



Department of
Primary Industries

Grapevine management guide 2017–18



Editor Darren Fahey

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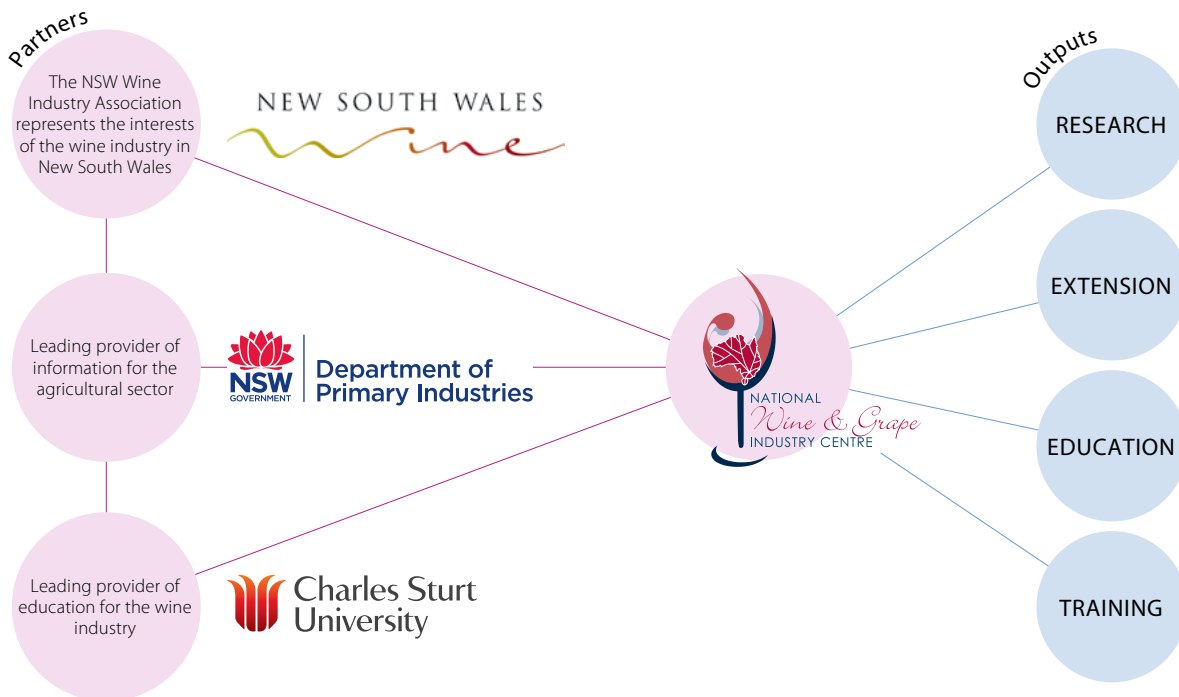
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Primary Industries

Grapevine management guide 2017–18

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The National Wine and Grape Industry Centre is an alliance of Charles Sturt University, NSW Department of Primary Industries and the NSW Wine Industry Association.

The National Wine and Grape Industry Centre delivers high value research, education, training and extension to the Australian Wine Industry.



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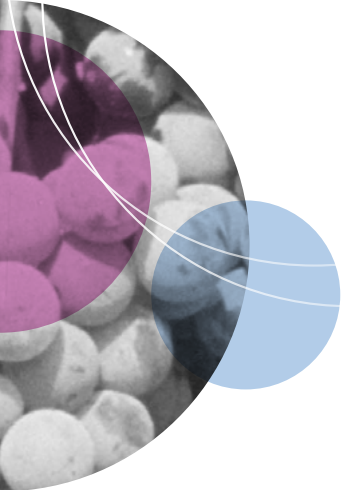
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Workforce Development & Extension

- Marketing
- Consumer science
- Food science

Market insights



Foreword

Putting NSW growers at the top of the glass

As the Development Officer – Viticulture (DOV), It is with great pleasure that I welcome you to *The grapevine management guide 2017–2018*.

My role as DOV is primarily to support capacity building and industry growth by providing access to expert advice and assistance, and by supporting NSW winegrowers to adopt new information and technologies to deliver benefit to the NSW wine grape industry.

As you will see in this year's guide, alternative and new varieties are fast becoming more than just the latest fashion trend for inner city wine consumers. With exports on the rise to Asia due to several free trade agreements and a lower Australian dollar, gaps exist in these and many other marketplaces for examples of NSW-produced Italian, Spanish, Portuguese and Greek varieties outside the varieties that have typically been produced.

This guide provides a broad, balanced approach with input from leading viticulturists in NSW, QLD, SA, VIC and WA, winemakers and researchers on what's already on the road to success and maybe what's next.

The Skills Development Program continues to provide resources for industry with the Weather Station Network all freely available on the [DPI website](#). VineWatch bulletins now cover the majority of NSW wine regions and continue to inform growers across the state via regular regional updates, news and events.

Our efforts to deliver the Wine Australia regional program on behalf of industry have now expanded to include the Riverina region with Adrian Englefield at the ready putting on trials, demonstrations, workshops and shed visits this coming vintage. Two activities undertaken in the greater NSW/ACT region, **Mid row crops for vineyards** and **Management of Botrytis in cool climates** are featured on **pages** respectively. As

always, the information will be reported directly back to industry through the Spring Vine Health Field Day workshops, which cover seven regions across the state during August and September, so be sure to register and hear the latest and greatest in all things viticulture during these sessions to help drive innovation in your vineyard.

With the recent annual Innovator's Forum updating the strategic plan, industry now has a clear focus and goal to meet its objectives across four themed areas with specific RD&E concepts to be undertaken from these. NSW DPI will support this by delivering both high quality research and extension to the state's wine industry based on this collaboration.

The grapevine management guide 2017–2018 is one of NSW DPI's flagship publications. Such publications are a crucial means of packaging information for producers and, as such, I recommend this current edition to you.

Feedback please

NSW DPI wants to make sure that the information we're providing is what you need to make your business grow. We would like to receive any feedback that you care to offer – good, bad or indifferent. This will help us to make future editions even more useful.

Please contact me with your suggestions by mail, phone or email.

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Current DPI NSW viticulture research

Dr Gregory Dunn, Leader, Viticulture DPI NSW

DPI NSW conducts the majority of its viticulture-related research at the National Wine and Grape Industry Centre (NWGIC) at Wagga Wagga, which is an alliance between Charles Sturt University (CSU), DPI NSW and the NSW Wine Industry Association.

Research projects span the continuum from the grapevine to the wine and on to the consumer. These projects are mainly co-funded by the Australian Grape and Wine Authority (AGWA) and often involve collaboration with other R&D providers across Australia. In addition to these research projects, post graduate students and visiting scholars conduct other smaller studies.

Major research themes and current DPI NSW projects are:

Vine health and biosecurity

- Understanding fungicide resistance in powdery and downy mildew – Dr Sandra Savocchia, email: ssavocchia@csu.edu.au
- Evaluating and demonstrating new white and red disease-resistant varieties for the Riverina – Dr Bruno Holzapfel, email: bruno.holzapfel@dpi.nsw.gov.au

- Brassica biofumigation of black foot fungi in vineyard soil – Dr Melanie Weckert, email: melanie.weckert@dpi.nsw.gov.au

Vine quality and yield

- Improved yield prediction for the Australian wine industry using real time image capture and analysis – Associate Professor Gregory Dunn, email: gregory.dunn@dpi.nsw.gov.au
- Improving industry capacity to manage yield and wine quality relationship through understanding the influence of vine carbon balance and berry composition – Dr Bruno Holzapfel, email: bruno.holzapfel@dpi.nsw.gov.au

Fruit and wine composition and style

- The sugar potassium nexus within the grape berry – Dr Suzy Rogiers, email: suzy.rogiers@dpi.nsw.gov.au
- Cell death in the grape berry – Dr Suzy Rogiers, email: suzy.rogiers@dpi.nsw.gov.au

Introduction

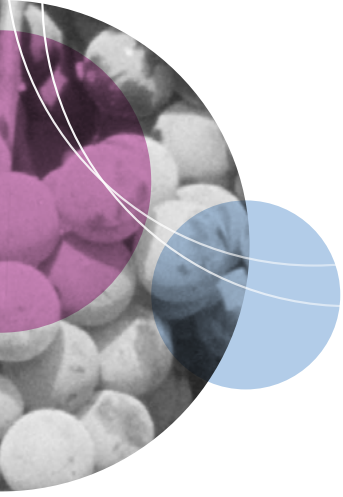
Dr Gregory Dunn, Leader, Viticulture DPI NSW

The Australian wine industry is based on numerous diverse and geographically separated wine regions. The extent of this diversity is unique when compared with our international competitors.

Of the wine producing Australian states, NSW exemplifies this diversity more than any other state. Capturing the benefits of this diversity is due, in no small way, to skillfully matching sites with varieties.

This issue of the *Grapevine management guide* focuses on exploring interesting and appropriate alternative grapevine varieties for NSW and their wine-making characteristics. The guide complements a focus on germplasm in research projects and extension activities in 2017, including regional variety workshops in the Riverina exploring exciting red and white Italian varieties.

I hope you enjoy reading the 2017–18 *Grapevine management guide* and find it useful.



New and emerging varieties

Darren Fahey, Viticulture Development Officer

NSW can lay claim to being the birthplace of grape production and wine in Australia. However, step forward to 2017 and it would seem the industry has lost its way with the state now following the rest of the country in the production of many new and alternate varieties. Sure, early adopters such as Freeman, Calabria and Di Lusso wines have used Italian varieties to build successful brands, but many vineyards still maintain predominately the favoured French five of Cabernet Sauvignon, Merlot, Chardonnay, Shiraz and Semillon.

While there is nothing wrong with that, given that these varieties still dominate domestic and export marketplaces, other wine regions from across Australia have seemingly stolen the march and are now leading the way producing and supplying varieties from Spain, Italy, Greece, Georgia, Portugal and Austria. Several examples spring to mind with Touriga Nacional from McLaren Vale, Gruner Veltliner from the Adelaide Hills and Prosecco from King Valley.

This edition of the NSW DPI *Grapevine management guide* goes one step towards putting NSW first again.

I have drawn upon numerous contributions from leading viticulturists and industry researchers and consultants across the nation. Grape varietal and winemaking information has come from Cathy Howard (Western Australia), Kim Chalmers (New South Wales and Victoria), Mark Krstic (Victoria), Sam Bowman (South Australia), Mike Hayes (Queensland and New South Wales). Not to leave grape growers out, contributions also came from Ben Crossing, Jacob Stein and David Kyngdon of New South Wales.

I truly hope the focus of this edition evokes further understanding, greater knowledge and passion about just a few of the many new and emerging varieties now available to NSW wine grape growers, ultimately generating interest and uptake from consumers not only in the restaurants and bars of Sydney and Melbourne, but at the barbecues, dinner parties and celebrations right across the nation and abroad.



Robert Stein vineyard and winery

Jacob Stein – General Manager and Chief Winemaker
Pipeclay Lane, Mudgee NSW 2850

Implementing a new varietal

Background: The Robert Stein Vineyard is a small 15 ha block which comprises 13 individual blocks of eight different varieties. The varieties planted are Shiraz, Riesling, Merlot, Chardonnay, Cabernet Sauvignon, Gewurztraminer, Black Muscat and previously Semillon. The vineyard grows grapes for the single vineyard Robert Stein wines, and the winery sources fruit from other vineyards in the region to supply the extra demands.

