

Rootstocks

Helping vines protect themselves

Growing on rootstock

Rootstocks are becoming more and more widely adopted by Australian and New Zealand growers as ways to better protect their vines from pests and help them respond better to their environments. Journalist Harrison Davies attended a rootstock field day in Coonawarra to understand more about how growers are using rootstocks to help improve their long-term vineyard sustainability.



David Hansen. Photo: Coonawarra Vignerons

Rootstock growing was developed in France in the late 19th century as a way to protect vines from phylloxera, which had recently been introduced to Europe by way of the New World.

The pest had not been found in Europe before and the vines were particularly susceptible – meaning many producers would watch their livelihoods fade away before their eyes.

The idea to graft North American roots to the base of European vines was toyed with as a way to keep Old World vines

These conversations are all about ‘how do I match my soil total available water, my climate, my rootstock, and my scion variety, to my desired yield and quality specification?’ I’m aiming for this, the Holy Grail.

David Hansen

safer from phylloxera and growers quickly found it to be effective.

Over a dozen clones of rootstock have been developed in the last century, all of which respond to different conditions and provide protection from a variety of disorders.

I attended a rootstock field day, hosted by Vinehealth Australia, where they demonstrated some of the rootstock research that had been conducted at Wynn’s in Coonawarra. ▶

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Ramsey rootstock. Photo: Coonawarra Vignerons

On a chilly April morning I huddled into a bus with a bunch of viticulturists, winemakers and winegrape growers to get a first-hand look at the research being evaluated by David Hansen of Hansen Consulting Group.

The aim of the research was to expand on how different rootstocks respond to similar soil conditions and how these affect the vigour and yield of the vines and, ultimately, the quality of wine they would produce.

A look underground

The group wandered into the vineyard and were met with a series of soil pits that would provide a rare look at the cross section of the rooting patterns of these various rootstocks, where the roots had been painted to help demonstrate the size, density and depth of the root systems.

The study measured rooting density, root volume and grape yield for each rootstock growing under the same management, and discussed potential suitability of each of rootstock to different climate and soil conditions and desired wine quality and yield.

The study monitored CW44 clone Cabernet Sauvignon grafted onto eight different rootstocks against an own rooted control.

Management techniques such as irrigation and vine spacing were also discussed as each vine was presented.

While the ability of rootstocks to tolerate or resist phylloxera has been well documented, this is among one of very few trials studies in Australia set up with the aim to help growers understand inherent differences between rootstocks and their contributions to wine quality.

Hansen stood in the first of nine pits that displayed the makeup of various rootstocks in the calcium rich soils of Coonawarra.

He explained that vine roots would generally aim to grow as deep into the ground as possible, but that in the soil profiles at Wynn's they had been restricted to a depth of around 10-40cm below the surface.

This was because soil above that level was inhospitable and under 30cm the soil was too dense for the roots to penetrate.

"They're in sort of 10 to 30 range," Hansen said.

"They're limited by this calcareous layer and they're limited by the surface, [where] we often see the herbicide and the sun.

"We're also seeing the effects of soil compaction by machinery, with a general lack of root growth in the wheel tracks in all soil pits."

Hansen, along with fellow researchers Nick Dry of Foundation Viticulture and Suzanne McLoughlin from Vinehealth explained that many of the vines would seek out moisture more than anything else, and that the similar activity between different rootstocks was more dependent on soil moisture and soil density.

Dry explained that the Wynn's vineyard had dense soil as well as a calcerous layer that all contributed to the shape in which

the roots would grow and also pointed out that some of the root systems of these rootstocks are inherently different.

"The 5489 [Merbein clone] had area to work into volunteer work into on the shallow side," he said.

"So that speaks to the fact there are differences between rootstocks. Some will explore and some will be a little bit closer to the surface.

"Some rootstocks are more efficient at taking up certain minerals [like] nitrogen and excluding salts such as potassium, sodium and chloride.

"But then there are then some rootstocks with antagonistic relationships between potassium and magnesium.

"So if they take up magnesium more readily, then they don't take up as much calcium and vice versa.

"Given that we have generally high potassium levels in our soils and potassium can impact on wine, one of the attributes that you're looking for is less potassium uptake.

"This was one of the reasons we have been keen to evaluate the Merbein rootstocks in this trial that have been bred specifically for low potassium uptake."

