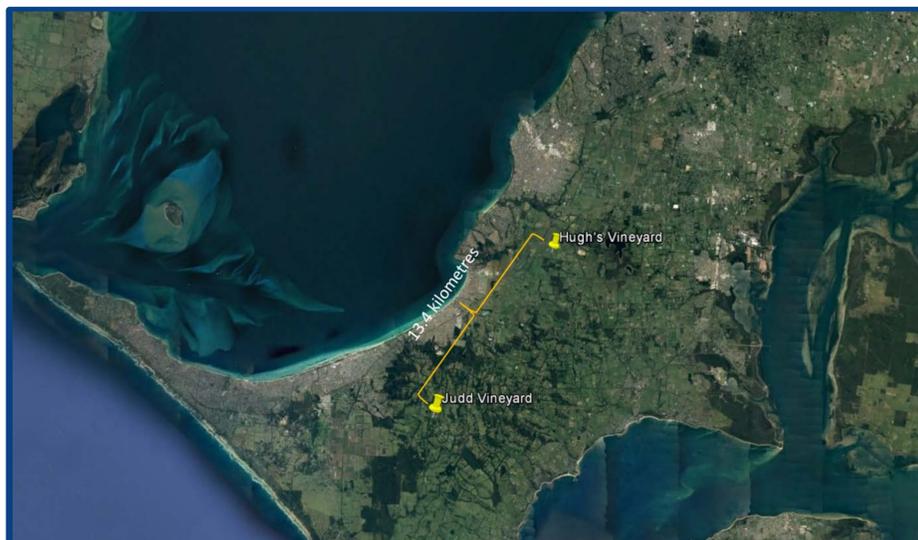


Figure 1. Location of Hugh's vineyard and Judd vineyard at the Mornington Peninsula, satellite image obtained from Google Earth. (Google LLC, Mountain View, CA 94043 USA)

Materials and Methods: This study was conducted at two commercial vineyards located in the Mornington Peninsula wine region of Victoria, Australia. The two vineyards are approximately 5 kilometres apart, one at a warmer coastal area (Hugh's vineyard S38.295, E145.058, Elevation 48 m), and one on cooler hillslopes (Judd vineyard S38.392, E144.967, Elevation 174 m), reflecting two distinct meso-climates at the peninsula.

At both vineyards, the scions of *V. vinifera* L. cv Pinot Noir were grafted onto 14 rootstocks in 2014 and 2016 with 3 replicates per treatment and one panel per replicate. Studied rootstocks were: 101-14, 1103 Paulsen, 5BB Kober, 110 Richter, Schwarzman, 5C Teleki, 3309C, Merbein 5489, Merbein 6262, Merbein 5512, C20, C29, C113 and C114. Grapevine were also planted on own root as control. The spatial arrangement of rootstocks and planting density were the same in both vineyards. Both vineyards were managed according to industrial practices with no severe pest or disease occurrences in the experimental vintage.

Plant phenology, plant physiology, plant and soil parameters, including percentage of flowering, percentage of veraison, chlorophyll content, leaf area index (LAI), pruning mass, chlorophyll content, petiole nutrients and soil moisture, have been measured at key stages of grapevine growth – anthesis, veraison and harvest.

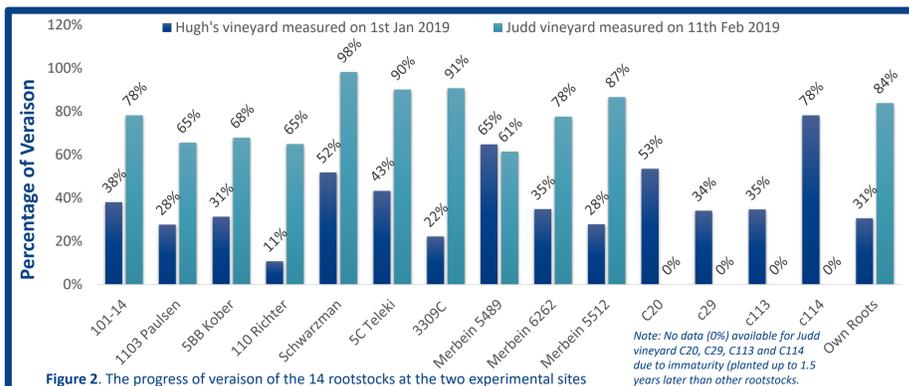


Figure 2. The progress of veraison of the 14 rootstocks at the two experimental sites
Finding 1: Schwarzman, 5C Teleki, C20 and C114 showed more advanced veraison compared to own roots, while 110 Richter showed slower progress of veraison compared to own roots in both vineyards, other rootstocks including 101-14 showed similar results as own roots.