Removing the Semillon vineyard

The decision was made that the winery needed a red alternative variety with the choice to either add on more vineyard area, or pull some existing varieties out. We chose to pull out the 1.3 ha Semillon block in the 2016 winter because, in recent years, it had become financially unviable due to low sales. It was a hard decision, because the block was producing excellent wines, and planted by Jacob's grandfather 40 years ago.

Choosing the new variety/ies: Gewurztraminer and Montepulciano

The vineyard currently only has 0.3 ha of Gewurztraminer, which has had good growth in sales, so we are constantly running out of stock. An additional 0.3 ha was planted to Gewurztraminer clone 456 in the top nine rows of the old Semillon block, to fill the void.

Research was undertaken for an alternative red variety that would suit the brand and climate in Mudgee. Mudgee has a rich history with Italian varietals, and more recently with Spanish varietals, so the area was well suited to marketing and growing alternatives. Other mainstream varieties such as Nebbiolo and Sangiovese were contemplated.

After tasting many different alternative red varietals, a strong liking of Nero d'Avola and Montepulciano wines was front of mind. However, whilst researching the ideal climates and origins of both grape varieties, it was found that Montepulciano was probably better suited to Mudgee than Nero d'Avola.

Market research suggested Montepulciano was very favourably rising in percentage sales in the domestic market of both internationally and locally produced wines.

We anticipate many benefits from having an alternative red variety in our range, as we are increasingly being asked for different varieties at our cellar door and in the restaurant. We also thought that the variety could help us establish a relationship with Italian restaurants, wishing to showcase locally-made Italian varietals.

'Monte' is the second most widely-planted grape variety, after Sangiovese, and it prefers cooler, high altitude sites rather than flat, warm climates. Montepulciano d'Abruzzo is a red Italian wine made from the Montepulciano wine grape in the Abruzzo region of east-central Italy. It should not be confused with Vino Nobile di Montepulciano, a Tuscan wine made from Sangiovese and other grapes. 'Monte' can be versatile in that it can make light Rose wines, and medium or heavy styles of table red wines. It can be described as being highly aromatic, with a deep purple colour, with black fruits and earth character, and supple mouthfeel.

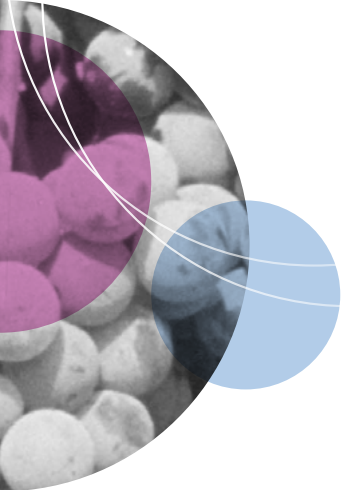
In the 2016 winter, 1650 vines of Montepulciano clone SAV11 01 were ordered from Elite Nursery for planting in Spring 2016 into 0.8 ha. We chose advanced peat pots to get good growth, and most vines were up to the cordon wire by the end of summer 2017.

Some challenges we could face is that monte is notably a high cropping variety, so could need crop thinning. To alleviate this, we chose to plant closer with 1.2 m spacings to try and reduce crop load and vigour. The soil might also help, being very light, almost sandy topsoil, with a red ironstone shale subsoil.

It is also worth noting that Jacob's wife, Gina, is of Italian origin. Yes, they are from the Abruzzo region, and love Montepulciano!



Figure 1. Jacob Stein of Robert Stein vineyard.



Varieties

Glossary

| | |
|------------------|---|
| AAVWS | Australian Alternative Varieties Wine Show |
| AB&D | Alpha Box & Dice |
| AG | antique green |
| ASWS | Australian Small Winemakers Show |
| Cfa | Climate classification |
| Coulure | failure of grapes to develop after flowering creating gaps |
| DOC | Controlled designation of origin (Italy) |
| DOCG | Controlled and guaranteed designation of origin |
| FFG | Fall From Grace |
| GI | Geographical indicator |
| LBAM | light brown apple moth |
| Mg | magnesium |
| Millerandage | grape bunches contain berries that differ greatly in size and, most importantly, maturity. |
| MJT | mean January temperature |
| NWSA | National Wine Show of Australia |
| Pruned to vigour | means if it is vigorous you leave more buds, less vigorous less buds, therefore pruned to vigour. |
| RNA | Royal National Agricultural |
| RS | residual sugar |
| SO ₂ | Sulfur dioxide |
| TA | Titrateable acidity |
| VA | volatile acidity |
| VSP | vertical shoot positioning |

New South Wales

Di Lusso Estate

Picolit

Region/sub region: Central West region – Mudgee

Planting date: November 2002

Rootstock or own roots: Grafted vines over Kober5bb

Planted area: 800 vines (1 acre)

Slope: Less than 1%

Elevation: 460 m

Climate and weather: The climate is warm and temperate in Mudgee. There is a great deal of rainfall, even in the driest month. According to Köppen and Geiger (2007), this climate is classified as Cfa. The average annual temperature is 15.3 °C in Mudgee. The rainfall here averages 717 mm/year.

The driest month is June, with 46 mm of rainfall. The greatest amount of precipitation occurs in January, with an average of 81 mm.

The warmest month of the year is January, with an average temperature of 22.6 °C. The lowest average temperatures in the year occur in July, when it is around 7.7 °C

The difference in precipitation between the driest month and the wettest month is 35 mm. The variation in temperatures throughout the year is 14.9 °C.

Viticulturist: Rootstock planted in 1999 by Mudgee Viticultural (Jim and Tony Muller). Grafted vines: Tony Hoare (Hoare Consulting, South Australia).

Growing tips and tricks: Due to a genetic micronutrient deficiency, Picolit suffers from floral abort, and thus has a very strong tendency to produce a very poor fruit set. Otherwise, it has thick skins and is a low disease risk. We have gained reasonably better yields when boron and/or molybdenum are applied via foliar spray pre-flowering, and when flowering occurs during windless, dry weather.

Picolit suits a vertical shoot positioning (VSP) structure and needs to be netted due to the birds.

Pruning: Pruning to two buds gives the best results, with shoot and fruit thinning very seldom required.

Canopy management: Picolit's canopy generally develops easily (we use two foliage wires), and remains strong through to harvest.

Irrigation: No special needs.

Fertiliser: Refer section above to alleviate floral-abort problem.

Pest and disease issues: Picolit is not particularly susceptible to mildew or botrytis, and spray maintenance is as per other varieties.

Budburst: Late September. Picolit is somewhat vulnerable to mid-late October frosts.

Flowering: Around third week in November, with fruit set early December

Veraison date: Mid January.

Harvest date: By using bird netting, we encourage the fruit to ripen to over 15 Baumé – that is, to around mid-March.

Yield: The widest possible range of yields – from 100 kg/acre to 3 t/acre – depending on the season. (the reason there are only 20 or so growers of this variety in Italy, and three in Australia. Bunch size in a normal year is around 75 gm and berry size well under 1 gm.

Winemaker information: David Kyngdon (di Lusso Estate).

Winemaking notes: The fruit is left to ripen up to 20 Baumé through using the cordon cutting method and netting the vines to protect them against bird damage. The fruit is hand harvested and immediately crushed, pressed, cold settled and the clear juice racked off the solids. The juice was fermented at 13 °C in stainless steel. The fermentation is stopped so the wine retains the desired sweetness. The wine is stabilised and clarified before bottling.

The wine is a mid-straw colour. There is crisp green apple, pineapple and lime cordial aromas and flavours. The palate has a lovely balance of acid and sweetness. The acid is crisp, providing length, and prevents the finish from being cloying. It is lighter in style than botrytis affected wines.

Free SO₂: 35.2 mg/L

RS: 125.2 g/L

VA: 0.71 g/L

pH: 3.35

Titratable acidity: 6.2 g/L

Alcohol: 10.0%

Domestic or export market: Domestic

Markets and marketing: Price points: cellar door – \$29 per 375 ml bottle.



Figure 2. Depicting floral abort



Figure 3. A Picolit bunch in a good year



Figure 4. Picolit bottle – 375 ml

Di Lusso Estate

Aleatico

Region/sub region: Mudgee

Planting date: November 2010

Rootstock or own roots: Grafted vines over Kober5bb.

Area under plant: 1500 vines (1.8 acres)

Slope: Less than 1%

Elevation: 460 m

Climate and weather: The climate is warm and temperate in Mudgee. There is a great deal of rainfall, even in the driest month. According to Köppen and Geiger (2007), this climate is classified as Cfa. The average annual temperature is 15.3 °C. The rainfall averages 717 mm.

The driest month is June, with 46 mm of rainfall. The greatest amount of precipitation occurs in January, with an average of 81 mm.

The warmest month of the year is January, with an average temperature of 22.6 °C. The lowest average temperatures in the year occur in July, when it is around 7.7 °C.

The difference in precipitation between the driest month and the wettest month is 35 mm. The variation in temperatures throughout the year is 14.9 °C.

Viticulturist: Rootstock planted 1999 by Mudgee Viticultural (Jim and Tony Muller). Grafted vines by Tony Hoare (Hoare Consulting, South Australia).

Growing tips and tricks: Like many Italian varieties, Aleatico has a strong tendency to over-crop. We will remove up to 60% of the fruit before veraison, otherwise the bunches will cluster together, ripen unevenly and become prone to disease. Aleatico has a very thin skin and is therefore highly prone to bunch rot. For our small vineyard, Aleatico must be netted, as it is the birds' favourite variety – otherwise we will lose the entire crop. Aleatico suits VSP structure and requires moderate watering.

Pruning: Pruning to two-bud spurs gives best results, with 30–35 buds per vine. The vine will still require both shoot and fruit thinning.

Canopy management: Apart from a tendency to overshoot, the canopy generally develops easily. We use two wires to raise the canopy, and take care to thin the shoots to allow for sufficient air circulation.

Irrigation: No special needs.

Fertiliser: No more than other varieties.

Pest and disease issues: Due to the characteristics noted above, the variety tends to suffer from bunch rot, botrytis and downy mildew. It must be closely watched.

Aleatico is the birds' favourite variety – we have no choice but to net it.

Budburst: Early, but consistent. Somewhat vulnerable to mid–late October frosts (for which we use Envy frost protect spray).

Flowering: Around last week in October.

Veraison date: Aleatico tends to be the first variety to change colour, and starts approximately four weeks after fruit set. Veraison is characterised by very uneven colouring, which lasts as such for at least three weeks.

Harvest date: We harvest separately for two different styles:

1. For a rose, we harvest at around 12.5 Baumé.
2. For a dessert style, fruit comes in over 15 Baumé.

Yield: If not closely managed, the variety will yield a large crop – on two-bud pruning the propensity is towards 6 t/acre – we bunch thin to approximately 3.5 tonnes. Average berry weight around 9 g and bunch size 130 g.

Winemaker information: David Kyngdon (di Lusso Estate).

Winemaking notes: The fruit was machine harvested at 13.5 Baumé, crushed and pressed to tank. The juice was settled then fermented with an aromatic yeast at 10 degrees. Fermentation was halted when it had dropped to 7 Baumé. This allowed for a wine that has 139 g/L of sugar.

Aleatico is famous for and intense rosewater character: the “Turkish delight” that fuses with lychee, lemon and musk. A high acid cuts through the sweetness, allowing for a fresh finish.

pH: 3.20

Titrateable acidity: 8.5 g/L

Alc/vol: 6.7%

RS: 139 g/L

Markets and marketing: Rosé – \$23 a bottle cellar door; Dessert wine \$29 (500 ml) cellar door.