It was simple to see how the rootstocks that had smaller, denser roots would take up more nutrients and minerals from the

soil and produce more luscious, fruitful vines.

"At the end of the day, denser root volumes create bigger canopies and heavier fruit loads," Hansen explained.

"There might be a quality issue with this.

It's been good in this rootstock trial to have some different rootstocks not commonly available just to see how they might go.

Suzanne McLoughlin

"These conversations are all about 'how do I match my soil total available water, my climate, my rootstock, and my scion variety, to my desired yield and quality specification?' I'm aiming for this, the Holy Grail."

The vines in the Wynn's vineyard were affected by factors like rainfall and vehicle use, as well as other things that would contribute to the compaction of the soil.

Questions remain about the effectiveness of the rootstocks had they been used ▶

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Ockert Le Roux – Coonawarra Vignerons, Suzanne McLoughlin – Vinehealth Australia, David Hansen – Hansen Consulting Group, Kerry DeGaris - viticulturist at TWE, Nick Dry – Foundation Viticulture

from the start and were given more of an opportunity to establish.

Making wines with rootstock

One aim of the trial was to make wines and see how the rootstocks would affect the finished product, and the trial allowed us to try samples of Cabernet made in 2019 from each of the rootstocks used in the trial.

An immediate takeaway from the tasting was that the vines that grew with more vigour and produced larger yields were not the vines that created the most universally enjoyed wine.

The highest scoring wine in the official tasting that was conducted was the German Börner rootstock that was developed to be resistant to phylloxera.

While the vine created disease resistant berries that were made into a very

Some rootstocks are more efficient at taking up certain minerals [like] nitrogen and excluding salts such as potassium, sodium and chloride. But then there are then some rootstocks with antagonistic relationships between potassium and magnesium.

Nick Dry

well-liked wine, these vines were less magnificent.

Börner rootstock had the second lowest density of roots and also the second lowest yield of fruit.

“[Börner] has been definitely on the lower end of the scale in terms of yield and vigour and the fact that it probably doesn’t like the calcareous soils is probably impacting quite a bit on that,” McLoughlin said.

“This rootstock came up the most preferred wine from 2019.

“It’s been good in this rootstock trial to have some different rootstocks not commonly available just to see how they might go.”

On the other end of the scale was the Merbein 5489 clone, which had the largest yield of all the rootstocks and

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scored the second highest in the 2019 tasting.

It was noted on the day, however, that the conditions of the soil may have played a role in the vigour of the 5489 roots, as they were the only ones with a deep soil among those in the trial that did not appear to have a layer of calcerous soil directly below.

Still, the roots were only present between 10 and 40 centimetres into the soil.

Hansen explained that the comparatively high vigour and yield might have had more to do with the access to moisture, as the absence of the calcrete layer offered more opportunities for the moisture to be absorbed by the roots.

“The majority of the roots are between 10 and 30 centimetres again, with few roots growing in the wheel tracks or into the midrow,” he said.

“We rated this one pretty high and I think we’re reasonably high with root density in volume.

“I think probably the [rooting] volume we may have underestimated; there are some pretty chunky roots here.”

The trial suggested that greater root density and access to moisture would result in a greater yield, but a correlation between yield and quality of wine still seems to be inconclusive.

“Factors like penetration resistance and soil strength play a role,” Hansen said.



Suzanne McLoughlin and Nick Dry. Photo: Coonawarra Vignerons

“Certainly even within those limitations we felt that some root systems were denser, which equated to a bigger canopy and higher yield.”

Interest in rootstock

Viticulturists on the day were interested in the trial for several reasons, but a unifying factor was preparing for phylloxera.

“It’s only a matter of time,” one grower told me on the day.

South Australia produces more wine than any other state in Australia and has managed to keep the pest away from its wine regions.

Coonawarra growers, who are only a stone’s throw away from Victoria, where there have been the most recent cases of the pest, said introducing rootstock would go a long way in future proofing their vineyards

“I don’t have many vines on rootstock at the moment but we are starting any new growth on rootstock now,” the earlier grower said.

Rootstocks are quite a bit more expensive than own rooted vines, although Dry said that the cost of growing on rootstock would pay for itself as it greatly reduces the amount of tending the vines require.