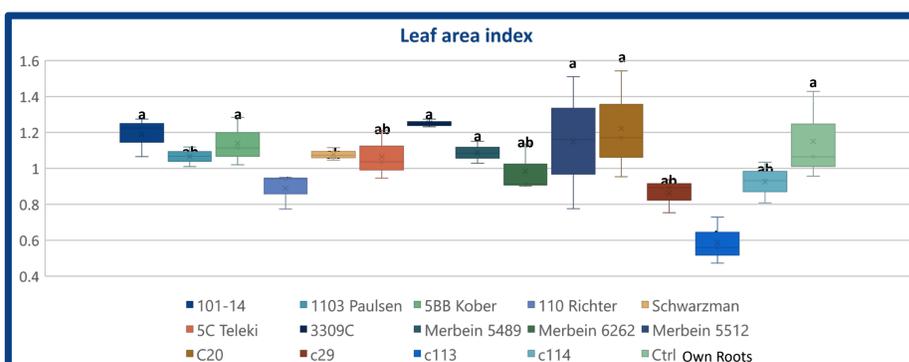


Figure 3. Leaf area index of the 14 rootstocks at veraison at Hugh's vineyard
Finding 2: Most rootstock showed similar LAI compared to own roots, except C113, which showed significantly lower LAI. This finding needs to be further validated in future vintages to exclude the influences of grapevine age on LAI. (Note: Grapevines with C rootstocks were planted 1 year later than the other rootstocks at Hugh's vineyard)

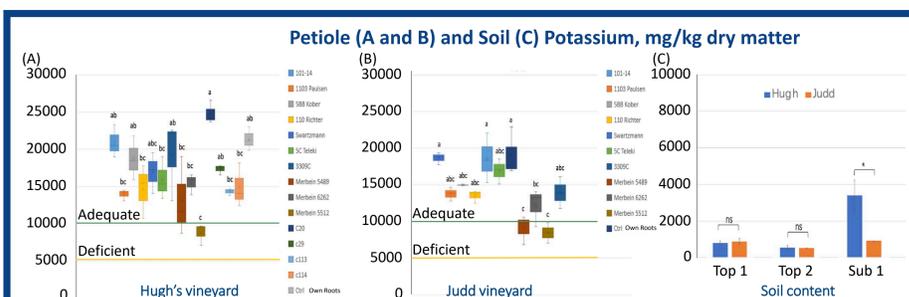


Figure 4. Comparison of petiole nutrients of 14 rootstocks at flowering: (A) Hugh's vineyard, (B) Judd vineyard; (C) comparison of soil nutrients of the two vineyards. Potassium content in petiole and soil is illustrated as an example.

Finding 3: Significant differences in some petiole nutrients were observed among studied rootstocks, including magnesium, potassium, calcium, phosphorus, sulphur, zinc, manganese, copper and boron. Some nutrients in specific rootstock may be below referenced adequate concentrations (Reuter & Robinson, 1997). Using Potassium as an example, Merbein 5512 had significantly lower petiole potassium content compared to other groups, which was slightly below adequate level. Petiole potassium content observed at two experimental sites were similar, and not influenced by the different potassium contents in the subsoil.

Conclusion and Recommendations:

Based on the current results, the performances of some rootstocks can be preliminarily evaluated:

- 5BB Kober and 5C Teleki might be a vigorous rootstock for Pinot Noir
- Rootstock 5BB Kober might be less capable at uptake of Mg and Zn
- Merbein 5512 may be a less vigorous rootstock and lead to higher acidity in grape
- The 4 types of C rootstocks exhibited different influences on grapevine phenology, physiology and nutritional parameters. Further investigations in future vintages are required to validate the results reported in the current study.

This project provides initial data reflecting the impacts of rootstock on grapevine performance. As the trial progresses, more insights to support rootstock selection will be found, therefore benefiting the Australian wine industry in selecting rootstocks.

Acknowledgements: This project receives financial support from the Australian Grape and Wine Authority through its Incubator Initiative program (UM1801). This project is a six-way collaboration between Wine Australia, The University of Melbourne, The Australian Wine Research Institute, Mornington Peninsula Vignerons Association, Yalumba Nursery and CSIRO.

The University of Melbourne Trace Analysis for Chemical, Earth and Environmental Science (TrACEES) Platform provided invaluable advice and support for plant nutrients and soil analyses.