Figure 5. Aleatico at veraison



Figure 6. Aleatico netted



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Department of Primary Industries

Angullong

Barbera

Region/sub region: Orange region

Planting date: 1999

Rootstock or own roots: Own roots

Area under plant: 2.9 ha

Clone: CDFVF6V4

Soil type: Clay-loam

Slope: Medium

Elevation: 605–620 m

Climate and weather: Average annual rainfall 750 mm, fairly evenly spread (60–70 mm/month), except drier during March to May (45–50 mm/month).

Viticulturist: Vineyard manager is Jim Diprose; viticultural consultant is Tim Esson.

Growing tips and tricks: We have found Barbera can tend toward biennial bearing. Some seasons we need to thin the fruit load, but this does not seem to necessarily reflect the seasonal conditions at the time. We are also very careful with our irrigation scheduling to minimise berry size and bunch tightness. We have found that when bunches are very tight, internal berries tend to split, rather than external berries being pushed off. Although Barbera is very acidic, late season botrytis can then be a problem.

Pruning: Barbera is not an easy variety to prune. It tends to throw a lot of blind buds, which slows pruning, and has very strong tendrils, making cane removal difficult, thus more expensive to prune than other varieties. Our Barbera is usually pruned to around 10–12 × 2 bud spurs/m of cordon, but this can vary considerably according to bud fruitfulness. Primary bud necrosis can be a problem in some seasons. We have trialled cane pruning to improve fruitfulness, with little success, so we have reverted to spurs.

Canopy management: Our Barbera can have quite vigorous vegetative growth. We routinely trim the canopy to about 60–70 cm on the morning side (row orientation is north–south), and around 1.2 m on the afternoon side. Foliage wires are lifted on the morning side pre-trimming.

Irrigation: Barbera is not a heavy water user, and irrigation is scheduled according to plant requirements, as the season progresses. As mentioned above, excess irrigation/rainfall after fruit set can create issues with berry size and bunch tightness.

Fertiliser: Nothing special to date. Depending on seasonal conditions, we have, from time to time, applied calcium and magnesium to reduce bunch stem necrosis. This is usually applied around Christmas, pre veraison.

Pest and disease issues: There are no particular disease issues with our Barbera, except occasional late season botrytis.

Budburst: Early to mid season, similar to Merlot.

Flowering: Mid to late season, after Shiraz and before Cabernet.

Veraison date: Mid season.

Harvest date: Mid season.

Yield: Crop is often thinned to requirements – generally around the 8–9 t/ha. If left unthinned, yields can be as high as 13–14 t/ha in a heavy-yielding year.

Winemaker information: Jon Reynolds.

Winemaking notes: Under low-cropping conditions, Barbera will develop attractive, dark plummy characters with ample soft tannins. Barbera is also a high acid variety that needs to be picked ripe. The fruit is monitored for Baumé, pH and total acid levels during ripening. Harvesting is determined by taste, with ripe tannins being important; usually occurring around 14–14.5 Baumé. We also usually wait for titratable acidity to fall to below 6.5g/L. Fruit is machine harvested with typical analyses of 14–14.5 Baumé, pH of 3.45–3.75 and titratable acidity of 5.0–6.5. Fruit is de-stemmed with rollers open to retain some whole berries and transferred to 8 tonne static fermenters. Additions are typically cultured yeast, yeast nutrient, tannin, cultured malo-lactic acid bacteria and, in some years, tartaric acid. Fruit is soaked for 3–4 days at which point the cultured yeast begins the fermentation process. Once the fermentation has begun and the skins have risen to form a cap, the fermenting juice is racked (drained off) and returned over the skin cap. This is usually done every six hours to keep the skin moist and cool and to maximise colour extraction in the process. The malo-lactic acid bacteria culture is added at about 6 Baumé and co-fermented with the yeast fermentation. When fermentation is almost complete, all free juice is drained and the skins pressed. In most seasons, all the pressings are returned to the free run portion. Maturation is 12 months in French oak puncheons, approximately 25% new with the remainder in second and third year use barrels. Before bottling, the wine is lightly fined with egg whites, partially cold stabilised and cross-flow filtered.

Show results: Silver medal, Class 14 2016 NSW Wine Awards.

Domestic or export market: Domestic.

Markets and marketing: Angullong Fossil Hill Barbera 2015; RRP: \$26; Domestic, cellar door and online.

Toppers Mountain

Variety: Nebbiolo



Figure 7. Nebbiolo bunches close to harvest.

Synonyms: Spanna, Picotener, Prunent, Picotendro.

Sub region: Northern New England Australia.

Planting date: 2007

Rootstock/own roots: Richter 110

Area under plant: Two acres.

Clone: 230, 111, MAT3, MAT7, Lampia

Soil type: Red soil (basalt)

Slope: Easterly

Elevation: 890 m

Climate and weather: Predominantly summer rainfall with 900 mm annually and 600 mm throughout the growing season. Temperatures range from -5°C to -6°C in the winter to 36°C peak in summer.

Viticulturist: Mark Kirkby

Growing tips and tricks: Crop reduction is imperative to achieve balance and ripeness; leaf reduction is recommended post berry set with air flow and extra sunlight on the bunches an advantage. Keeping the canopy in check early is also recommended to improve air flow.

Growing do's and don'ts: Don't over water as this will definitely dilute the flavour profile. Watering should stop three weeks before harvest to intensify the flavours. Do plant multi clone plots to improve wine quality with a particular attention to the MAT3 and MAT7 clones to deliver weight to the wine.

Pruning: Four arched canes with 15 internodes in length for each cane.

Canopy management: Leaf size – Medium to large with leaf variation observed. Open petiole sinus with three lobes common.

Growing habit: Semi plagio-tropic with canopy wires needed to contain the hanging shoots quite early. I have noticed that before flowering the vine can look quite messy and therefore wire lifting is required.

Shoot strengths: Tips are fragile and shoots can grow vigorously, therefore shoot damage is noticeable early in the growing season. Can be vigorous in quality soils.

Irrigation: Normal applications at vital growing points is recommended: budburst, flowering and veraison. In dry years you might need 0.5 ML/ha.

Fertiliser: Early applications of zinc and boron will help fruit set.

Pest and disease issues: Quite resilient; in most cases there are large bunches of small, round berries with thick skins. I have observed some botrytis in extremely wet years (nearly all wine grape varieties displayed bunch rot in 2010 and 2011). In Piedmonte, Italy I observed minor traces of powdery mildew, however, this is easy to contain through a thorough spray program.



Figure 8. Nebbiolo leaf and bunch morphology.

Budburst: Early bud burst (Before Pinot Noir and Chardonnay) therefore a site on a slope or at the top of a hill is preferred to avoid frost risk. I have seen this variety budburst in the third week of August.

Flowering: Mid November with little or no issues observed. In wet years, only minimal loss through coulure.

Veraison date: Last week in January and can continue over a three-week period.

Harvest date: Late April with Baumé levels around 13 recorded. It appears the variety has a lengthy period in which it can be harvested. Phenological ripeness occurs early April.

Tonnage : 2.5–3.5 t/acre delivers ideal quality.

Winemaker : Mike Hayes – Symphony Hill Wines for Toppers Mountain Wines.

Winemaker notes: Lampia clone proved to be a poor clone for colour and this is the clone that had issues with botrytis. The 230 clone delivers structure to the mid palate and the 111 clone has the beautiful fragrance of freshly picked roses. MAT3 and MAT7 clones are quite beneficial, delivering tannin and assertive acidity. Cold soaking for four weeks is recommended to extract colour and flavour with no extended maceration required as it may deliver stringent tannins. Barrel aging in old clean barrels is recommended, as new barrels appear to destroy the delicacy of perfume for which this variety is famous. A Baumé of 12.5 appears to suit the style we are chasing from this property, with 3.2 pH and in some years titratable acidity as high as 9 g/L.

Show results: Toppers Mountain and Symphony Hill have won numerous gold medals and Best Wine of the Show from The New England Wine Show. Toppers Mountain has been awarded gold medals at the Berlin International Wine Show and the Hong Kong Wine Show. The Nebbiolos that come from Toppers Mountain vineyard consistently gain attention from the wine writers along the east coast of Australia. Common points for the wines are above 93, and it appears the variety has found a place in the New England.

Domestic market: This is where we have an issue with Nebbiolo. Generally speaking, the wine reaches its peak after 8–10 years and therefore, when consumed early, the high acidity and low tannins are

not favourable with young consumers. If selling in a cellar door situation, attention to food matching and educating the public is necessary and ongoing.

Market and marketing strategies: When served with the appropriate food, Nebbiolo is enjoyed by all. Best food suggestions include steak with a small amount of fat to counteract the tannins and acidity and increase richness; osso bucco is another food suggestion to tame the aggressive tannins. Hand selling is required and varietal education is important to achieve repeat sales. Generally speaking, this is a masterful wine style that commands respect, however, the variety appears to challenge Australian wine consumers.

Angullong

Sagrantino

Region/sub region: Orange region

Planting date: 2011

Rootstock or own roots: Own roots

Area under plant: 1.1 ha

Clone: Mat 1

Soil type: Clay–loam over clay, drainage good to fair (pooling can occur in the lower parts during extended wet weather).

Slope: Medium

Elevation: 600–620 m

Climate and weather: Spring frosts are an issue. The Sangrantino, being mid season to burst, has been singled by frost in the past, but not badly.

Viticulturist: Vineyard manager is Jim Diprose, viticultural consultant is Tim Esson.

Growing tips and tricks: Sagrantino is a comparatively new variety at Angullong, and we are still learning. As far as I am aware, we have the only planting in the region. It has proven to be more difficult to grow than other varieties, and appears to be more sensitive than other varieties to soil moisture and fertility levels. We lost a number of vines in the second season when soil moisture was too high in the poorer-drained part of the block.

Growing do's and don'ts: Don't over water, particularly when vines are young.

Pruning: Up until the current 2016–17 season, we have spur-pruned all the Sagrantino at a 2-bud-spur every 10–12 cm along the cordon. Each vine has been pruned to vigour to date, according to growth and cordon size. This year we cane-pruned two rows as a trial, mainly to see if this helped to reduce shoot thinning, and if harvesting was easier. No clear results have yet been seen.

Canopy management: We found the Sagrantino to be more difficult to train than other varieties. Canes can be rather brittle, so additional care is needed during

cordon training. Internode spacing is much shorter than usual, and we found that vigorous tendril growth often caused problems by catching and deforming shoot tips. We found that a shorter interval between training passes helped.

Bunches are fairly tight, and mechanical harvesting has been difficult. We have found that we need to hit fairly hard to get the fruit, and some cane damage has resulted, but yield has not suffered in the following year. We shoot-thin early to reduce crop load and to keep the canopy open. This might not be needed as the vines age.

Irrigation: So far, the Sagrantino does not appear to be a high water user. We monitor the moisture levels closely though, after losing some young vines through over-watering.

Fertiliser: No special fertilising regime is used so far. We fertigated with urea in the first year as would occur with most new plantings.

Pest and disease issues: Downy and powdery mildew seem to be well controlled with a normal spray program, and Sagrantino does not appear to be particularly prone to any specific diseases. Botrytis has not been an issue to date. We have had some problems with blister mite, requiring high rates of sulfur for control.

Budburst: At Angullong, Sagrantino is one of the earlier varieties to burst in the spring, after Chardonnay, similar to Verdelho and Riesling.

Flowering: Flowering is early–mid season, similar to Shiraz.

Veraison date: Mid season.

Harvest date: Mid–late season. To date, the Sagrantino has been harvested after all varieties except Cabernet.

Yield: Variable so far, probably due to the vines being very young. The 2017 vintage was about 9 t/ha, but some bunch and shoot thinning occurred, and it was a vigorous growing year. We expect to continue having to bunch thin, though the vines might settle more as they age.