“When you don’t have to worry as much about nematodes or phylloxera you can see that the extra cost is definitely worth it,” he said.

Hansen and Dry said there needed to be more trials such as this across different locations in Australia.

The trial will continue into the future and more avenues around rootstocks will be explored. ▶

An advertisement for IRONMAX PRO slug and snail bait. The main visual is a large, metallic, silver robotic hand with a clenched fist, holding two snails. The background is dark with a brown, torn-paper-like banner at the top containing the product name. Text on the left includes 'NEW' in a red banner and the website 'agnova.com.au'. The central text reads 'Iron-fisted on slugs & snails. Gentle on the environment.' Below this are several bullet points describing the product's benefits: 'Next generation, iron-based, all-weather slug & snail bait that packs a punch in controlling slugs & snails but is soft on the environment, crops & non-target organisms.', 'IRONMAX Pro is the latest development in slug & snail control with COLZACTIVE® technology for maximum attractiveness, palatability & persistent control.', 'Nil withholding period for grazing & harvest.', and 'Certified input for organic production.' At the bottom right is the AgNOVA TECHNOLOGIES logo with social media icons for LinkedIn, Instagram, Facebook, and Twitter. The bottom left of the ad features the website 'agnova.com.au' and the slogan 'Innovation. Quality. Solutions.' The bottom center contains a small line of text: '©IRONMAX Pro & Colzactive are registered trademarks of De Sangosse SA. 220406'.

Rootstocks examined in the trial

Börner - *V. riparia* x *V. cinerea* cv. Arnold

- A phylloxera 'immune' rootstock developed in Germany.
- Low vigour and low yield across all three seasons of data collection.
- Open canopy/good vine balance.
- Performed well in wine quality measurements.
- Should be considered for further commercial evaluation.
- Need to establish and manage with consideration for the 'riparia' parentage i.e. water and lime issues.

2022 Observations:

- Lower vigour, some basal leaf yellowing
- Possibly needs deeper soils, closer planting

M5489 and M5512 - complex hybrids from *V. berlandieri*

- Australian rootstocks developed for local conditions.
- Medium vigour across all three years of data collection.
- Highest yielding treatments in V19
- M5512 = 8.8kg/vine & M5489 = 6.4kg/vine
- V19 field walk indicted that these two treatments looked to be in 'good balance'.
- Performed well in V19 wine evaluation.

2022 Observations:

- M5489- moderate vigour, high yields, no yellowing
- M5512- mod.-high shoot growth, moderate yield
- Both high root density and root length

110 Richter - *V. berlandieri* x *V. rupestris*

- A moderate vigour, drought tolerant option.
- Medium vigour across all three years of data collection (similar to M5512, M5489 and Ramsey).
- Ranked 3rd in yield in V19 (6.3 kg/vine) behind M5512 and M5489.
- Grouped with 1103P and 140R in principal bi-plot analysis - wine evaluation tended towards herbal/higher methoxy characters.

2022 Observations:

- Moderate-high vigour (lower than 1103P and 110R).
- 'Well suited to red, limited soils as a drought tolerant option- not suited to black or sandy loam soils'

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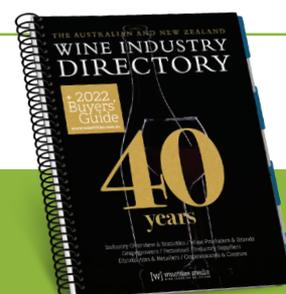
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1103 Paulsen & 140 Ruggeri - V. berlandieri x V. rupestris

- Drought tolerant, higher vigour options.
- Higher vigour and declining yields
- High wine potassium, high methoxy levels, lowest wine scores.
- Homogenous management appears to have impacted performance
- How should they be managed to get benefits from drought tolerance while still producing consistent quality?

2022 Observations:

- Both high vigour and high root density and volume.
- 'Too much vigour to control in wetter springs or where there is frost control required.'

• Ramsey - V. champinii

- Drought tolerant, higher vigour option.
- Highest yield in V15, lowest yield in V19
- Medium vigour in V19
- Surprisingly paired with own roots in the principal biplot analysis.
- Shallow soils inhibited Ramsey's normal high vigour, high yield nature?
- Does it still display drought tolerance?

2022 Observations:

- Low-moderate vigour, some yellowing
- Horizontal thick roots **CW**

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