Winemaker information: Jon Reynolds.

Winemaking notes: This variety is indigenous to Umbria in central Italy. Being the newest variety with which we have worked, we have allowed this wine to show us what it can do in terms of varietal expression. Known for its naturally high levels of tannin, we are careful to not overwork the skins during fermentation.

Sagrantino can produce amazing intensity of colour and flavour with big tannins that are chalky and in the softer spectrum. Fruit is monitored for Baumé, pH and titratable acidity during ripening.

Harvesting is determined by taste, with ripe tannins the main determinant. Typically, ripeness usually occurs around 14–14.5 Baumé. Fruit is machine harvested with typical analyses of 14–14.5 Baumé, pH 3.40–3.8 and titratable acidity 5.5–6.5. Fruit is de-stemmed with rollers open to retain some whole berries and transferred to 8 tonne static fermenters.

Additions are typically cultured yeast, yeast nutrient and cultured malo-lactic acid bacteria. The crushed fruit is soaked for 3–4 days, at which point the yeast begins the fermentation process. Once the fermentation has begun and the skins have risen to form a cap, the fermenting juice is racked (drained

off) and returned over the skin cap. This is usually done once every six hours to keep the skins moist and cool and to maximise colour extraction while limiting harsh tannin extraction during the process. Rack and returns are discontinued once the ferment reaches about 4.0 Baumé to limit further extraction of hard tannins. The malo-lactic acid bacteria culture is added at about 6 Baumé and co-fermented with the yeast fermentation.

When fermentation is almost complete, all free run is drained and the skins are pressed. Depending upon the season, some or all of the pressings are returned to the free run portion. Maturation is for 12 months in French oak puncheons, approximately 25% new and the remainder in second and third use barrels.

Show results: Gold Medal at the Australian Italian Varieties Wine Awards 2016 and Silver Medal, Class 13, 2016 Orange Wine Show.

Domestic or export market: Domestic

Markets and marketing: Angullong Fossil Hill Sagrantino 2015; RRP: \$26; Domestic, cellar door and online.

Angullong

Sangiovese

Region/sub region: Central Ranges zone/Orange region

Planting date: grafted vines: 1998 originally as Marsanne and grafted over in 2011 to Sangiovese with clones Mat6, Mat7, VCR5 and VCR6.

Area under plant: 2.05 ha

Clone: Own-rooted 2000 with clone H6V9

Soil type: Own rooted – gravelly clay-loam, very well drained. Grafted vine area – clay-loam over clay, drainage good to fair (pooling can occur during extended wet weather).

Slope: Medium

Elevation: 570–620 m

Climate and weather: Spring frosts are an issue across all varieties at Angullong and, as in many areas, local topography is critical. Thus our two blocks of Sangiovese, being earlyish to burst, are planted higher up the slopes.

Viticulturist: Vineyard manager is Jim Diprose, viticultural consultant is Tim Esson.

Growing tips and tricks: Sangiovese is not difficult to grow as such, but achieving the required fruit quality is a different story. The biggest issue is over-cropping, through both bunch number and bunch

size. At Angullong, the older clone over-crops more than the newer clone and, whilst the new clones still require thinning, these vines may settle down as they age. Timing fruit thinning appears to be a significant issue – thinning early results in the vines compensating with larger berries. We have found that veraison, or just after, gives the best results. Varying the bud numbers at pruning, as well as early shoot thinning, appear to make little difference.

Pruning: All our Sangiovese is spur-pruned at 10–12 × 2-bud spurs/metre of cordon. Cane pruning trials have been discussed, but not yet implemented.

Canopy management: All our Sangiovese requires some canopy manipulation. We lift foliage wires, and trim to about 60–70 cm cane length on the morning side of the canopy to allow better light exposure and air flow. At the same time, the afternoon side is left to sprawl, and is trimmed to about 1.2 m cane length, to give better protection from over exposure and sunburn.

Irrigation: Sangiovese is not a high water use variety at Angullong. As a guide, it does use more than the older clone (H6V9), which receives additional water, but this is due to gravelly soils rather than varietal requirement. Restricting the availability of water post fruit set helps to minimise berry size and bunch weights.

Fertiliser: No special fertilising regime is used. With over cropping being the norm, additional fertiliser is

not required while the vines remain healthy and in reasonable balance.

Pest and disease issues: The major issue is botrytis, mostly due to the large bunch size making spray penetration rather difficult. Downy and powdery mildew seem to be well controlled with a normal spray program, and the variety does not appear to be particularly prone to any specific diseases.

Budburst: At Angullong, Sangiovese is our earliest variety to burst in the spring, along with the Chardonnay.

Flowering: Flowering is early, similar to Chardonnay.

Veraison date: Early – it is the first of the reds to begin colour change. Again, similar to Chardonnay.

Harvest date: Mid-late season for table wine. We harvest the fruit for our own label when it is deemed flavour ripe. Sugar levels are obviously important, but flavour more so.

Yield: Yields are not really relevant as such, since all our Sangiovese is thinned to requirements and can vary season to season depending on canopy size, weather etc. Bunch weights can often exceed 500 g and berries can also end up very large if irrigation/rainfall is not timely. Target tonnage for table wine is usually around 8 t/ha, for rosé about 10–12 t/ha. Often up to half the crop is dropped at, or just after, veraison.

Winemaking notes: This variety originated in central Italy, occupying the greater part of Tuscany.

Clonal selection is important in the winemaking process and Angullong has concentrated on this by selecting improved Sangiovese clones such as VCR and MAT. As a result, considerable improvements in colour and flavour have been achieved. Fruit is monitored for Baumé, pH and titratable acidity during ripening. Harvesting is determined by taste, with ripe varietal flavours and colour being the main determinants. These usually peak at around 13.5–14.0 Baumé, although this varies depending on seasonal conditions. Sangiovese is an early-ripening

variety. Fruit is machine harvested with a typical analysis being 13.5–14.0 Baumé, pH 3.35–3.45 and titratable acidity 6.5–7.0. Sangiovese is naturally a high acid producer so it is important to get this down to below 7.0 g/L before harvest. The VRC and MAT clones have proved to develop a more intense colour than the H6V9 clone and flavour profile.

Fruit is de-stemmed with rollers open to retain some whole berries, chilled and transferred to 8 tonne static fermenters. Additions are typically cultured yeast, yeast nutrient and cultured malo-lactic acid bacteria. The crushed fruit is soaked for 3–4 days at which point the yeast begins the fermentation process. Once the fermentation has begun and the skins have risen to form a cap, the fermenting juice is racked (drained off) and returned over the skin cap. This is usually done every 4–6 hours to keep the skins moist and cool and to maximise colour extraction in the process. The malo-lactic acid bacteria culture is added at about 6 Baumé and co-fermented with the yeast fermentation.

When fermentation is almost complete, all free run is drained and the skins pressed. Depending upon the season, some or all of the pressings are returned to the free run portion. Following fermentation, maturation of at least 12 months follows in second and third use French oak puncheons to avoid overt oak characters and to maintain the variety's natural tannin structure. Blending the various clonal batches following maturation is an important part of the Sangiovese wine-making process and now defines our regional style. Before bottling, the wine receives a light egg white fining then undergoes cross-flow filtration and partial tartrate stabilisation.

Show results: Silver Medal, Class 23, NSW Small Winemakers Wine Show 2016 and Silver Medal, NSW Wine Awards 2016.

Domestic or export market: Domestic.

Markets and marketing: Angullong Fossil Hill Sangiovese 2015; RRP: \$26; Domestic, cellar door and online.

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Toppers Mountain Wines

Touriga Nacional



Figure 9. Touriga Nacional bunches going through veraison.

Synonyms: Azal Espanhol, Mortagua, Carabunera, Touriga Antigo

Sub region: Northern New England

Planting date: 2009

Rootstock/own roots: Own roots

Area under plant: 1 acre

Clone: E6V12.

Soil type: Red soil (basalt)

Slope: Easterly

Elevation: 890 m

Climate and weather: Predominantly summer rainfall with 900 mm annually and 600 mm throughout the growing season. Temperatures range from -5°C to -6°C in the winter to 36°C peak in summer.

Viticulturist: Mark Kirkby

Growing tips and tricks: Regular applications of micro-nutrients via foliar sprays are recommended with boron and calcium applied pre flowering. Low nitrogen is recommended to minimise bunch compaction.

Growing do's and don'ts: Regular trimming of the shoots post fruit set is required as shoots can reach heights of >1.5 m. Leaf plucking after veraison delivers increased air circulation and even ripening.

Pruning: Two-bud spur; 7 spurs/m

Canopy management: Leaf size – Small to medium, green, 3-lobed leaf. The leathery leaf can handle hot ripening conditions.

Growing habit: Semi erect with strong shoot growth. Leaf plucking is recommended. The variety can handle sun and hot ripening conditions with no sunburn seen.

Shoot strengths: Shoots are susceptible to wind damage early in the growing season, however, this is not an issue post flowering. Canopy wires should be moved according to shoot growth to eliminate damage.

Irrigation: Predominantly summer rainfall is normally sufficient for this variety. However, 0.3–0.6 m/ha might



Figure 10. Touriga Nacional leaf and bunch morphology.

be needed in dry seasons. Watering is essential at budburst, flowering and veraison to help minimise stress. If there is not sufficient water at flowering, a significant amount of flowers will be aborted.

Fertiliser: Magnesium and calcium appear to be the main elements needed periodically throughout the growing season. Low nitrogen will help to reduce berry size, therefore reducing bunch compaction.

Pest and disease issues: Powdery mildew and downy mildew need attention with a thorough preventative spray program. I have observed sour rot in wet years (2010, 2011) and botrytis can be an issue late in the season.

Budburst: Late September (third week)

Flowering: Mid November and coulure has been observed in wet cool years.

Veraison: Last week in January to Early February.

Harvest: Early–mid April.

Yield: 2.5 t/acre

Winemaker: Mike Hayes Symphony Hill for Toppers Mountain Wines

Winemaker notes: The variety needs to be ripe with Baumé s around 14 preferred. High pH and low titratable acidity (3.78 and 4.92 respectively) are common, allowing acid adjustment. Cold soaking is beneficial with 1–2 weeks the preferred length at 0°C . Care is needed to avoid over extraction of skin tannin that delivers a drying effect on the palate, therefore, no extended maceration post primary ferment is recommended.

Show results: The wines have not been shown, however the variety is proving to be very popular with other examples winning gold at various shows throughout Australia.

Domestic market: The domestic market has shown considerable interest in the variety as it delivers a style close to the old Shiraz/Cabernet blends of the 1980s: rich, ripe and delicious.

Market and marketing strategies: New wave wine drinkers are targeted as the variety has a story to be told. It also makes a style of fortified wine similar to the great vintage Portuguese ports. I believe the variety may in fact take over from Tempranillo as it is easier to grow and the resultant wine more interesting.

Queensland

Ballandean

Fiano



Figure 11. Angelo Puglisi, viticulturist at Ballandean, is happy with the Fiano bunch exposure.

Synonyms: Greco Aromatico and Minutolo.

Sub region: Granite Belt.

Planting date: 2011

Rootstock/own roots: Paulsen 1103

Area under plant: 1.5 acres

Clone: SAVII01



Figure 12. Fiano bunch and leaf morphology.

Soil type: Decomposed granite over a sandy to sandy-loam base. Depth is around 1.2 m.

Slope: Southerly

Elevation: 830 m

Climate and weather information: Predominant summer rainfall region averaging 30 inches or 750 mm/year (70% or above falling in the growing period). Higher than normal humidity with above average hail susceptibility. Temperatures range from -7.0°C in the winter to a cool 35°C in the summer (highest temperature ever recorded is 38°C). Best described as a continental climate: 28.88° south (latitude); 151.84° east (longitude)

Viticulturist: Angelo Puglisi.

Growing tips and tricks: This variety can over-crop so adequate crop reduction at veraison is required; a cropping level of 2–3 t/acre is preferred. Canopy trimming is required at least once before veraison, and possibly a light trimming is required after veraison.

Growing do's and don'ts: In sandy soils, maintain calcium and magnesium in early shoot development.

The variety is suited to little or no nitrogen (N) applications.

Pruning: 2-bud spur and cane pruning will achieve cropping levels in respect to vine balance.

Canopy management: Leaf size – medium to large with tiny hairs underneath. An open petiole sinus is observed and the leaf is coloured medium green.

Growing habit: heliotropic and strong, early shoots growth, therefore early trimming is a priority.

Shoot strengths: can be sensitive and brittle early in the season in high wind.

Irrigation: Generally only at budburst with minor applications required throughout the hot periods of vine growth. Sandy soils need 0.3–0.6 ML in the growing season. In summer rainfall-dominant regions, no irrigation is required.

Fertiliser: Low N and an application of all micro nutrients before flowering is beneficial for berry set. This variety is very tough and the perfect variety to grow. Angelo Puglisi says: 'I really enjoy working with this variety it is easy to grow and the little berries and thick skins are perfect for our growing conditions'.

Pest and disease issues: Powdery mildew has been observed and in one wet season I witnessed some downy mildew. Botrytis is not an issue with the tiny berries and very loose bunch.

Budburst: Mid September.

Flowering: Early–mid November

Veraison date: January 26.

Harvest date: First week of March.

Tonnage: 2–3 t/acre.

Winemaker: Dylan Rymer, Ballandean Estate.

Winemaker notes: Harvested around 13 Baumé, gives outstanding balance and complexity with hints of honey and jasmine. Green characters appear and destroy the wine if picked too early and therefore attention to physiological ripeness is paramount, 11 Baumé is not ideal for picking and light brown seeds should be observed with white tips on the beak of the seed. No malo influence has been trialled, as I feel it could detract from the textural prowess this variety displays.

Show results: Qld Wine Awards Champion Wine of the Show and consistently one of the best alternative white wines in Australia with multiple Gold medals won at various shows.

Domestic market: Excellent domestic market sales in southern Queensland has firmly entrenched this variety as one for the future. Consumers appear to love the textural honey flavours and the amazing floral and jasmine aromas.

Market and marketing strategies: The market for this variety is exploding with strong interest from fine wine shops, restaurants and, noticeably, cellar door sales are rocketing – the Italian answer for Chardonnay and in many situations more popular.

As an ideal food wine the variety will gain in popularity over the next five years. No wonder the variety is held in high regard in Italy.

Symphony Hill Wines

Petit Manseng



Figure 13. Petit Manseng growing in Juranson, southern France. Note Mg deficiency.

Synonyms: Spain – Escriberou, Ichiriota Zuria Tipia; France – Manseng Blanc, Miot, Mausec

Sub region: Granite Belt

Planting date: Grafted in 2011 on to existing Shiraz.

Rootstock/own roots: Ruggeri 140

Area under plant: 1 acre

Clone: 8309

Soil type: Sandy decomposed granite over light-textured loam.

Slope: north-west

Elevation: 760 m

Climate and weather: Predominant summer rainfall region averaging 30 inches or 750 mm/year (70% or above during the growing period). Higher than normal humidity with above average hail susceptibility. Temperatures range from -7°C in the winter to a cool 35°C in the summer (highest temperature ever recorded is 38°C). Best described as a continental climate: 28.88° south (latitude); 151.84° east (longitude).

Viticulturist: Mike Hayes and John Searle.

Growing tips and tricks: Shoots can be fragile throughout early shoot development stages and therefore adequate canopy wires need periodical lifting to limit tips damage. Applying foliar trace elements monthly are beneficial and periodic Seasol[®] sprays helps to reduce stress, in particular wind and heat.

Growing do's and don'ts: Quite an easy variety to grow and as each shoot can carry four bunches, crop thinning is essential. Reduce the fruit load to two bunches per shoot and this will equate to around the 2.5 t/acre.

Pruning: 2-bud spur with seven spurs/metre. The variety was trialled for cane pruning, but no significant difference in cropping levels or quality was observed.

Canopy management: Leaf size – Small to medium and orbicular in shape with a slightly U-shaped open petiole sinus. Berries are tiny and the bunch is sparse with plenty of natural looseness.

Growing habit: Plagiotropic with the shoots showing a propensity to droop early in the season.

Shoot strengths: Shoots are relatively strong and can handle quite windy conditions. The tips are more fragile than normal.

Irrigation: No extra irrigation is needed, however, in dry times 0.5–0.75 ML/ha throughout the season can be required in sandy soils. Ensure that the soil profile remains damp throughout the critical growing stages, budburst and veraison.

Fertiliser: The variety is prone to magnesium and iron deficiency with nitrogen required early in the growing stage for shoot development.



Figure 14. Petit Manseng on the Granite Belt Southern Queensland. Note the loose bunch and small berries.

Pest and disease issues: Prone to powdery mildew (easily kept in check with sulfur sprays every 10 days). Downy mildew appears to not being an issue and the bunch, with its sparsity and extra thick skins, practically makes this variety immune to Botrytis.

Budburst: Late September.

Flowering: The variety appears to be quite resilient around flowering with little or no issues surrounding coulure or millerandage. Observations at flowering include cooler nights and some rain activity with very little loss of fertilised fruit apparent.

Veraison: Mid January.

Harvest: Late February.

Yield: 2–2.5 t/acre.

Winemaker: Mike Hayes – Symphony Hill Wines.

Winemaker notes: The variety in other years appears to have a ferociously high total acidity, around 11 g/L. This can antagonise some delicate yeast strains. Cold stabilisation results in above average tartrate fall out. The best yeast strain to use is VL3 and three feeds of 30 g/hL of nutrient is recommended throughout the primary ferment with temperatures not exceeding 13°C .

DO NOT INNOCULATE WITH MALO.

The wine displays exotic floral notes with pronounced textural nuances and firm acidity. It is important to either deacidify the juice or the completed wine to keep the fruit/acid ratio in check.

Show results: Silver medals at AAVWS (Australian Alternative Varieties Wine Show) and the ASWS (Australian Small Winemakers Show).

Domestic market: Cellar door and Symphony Hill Wine Club. Retail in Brisbane at the Craft Wine Store, a specialist wine shop with alternative varieties and the

consumer visits this store as it has a point of difference. Retail: \$30.00 per bottle.

Market and marketing strategies: Phonetically spelling the variety is required and additional consumer education. Repeating the name 3–4 times helps the consumer feel confident in pronunciation. Food suggestions and materialistically painting a scene for the consumer to enjoy is an added advantage, e.g. 'Imagine drinking Petit Manseng with Peking duck

smothered in a coriander and ginger sauce'. Educate your staff about where the variety's origins and how important it is in the culinary world.

The price point is not of concern when you explain the hands-on approach to growing and making the wine. The consumer shows no resistance to purchasing a bottle to try. It was noted that our wine club had return sales and the general comment was that over 95 % of the wine club members really enjoyed the wine.

Heritage Wine

Savagnin

Synonyms: Clevner, Gentil Blanc, Traminer D'Ore

Sub region: Granite Belt

Planting date: 2010



Figure 15. Savagnin bunches.

Rootstock/own roots: Ruggeri 140.

Area under plant: 1 acre

Clone: Galicia

Soil type: Sandy, decomposed granite over light-textured loam.

Slope: Easterly.

Elevation: 920 m

Climate and weather: See Petit Manseng on page 16.

Viticulturist: John Handy

Growing tips and tricks: In the early stages the vines have the propensity to droop and therefore canopy wires are required early in shoot development. Be careful not to overcrop and levels of 2–3 t/acre appear to deliver a balanced crop with fruit intensity.

Growing do's and don'ts: Do not over irrigate and definitely nitrogen only at the beginning of the season as this variety needs very little.

Pruning: Two-bud spur–7 spurs/m.

Canopy management: Leaf size –Medium to small with a slightly closed petiole sinus. The leaf is dark green with some hairs on the underside. The bunch is small to medium and compact with thick skins and medium-sized, round berries.

Growing habit: Semi upright and attention to VSP. is required after berry set.

Shoot strengths: Reasonably strong shoots, however, in high wind, care must be taken to ensure the canopy is firmly in place with additional canopy wires.

Irrigation: Required throughout the important stages of early development, budburst, flowering and veraison. Generally speaking 0.5–0.75 ML is required in dry or hot years.

Fertiliser: Throughout the flowering stage in sandy soils it is advised to monitor calcium, magnesium and boron levels to ensure berries fill out to their complete size.



Figure 16. Savagnin leaf and bunch morphology.

Pest and disease issues: Susceptible to powdery mildew in southern Queensland with great resilience to downy mildew and botrytis as the skins are considerably thicker than other western European varieties.

Budburst: Late August

Flowering: Early October

Veraison: Late December

Harvest date: Late February–early March.

Yield: 2 t/acre

Winemaker: John Handy, Heritage Wine, Granite Belt.

Winemaker notes: Flavours appear to be in balance with 12–13 Baumé. The pH is generally around 3.2–3.4 with a titratable acidity between 6 g/L and 7 g/L. Aromatic yeasts are preferred and a cool fermentation phase of around 13–14 °C is ideal. No malo-lactic fermentation has been performed and possibly this could detract from the textural palate often received from this variety.

Show results: Heritage Savagnin has had solid success with silver and bronze medals won from reputable

wine shows. The variety was confused with the Spanish Albarino before DNA testing rectified the error.

Domestic market: Strong sales at the cellar door with no issues around varietal mix up. As the variety is related to Gewurztraminer, there is a story in itself to be told. Most consumers are surprised by the aromatics and crispness that the variety delivers.

Market and marketing strategies: Difficulty in explaining the confusion between Savagnin and Albarino appears to be a mindset within the market place; hand selling is required to explain the story and the variety's background. As the variety appears more frequently in the domestic market, it will become more widely accepted as an alternative variety of repute.

Golden Grove Estate

Vermentino

Synonyms: Rolle (France), Pigato, Favorita (Italy)

Sub region: Granite Belt

Planting date: 2008

Rootstock/own roots: Kober5BB



Figure 17. Sam Costanzo in front of his Vermentino vineyard. Note the cropping level and the canopy to fruit ratio.

Area under plant: 1.5 acres

Clone: VC1

Soil type: Decomposed granite over a sandy to sandy-loam base.

Slope: North easterly

Elevation: 750 m

Climate and weather: See **Petit Manseng** on page 16

Growing tips and tricks: Very easy variety to grow and it has a natural propensity to crop heavily. The best results in wine quality are delivered when the tons per acre are kept low, around 2–4. Watch for sunburn on the western side of the vine.

Growing do's and don'ts: Early canopy management and wire movement is advised. Immediately after berry set trimming is advised. Leaf removal is beneficial as the bunch can tighten up after a rainfall event.

Pruning: One-bud spur with 7–9 spurs/m.

Canopy management: Leaf size – Large 5-lobed with a U-shaped petiole sinus along with closed petiole sinus. Leathery, dark green leaf with a glossy feel.

Growing habit: Erect and the tendrils grab onto wires quite early, reducing shoot damage. Viticulturists will need to pay attention to the leaf to fruit balance. Care must be taken as this variety can crop at 10 tonnes to the acre.

Shoot strengths: Strong shoots and therefore wind damage is not as an issue as in other varieties. Moving canopy wires early to mid season is recommended to maintain vine integrity.

Irrigation: At budburst irrigation is required, however, this variety originates from an extremely hot region in Europe and therefore can handle hot and dry conditions. 0.3–0.6 ML is required in a dry year. In summer, there is sufficient rain to minimise irrigation.

Fertiliser: The usual magnesium and calcium foliar applications are needed to supply the quick-growing canopy. I have noticed an iron deficiency in heavier soils. Low nitrogen applications is preferred 2–3 weeks after budburst.

Pest and disease issues: Quite resilient variety with Powdery Mildew possibly the only issue, however easily controlled with a preventative spray program. In wet years bunch compaction is observed and occasional botrytis bunches were noticed. I have witnessed Phomopsis in higher humidity climates.

Budburst: Mid September (good variety for late frosts).

Flowering: Flowering is normally around mid-November with no issues observed. Berry numbers are high and no issues associated with cool nights were noted.

Veraison: December 25–29.

Harvest: Last week in February and can, in cool years, push into March.

Yield: 2–3 t/acre.

Winemaker: Ray Costanzo, Golden Grove Estate.

Winemaker notes: preferred harvest around 12 Baumé and acidity levels are pH 3.6 and titratable acidity around 5.5–5.9 g/L. Natural yeasts are used with 20% barrel fermentation back blended. This style is very textural and delivers the entire flavour profile in balanced proportions. The estate is also releasing a sparkling Vermentino (bottle fermented) style.

Show results: Known as one of Australia's best Vermentinos with Ray Costanzo mastering this wine style. Multiple gold medal winner right across Australia with trophies at AAVWS, Brisbane RNA, ASWS, Queensland Wine Awards and NWSA

Domestic market: Over 6,000 bottles produced annually with a huge following locally and interstate. The wine retails for \$26.00 per bottle.

Market and marketing strategies: The variety has strong interest from retailers and restaurants combined with the wine being ideally suited to the cellar door. Chefs are matching seafood dishes and light style meals with this variety.

Symphony Hill Wines

Lagrein

Synonyms: Lagrein

Sub region: Granite Belt

Planting date: 2008

Rootstock/own roots: Own roots

Area under plant: 0.5 acre

Clone: H9V7 and H9V9

Soil type: Decomposed granite over a sandy to sandy-loam base. Depth is around 1.2 m.

Slope: Southerly

Elevation: 1050 m

Climate and weather: See **Petit Manseng** on page 16

Viticulturist: Mike Hayes



Figure 18. Lagrein bunches protected under net and close to harvest.



Figure 19. Lagrein leaf and bunch morphology.

Growing tips and tricks: Over cropping will deliver a very poor quality wine.

Growing do's and don'ts:

Pruning: two-bud spur–7 spurs per metre.

Canopy management: Leaf size – Medium, 3-lobed with an open petiole sinus or U-shaped. Leaf colour varies from dark green early in the season to pale green at or near harvest.

Growing habit: Semi upright and quite vigorous (Shiraz on steroids). Canopy can be messy and early attention to wire movement is needed to keep the vine in check.

Shoot strengths: Under certain conditions, shoots will grow rapidly (high humidity and early spring rain) and can be susceptible to wind damage. An extra set of wires might be needed to keep the canopy in check.

Irrigation: Early season watering is encouraged to support early season vigour. As usual, it is important to irrigate throughout the growing cycle with attention at flowering and veraison.

Fertiliser: Magnesium and calcium early in the season is beneficial and zinc/boron and iron are vital additions pre-flowering. Care needs to be taken with late season nitrogen applications as berry split is almost guaranteed.

Pest and disease issues: High vigour and therefore, in some years, fruit set can be an issue. Minor susceptibility to downy mildew and sour rot in extremely wet years.

Budburst: Mid September (almost identical to Shiraz).

Flowering: Mid November and coulure has been observed in wet years. Clonal variation delivers remarkably different berry counts with the H9V9 delivering a looser bunch.

Veraison date: Early January – beginning of the second week.

Harvest date: Late March–mid April (this variety can hang without any quality compromise).

Tonnage: 2.5 t/acre appears to deliver a balanced crop.

Winemaker: Mike Hayes, Symphony Hill Wines.

Winemaker notes: We have made wine now from three regions: Granite Belt, Heathcote and the Riverland with the latter proving to produce high quality wine with an explosive rich palate and velvet texture. Low Baumés are recorded and around 12 is common for physiologically ripe grapes. The pH and the titratable acidity are 3.7 and 5.5 respectively and low tannin levels are normal. Making the wine is exciting with cold soak benefiting the colour extraction. Cool ferment around 19 °C is recommended and no extended maceration is required. A delightful variety to make in the winery with little or problems observed.

Show results: National Gold Medal at Brisbane RNA with the 2013 achieving top gold. Regular minor medals awarded right across Australia. James Halliday's Companion awards the wine 95 points.

Domestic market: The consumer loves this wine and I call it the new charming kid on the block. Very easy to sell and restaurants are very keen to match food with this variety as it delivers low intensity tannins and a softness on the palate that appears to excite everyone.

Market and marketing strategies: Currently, this wine is Symphony Hill Wine's flagship with a price of \$95.00 per bottle and selling well. The name is easy to pronounce, therefore no extra work is needed in that department. Once people try the variety, it is commonly stated they prefer it to Shiraz. A great wine for the future of the Australian wine industry.



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Sagrantino

Synonyms: Sagrantino Rosso and Sagrantino di Montefalco

Sub region: Granite Belt

Planting date: 2007

Rootstock/own roots: Ruggeri 140

Area under plant: 1 acre

Clone: MAT1

Soil type: Sandy decomposed granite over light-textured loam.

Slope: South-westerly

Elevation: 940 m



Figure 20. Sagrantino bunches going through veraison.

Climate and weather: See Petit Manseng on page 16

Viticulturist: Graham Murchie and Mike Hayes

Growing tips and tricks: Pruning balance is essential for the crop levels as the vine has the propensity to over crop. Early season leaf analysis is required to check for low levels of boron and zinc as this variety appears to deliver a higher yield every three out of five years.

Growing do's and don'ts: Don't let the vine dry out as early leaf fall from water-stressed vines is common. Crop thin to 2.5 t/acre and remove the leaf from the fruiting region after veraison. This variety can have a rather extended period of hang time.



Figure 21. Sagrantino leaf and bunch morphology, bunches pictured going through veraison.

Pruning: Two-bud spur with 7 spurs/m.

Canopy management: Leaf size – Medium size orbicular with 3–5 lobes common. U-shaped and overlapping petiole sinus is common with a medium green colour.

Growing habit: Semi upright with slight plagio-tropic growth observed on over cropped vines. Early shoot damage from high winds is common, however, if the vine is close to flowering this is not an issue.

Shoot strengths: Delicate when young and the critical stage is budburst to flowering. Early wire movement is recommended to reduce shoot loss. Tips are also fragile.

Irrigation: Early season watering is beneficial for shoot development and the variety appears to suffer in drought with early leaf fall noticeable from under watering. Adequate irrigation is required at budburst, flowering and veraison.

Fertiliser: Zinc, boron, iron, magnesium and calcium levels need to be checked at least twice in the growing season as the vine will struggle to ripen all berries with a noticeable amount of unripe fully green berries in a vine that is struggling.

Pest and disease issues: Some resilience to powdery mildew with downy mildew a huge concern. Wet conditions deliver an explosion of downy mildew and periodic treatments are crucial up to veraison.

Budburst: Mid September

Flowering: Late November

Veraison date: Late January

Harvest date: End of March–early April.

Yield: 2.5 t/acre.

Winemaker: Mike Hayes, Balancing Rock

Winemaker notes: Lower Baumé levels are achieved from this variety and common figures are recorded between 12–12.5. Acidity levels are kept in order and a pH of 3.3–3.4 with a titratable acidity level around 7.5–8 g/L common. Cold soaking for longer than four days will increase bitterness. Recently the first wines made are showing secondary fruit characters of cloves and old spice. Oak is essential to moderate the bitterness levels and 12–14 months minimum is required.

Show results: Silver and bronze medal winners consistently across many wine shows. As the vine ages the quality is greatly improving with an exciting quality potential.

Domestic market: Sales are solid with a considerable interest in this variety as a food wine. Restaurants are showing a huge interest as the variety displays all of the attributes that Mediterranean food commands. Cellar door sales are strong as it appears to be an alternate to Cabernet Sauvignon and Merlot.

Market and marketing strategies: Brisbane wine drinkers are showing a huge interest in Sagrantino with most domestic sales coming from there and the Sunshine Coast. As new chefs accept the challenge and present different food dishes with this variety, its popularity will increase. International markets are showing interest, especially China.

South Australia

Pikes

Fiano

Region/sub region: Clare Valley/Polish Hill River

Planting date: Grafted 2010 onto Chardonnay

Rootstock or own roots: Chardonnay rootstock

Area under plant: 1 ha

Clone: SAVII01

Soil type: Alluvial clay loam

Slope: Flat

Elevation: 450 m

Climate and weather: Cool temperate, 650 mm rainfall, winter dominant

Viticulturist: Andrew Pike (proprietor)

Growing tips and tricks: VSP training system works well

Growing do's and don'ts:

Pruning: Cordon spur pruned 35–40 buds/vine

Canopy management: Quite vigorous, upright growth habit, medium leaf size.

Irrigation: Quite resilient, doesn't need unusual amounts of water.

Fertiliser: Nil. Natural soil nutrient sufficient for balanced vines.

Pest and disease issues: Quite resistant to powdery and downy mildew; open bunch structure not conducive to light brown apple moth (LBAM) or Botrytis.

Budburst: Mid to late season budburst, no issues.

Flowering: Mid to late season flowering, third week in November.

Veraison date: Normally early February.

Harvest date: Normally late March–early April

Yield: Medium size berries; cluster weight 120 g.

Winemaker: Neil Pike and Steve Baraglia

Winemaking notes: Aim for 12 Baumé, 7.5–8 g/L, 2.7 pH.

Show results: Gold medal at 2016 Alternate Varieties Wine Show in Mildura.

Domestic or export market: Domestic 100% cellar door/wine club members/local wholesale.

Markets and marketing: RRP \$20/bottle, fits into our Luccio range of Italian varietals.

Hahndorf Hill

Gruener Veltliner

Region/sub region: Adelaide Hills

Planting date: 2008

Rootstock or own roots: Own rooted + grafted onto existing vineyard

Area under plant: 3 ha

Clone: HHW A1–2, HHW A1–3

Soil type: Sandy loam topsoil with slate and ironstone intrusions. Clay subsoils

Slope: varied

Elevation: 350 m

Climate and weather: MJT 18.5–19.2 °C

Viticulturist: Larry Jacobs

Growing tips and tricks: The main issue with this variety is its propensity to over crop – both large bunches and many bunches. This issue was definitely more prevalent in the first couple of years and now seems to have somewhat settled down.

Growing do's and don'ts: Need to monitor yields to ensure quality.

Pruning: spur pruning

Canopy management: Shoot thinning, crop reduction if necessary. VSP system. Strong grower, slight sprawl. Not particularly brittle.

Irrigation: Drip system. This variety has no greater irrigation need than any other variety we grow.

Fertiliser: Nil

Pest and disease issues: The fruit supposed to be less susceptible to botrytis due the berry's thick skin, but I have not been able to confirm this.

Budburst: Similar to Chardonnay

Flowering: Similar to Chardonnay.

Veraison date: Similar to Chardonnay

Harvest date: Similar to Chardonnay

Yield: Varies from year to year as with other varieties. Can have very large bunches in certain seasons, such as an average bunch size between 200–250 g with some going up to 450 g. I've had one season when the average bunch size was 60 g. This year I'm expecting an average bunch size of 150–160 g with medium to large berry size.

Winemaker: Lodestone Winery

Winemaking notes: Varies from year to year. Can have good natural acids.

Show results: Gold medals locally and abroad; two trophies within Australia; selected to represent Australia at the 2016 Six Nations Wine Challenge where it won double gold; winner of Austria's Falstaff International Gruener Veltliner Tasting 2013.

Domestic or export market: Mainly domestic. Small export to UK/China.

Markets and marketing: Sold at cellar door, on-premise and off-premise. 2016 production of Gruener Veltliner across all styles was a total of 2000 cases. Our four wine styles of Gruener Veltliner are differentiated by different bottle shapes, corresponding largely to what is found in Austria:

1. Hahndorf Hill GRU Gruener Veltliner \$28/ bottle cellar door price, Hock bottle antique green (AG), classic style.
2. Hahndorf Hill White Mischief Gruener Veltliner \$23 per bottle cellar door price, Claret bottle flint, fruit-driven style.
3. Hahndorf Hill Reserve Gruener \$45 per bottle cellar door price, Burgundy bottle AG, reserve style.
4. Hahndorf Hill Green Angel Late Harvest Gruener Veltliner \$30; flint 375 ml half bottle, late harvest style (due for release mid-2017).

Kalleske Wines

Vermentino

Region/sub region: Barossa Valley, Koonunga

Synonym: Rolle

Planting date: 2009

Rootstock or own roots: Own roots

Area under plant: 0.4 ha

Clone: VCR1

Soil type: Biscay over red clay/ironstone

Slope: West to east downward medium slope

Elevation: 290 m

Climate and weather: 500 mm rainfall. Warm to hot growing season. Hill exposed to westerly and northerly swirling winds.

Viticulturist: John, Barb and Andy Kalleske

Growing tips and tricks: Nothing too complicated other than to keep the crop levels under control.

Growing do's and don'ts: It loves heat so if you can do a heat dance this could be beneficial. Shoot thinning (breaking out doubles at the very least) most years and bunch thinning in its youth or when over cropped. Catch wire to prevent rolling under the weight of the crop thus reducing bunch exposure to the sun. Keep the canopy happy and healthy during the heat of January/February without any over irrigating.

Pruning: Hand pruned single cordon permanent arm. 10 × 2-bud spurs/m. Average of 40 buds/vine.

Canopy management: Grows relatively horizontal and especially inclined to roll once the weight of the crop increases. Medium-large, healthy looking dark green leaves, lengthy canopy and strong canes.

Irrigation: On average 1 ML/ha/season. Pound for pound requires less irrigation than any of our other varieties. Considering its high crop load, I would consider it quite drought tolerant given we irrigate it about the same as Shiraz.

Fertiliser: No fertilisers used.

Pest and disease issues: No more susceptible than other varieties from what we've seen so far. Yet to see any disease issues that cause us any concern. Given its early harvest, this decreases the instance of disease pressure in the cooler nights of autumn.

Budburst: Typically second or third week of September.

Flowering: Typically mid November. No issues at this stage. Have had excellent sets for all the vintages so far.

Veraison date: Typically mid-January

Harvest date: Typically early March

Yield: Very large berry size. Bunch weights heavy (not sure on actual weights but at a guess 250 g+). Bunches have a nice reverse pyramid shape; 4–5 t/acre.

Winemaker: Ryan Johns

Winemaking notes: Harvest early to retain its natural acidity to make a nice refreshing and balanced wine. Vinified quite simply, fermented in tank, light stirring of the lees and bottled young Aze's Vermentino is all about a nice textural mouth feel, limey citrus and zesty, fresh tangy fruit. Dry and utterly refreshing, this is the perfect wine to drink right through the spring and summer. Pair it with seafood or drink as an aperitif, its 12% alcohol is refreshingly low. 12 Baumé, 3.5 pH, 6.5 titratable acidity, alcohol 12%.

Show results: Fruit grown off property won a gold for its class in the 2016 AAVWS.

Domestic or export market: Domestic.

Markets and marketing: Price point \$22.99. We're still in the experimental stage with our packaging. For the first three vintages we used our existing label (Bordeaux bottle shape and same label used for reds) with a few colour tweaks and a flint (clear glass) bottle. Last vintage we changed to a burgundy bottle and the changed label to a more colourful/contemporary label. This year we are planning to change again to something slightly more feminine as we believe this fresh crisp style is ideally suited to target the female 25–50 year old market. We have also debated the possibility of using the French varietal name Rolle instead of the term Vermentino; there is the possibility that the name Rolle could be more appealing.

Kimbolton Wines

Montepulciano

Region/sub region: Langhorne Creek

Planting date: Grafted 2006, 2010, 2013 and planted 2014

Rootstock or own roots: Rootstock (Richter 99)

Area under plant: 4 ha

Clone: not provided

Soil type: Sandy free draining soils

Slope: Nil

Elevation: 150 m

Climate and weather: Variable these days, but normally warm days and cool nights influenced by cooler afternoons due to Lake Alexandrina's close proximity.

Viticulturist: Brad (Fabio) Case

Growing tips and tricks: Grow on lean or sandy soils, keep it happy and be prepared to shoot thin and bunch thin every year.

Growing do's and don'ts: Don't grow on heavy soils or wet sites unless they are really infertile soils; don't prune too hard as it will become excessively vegetative, VSP trellis is needed, hand picking is best.

Pruning: Two-bud spurs, 16/vine (2 m spacings by 3 m row spacings).

Canopy management: Strong grower, large leaf size, big bunches, brittle if machine harvested due to bunch size and weight, needs wire lifting to manage the canopy.

Irrigation: Keep it happy when warm; small amounts more often on sandy soils.

Fertiliser: No strong demand for fertiliser, very site and soil-specific.

Pest and disease issues: Very similar to other varieties.

Budburst: Late bud burst (early October).

Flowering: Late flowering (late November)

Veraison: Early to late January, depending on the season.

Harvest: Early April through to late April in cooler seasons.

Yield: 8–10 t/ha (after shoot and bunch thinning), larger bunch and berry size.

Winemaker: Sam Berketa (Alpha Box & Dice), Matt Head (Parous), Gill Gordon (Fall From Grace), Sam Scott (Scott), Peter McIntyre (Five Acre), AJ Williams

(Next Crop), Tony Mitolo (V. Mitolo & Son), Joe Evans (Ballycroft), Steve Pannell (SC Pannell), Justin Lane (Kimbolton), John Gilbert (By Jingo).

Winemaking notes: Picking varies from 12–14 Baumé depending on the winemaker; retains good acid.

Show results: 2016 Langhorne Creek Wine Show Trophy (Next Crop Wines 2015 Montepulciano), generally too small an amount is made for entry into larger shows.

Domestic or export market: Domestic

Markets and marketing: Pricing varies from \$25 through to \$40 a bottle, from Rosata, lighter dry red to heavier dry red and a sparkling Montepulciano (a world first for this variety).

Hither & Yon

Nero D'Avola

Region/sub region: McLaren Vale

Planting date: September 2010

Rootstock or own roots: Rootstock Richter 110

Area under plant: 1.1 ha

Clone: MAT1

Soil type: Alluvial clay (red) with small sandstone pebbles.

Slope: None

Elevation: 60 m

Climate and weather: Maritime cool to cold winters with average rainfall of 600 mm, and warm to hot summers.

Viticulturist: Richard Leask

Growing tips and tricks: Keep the vine spacing between 1.5 m and 2 m. One-year-old canes can be susceptible to apical dominance and not burst evenly along the cane, making spur position set up a little difficult. Watch rootstock compatibility, there have been some issues, I have had none with my combination.

Growing do's and don'ts: Keep them happy for the first few years (3–4) until they are well established.

Pruning: Spur, single cordon

Canopy management: It has a drooping growth habit and we use a single pair of movable foliage wires to help keep it upright in a VSP. It has large leaves that can cause a dense canopy if too many shoots are

present. Canes are of moderate strength and can be machine harvested with care! It could be very vigorous on a fertile site. Can be prone to hen and chicken fruit set. Overall canopy seems quite tough and can withstand prolonged heat periods.

Irrigation: Less now that they are established. It appears that they will need very little water <0.5 ML/ha assuming an average winter.

Fertiliser: Less now that they are well established. No more than typical in the establishment stage.

Pest and disease issues: Appears to be very robust to all major fungal diseases.

Budburst: Mid season similar to Shiraz.

Flowering: Same as above, some hen and chicken appears to be normal.

Veraison date: Same as Shiraz.

Harvest date: Same as Shiraz.

Yield: Water availability plays a large role here. Berries can be very large if there is plenty of freely available water. Can be controlled with deficit irrigation at fruit set. Bunch structure is large therefore usual bunch size of 150 g + is the norm.

Winemaker: Richard Leask, Malcolm Leask, Josh Watcher

Winemaking notes: See Nero d'Avola on page 30

Show results: 2015 Nero D'Avola Australian Alternatives Wine Show: Best Red Wine of Show; Best Italian Red Variety; Best Nero D'Avola; gold medal.

Domestic or export market: Domestic

Markets and marketing: \$30

Victoria

Chalmers Heathcote vineyard

Fiano

Region/sub region: Heathcote

Synonyms: Fiano di Avellino, Fiore Mendillo, Latino

Planting date: 2009

Rootstock or own roots: Grafted on 110 Richter

Area under plant: two Hectares (about to plant another three)

Clone: VCR 3

Soil type: Rich red Cambrian soil, clay-loam, deep and with excellent water-holding capacity. Slightly acidic at 5.7pH.

Slope: 0.08 m gradient (45 m fall over 530 m run)

Elevation: 150–195 m above sea level

Climate and weather: Heathcote is a long, narrow region and our site is in the northern part of the geographical indicator (GI) which is around 2 °C warmer on average and receives about 5–10 mm less rainfall per month than the south of the district. Average annual rainfall of 515 mm. Rainfall is reasonably evenly spread across the year with slightly more in winter and spring, about a monthly rainfall average of 30–50 mm. The climate is warm and temperate and the site is quite windy. Maximum temperatures average 22 °C a year (January mean max. 30.3 °C, June mean max 14 °C). Summers are hot, only a couple of degrees less than Mildura, but evenings are cool and there is a lot of wind, which is great for reducing disease risk.

Viticulturist: Troy McInnes (vineyard manager) and Chalmers family

Growing tips and tricks: This variety has traditionally succeeded in soils of volcanic origin and heavy, clay-based soils, but can produce wines with early-drinking appeal off lighter, sandy soils. A late ripener, it is found in warm to hot climates. It is suitable for different training systems; in the limited area of Italy the traditional vertically trained system is used. It is a vigorous variety, which needs controlling. Very forgiving viticulturally. No special tips.

Growing do's and don'ts: Very viticulture friendly.

Pruning: We grow it at 4545 vines/ha on a unilateral rod pruned system. It's cane pruned to 10 bud canes.

Canopy management: Very strong, open canopy. Responds well to VSP. Excellent natural placement of small berried, thick skinned bunches. Growing tip is fully open, cottony, of whitish colour. Leaf is medium of blade, orbicular, 3-lobed or 5-lobed. Has a U- or V-shaped petiolar sinus, lateral sinuses shaped like a closed lyre with lobes slightly overlapped. The profile is flat without hairs on the upper surface, and with very dense hairs on the underside.

Irrigation: Irrigation at this site is supplemental because of the water holding capacity of the soil. It is usually only used to apply fertigation or prepare for heat waves, rather than a regular regime. Fiano is average in water use for our vineyard and moderately drought tolerant, but if it dries out too much the foliage will burn or basal leaves will die. It uses a little more water than Shiraz.

Fertiliser: 10 m³/ha of organic composted cow manure applied every second season (half the rate of the top block). Seaweed extract applied by fertigation at 5 L/ha once or twice a year as required. Two applications of boron from the first sign of flowering.

Pest and disease issues: Can be a tiny bit sensitive to powdery mildew early in the season around flowering, but otherwise very hardy and appears to have better resistance to mildews and rot than most varieties. Very thick skins – even in 2011 the Fiano was clean as a whistle.

Budburst: No issues. Average.

Flowering: Average. You do get a few small berries that don't set. Almost always sets a second crop high in the canopy.

Veraison: Average

Harvest: Moderately early, comes off about a week before Shiraz.

Yield: Bunches are medium-small, of pyramidal form, with one developed wing, medium density. Berries medium size, elliptic; skin coloured gilded yellow with flecks of amber, thick, slightly covered by bloom. Average bunch weight 150 gm. Average yield 8 t/ha.

Winemaker: Chalmers (Kooyong Winery)

Winemaking notes: Harvest analysis 15 Feb 2012: Baumé 12.8, pH 3.12, titratable acidity 7.9 – Finished wine: Alc/vol 13.7, pH 3.07, titratable acidity 6.4.

Fantastic natural acid, rarely needs acidifying. We even make methode traditional from it without the need for acid additions or dosage. Fiano is a winemaker's grape and can be handled in lots of ways with great results. Squeaky clean, racy and young, oak, skin contact, lees, you name it. It works.

Show results: Gold medal Australian Alternative Varieties Wine Show.

Domestic or export market: Domestic and UK.

Markets and marketing: This is our top white in the Chalmers range at an RRP of \$33. The wine is consistently outstanding and ages really well too. We deliberately sell ours with a couple of years age on it to emphasise its complexity. Consumers love it when they taste it and I think Fiano has the magic combination of viticultural, winemaking and marketing ticks to be a great Australian grape of the future. Our Fiano sells slowly in Australia, perhaps because at that price it's competing with single vineyard chardonnays and the like for wine list space, but is taking off in the UK where it retails for £20.00.

Garganega

Region/sub region: Heathcote

Synonyms: Grecanico, Malvasia de Manresa

Planting date: 2014

Rootstock or own roots: Own roots

Area under plant: 0.2 ha

Clone: VCR4

Soil type: Rich, red Cambrian soil, clay–loam, deep and with excellent water holding capacity. Slightly acidic at 5.7 pH.

Slope: 0.08 m gradient (45 m fall over 530 m run), east facing.

Elevation: 150–195 m above sea level.

Climate and weather: Heathcote is a long, narrow region and our site is in the northern part of the GI, which is around 2 °C warmer on average and receives about 5–10 mm less rainfall a month than the south of the district. Average annual rainfall is 515 mm. Rainfall is reasonably evenly spread across the year, with slightly more in winter and spring – monthly rainfall average of 30–50 mm. The climate is warm and temperate and the site is quite windy. Maximum temperatures average 22 °C a year (January mean max. 30.3 °C; June mean max 14 °C). Summers are hot, only a couple of degrees less than Mildura, but evenings and mornings are cool and there is a lot of wind, which is great for reducing disease risk.

Viticulturist: Troy McInnes (vineyard manager) and Chalmers Family.

Growing tips and tricks: Garganega in Italy has shown a preference for deep, rich soils. The vines require wide training systems (tendone and pergola) in cooler regions, while in the warmer regions spur pruning can be used. It is considered to be suitable for full mechanisation. The typical bunch is large, long, loose and winged. It is highly productive and its vigour requires careful management. A late ripener, the berry skin can turn a light amber colour when approaching maturity. At Heathcote, it shows very late budburst, up to two weeks after most whites.

Growing do's and don'ts: Extremely vigorous, downward growth habit. VSP recommended.

Pruning: Currently cane pruned, but needs to go to spur to help control yield. Early pruning might bring forward budburst.

Canopy management: Large leaves, long, strong canes. Long internode spacing. Downward growth. VSP required. At least three pairs of lifting wires. Growing tip is half-open, cottony, coloured whitish green with reddish edges. Leaf is medium–large surface area, 3-lobed or 5-lobed. Has a U- or V-shaped petiolar sinus; lateral sinuses shaped like a V with lobes strongly overlapped. The profile is undulating with hairs on the upper surface.

Irrigation: Can benefit from less water to restrict vigour, but does show heat stress in extreme conditions.

Fertiliser: Typical nutrient requirement.

Pest and disease issues: Very loose bunches seem to keep this at bay. Not particularly thick skins though.

Budburst: Two weeks later than most whites. In our experience, it is not over productive as it has less bunches. Might benefit from cane pruning to increase productivity.

Flowering: Flowering date is a week or two later than the average white.

Veraison: Mid–late season. Seems to catch up.

Harvest: Early–mid season, can achieve flavour ripeness at lower Baumé – from 10.5 Baumé.

Yield: Bunches are very large and elongated, of cylindrical–pyramidal form, with one developed wing, loosely spaced berries. Berries of medium dimensions, round or slightly oblate; thin skin, lightly covered by bloom, yellow with reflexes of amber; juicy pulp with neutral taste. Average bunch weight 200–400 g. Average yield 12 t/ha.

Winemaker: Bart van Olphen and Tennille Chalmers (Chalmers Project).

Winemaking notes: Maturity at harvest Baumé 10.4, pH 3.53, titratable acidity 5.2. Finished wine 11.4 alc/vol. Again, made in our project winery so made simply. Basket pressed and fermented wild on solids. Clean fresh style, pleasantly low alcohol. Great potential and a relatively un-used grape in Australia so far. Only a couple of wines on the market. Commercially viable and consumer friendly.

Domestic or export market: Domestic.

Markets and marketing: RRP \$32, mostly sold from the premises to venues with good wine knowledge.

Malvasia Istriana

Region/sub region: Heathcote

Synonyms: Malvazija Istarska, Malvasia del Carso, Malvasia Fruilano, and Polijsakica Drnovk

Planting date: 2014

Rootstock or own roots: Own roots

Area under plant: 0.2 ha

Clone: VCR4

Soil type: Rich red Cambrian soil, clay–loam, deep and with excellent water-holding capacity. Slightly acidic at 5.7 pH

Slope: 0.08 m gradient (45 m fall over 530 m run). East-facing slope

Elevation: 150–195 m

Climate and weather: Heathcote is a long, narrow region and our site is in the northern part of the GI, which is around 2 °C warmer on average and receives

about 5–10 mm less rainfall a month than the south of the district. Average annual rainfall is 515 mm. Rainfall is reasonably evenly spread across the year, with slightly more in winter and spring – monthly rainfall average of 30–50 mm. The climate is warm and temperate and the site is quite windy. Maximum temperatures average 22 °C a year (January mean max. 30.3 °C; June mean max 14 °C). Summers are hot, only a couple of degrees less than Mildura, but evenings and mornings are cool and there is a lot of wind, which is great for reducing disease risk.

Viticulturist info: Troy McInnes (vineyard manager) and Chalmers Family.

Growing tips and tricks: This vigorous variety produces good and reliable yields, but loses its aromatic nature if overcropped. It has a preference for well-drained soils and thus flourishes on sand and hillsides on lighter soils rather than clay. It suits wide-spaced vines; Best grown on VSP to keep fruit zone open as it is susceptible to botrytis.

Growing do's and don'ts: Avoid overcropping and be aware of botrytis sensitivity. Can be harvested early in warmer areas.

Pruning: Established at 4545 vines/ha on east–west rows on unilateral cane pruning. This is only because it's new. Most likely, like many other Italian varieties with a propensity to yield high, we will change it over to spur pruning to control yield.

Canopy management: Very uniform, upright growth habit, medium–large leaves, strong, large-diameter canes. Growing tip is wide open, cottony, coloured green with yellowish edges. Leaf is medium–large, pentagonal shape, 3-lobed or entire leaf. Has an open, V-shaped petiolar sinus, lateral superior sinuses are V–U shaped, while inferior are rare. The profile is revolute. The upper and under surface is hairless.

Irrigation requirement: Average.

Fertiliser requirement: Average. 10 m³/ha organic composted cow manure applied every second season (half the rate of the top block). Seaweed extract applied by fertigation at 5 L/ha once or twice a year as required. Two applications of boron from first sign of flowering.

Pest and disease issues: Botrytis susceptible. Seaweed helps thicken the slightly thin skins.

Budburst: Average.

Flowering: In line with most whites – mid season.

Veraison date: Mid season.

Harvest date: Early.

Yield: Cluster is medium sized, cylindrical with one small wing, semi-compact from densely distributed berries to single berries with some visible pedicels. Berry is medium sized, spherical, with waxy bloom, skin is yellowish-green. Average bunch weight 150–250 g. Average yield 8–13 t/ha.

Winemaker: Bart van Olphen and Tennille Chalmers (Chalmers Project).

Winemaking notes: Maturity at harvest 3/2/2016: Baumé 11.7, pH 3.63, titratable acidity 5.4 – not particularly good acid in hot climate, acid adjustment required. Finished wine: Alc/vol = 12.43. Wine is quite perfumed with scents of honey and straw, has a slippery texture and is moreish. It also has exotic spice flavours too: cardamom and clove. The wine is basket pressed and fermented wild on fine solids.

Domestic or export market: Domestic – it is a project wine made in small batches. The Chalmers Project made a small batch of Malvasia Istriana in 2016 that was sold in Melbourne and Sydney – mainly to restaurants.

Markets and marketing : RRP \$32, mostly sold from the premises to venues with good wine knowledge. An appealing variety to consumers though, because of its almost aromatic quality.

Aglianico

Region/sub region: Heathcote

Synonyms: Aglianica, Agnanico, Aglianico Nero, Aglianicuccia, Aglianichella Aglianico di Castellaneta, Aglianico di Puglia, Agliano, Agliatica, Agliatico, Ellenico, Fiano Rosso, Gagliano, Glianica, Ghiandara, Gnanico, Ghiannara, Olivella di S. Cosmo, Spriema, Cascavoglia, Fresella, Cerasole, Ruopolo, Tringarulo, Uva dei cani, Uva di Castellaneta, Uva Nera.

Planting date: 2009

Rootstock or own roots: Grafted on 110 Richter

Area under plant: 1 ha

Clones: Taurasi VCR23

Soil type: Volcanic, rocky Cambrian with very little top soil of clay/loam. Green basalt, ironstone, dolerite and jasper, plus infused quartz. Strongly acidic at 5.5 pH.

Slope: 0.1 m gradient (30 m fall over 300 m run).

Elevation: 190–225 m.

Climate and weather: Heathcote is a long, narrow region and our site is in the northern part of the GI, which is around 2 °C warmer on average and receives about 5–10 mm less rainfall a month than the south of the district. Average annual rainfall is 515 mm. Rainfall is reasonably evenly spread across the year, with slightly more in winter and spring – monthly rainfall average of 30–50 mm. The climate is warm and temperate and the site is quite windy. Maximum temperatures average 22 °C a year (January mean max. 30.3 °C; June mean max 14 °C). Summers are hot, only a couple of degrees less than Mildura, but evenings and mornings are cool and there is a lot of wind, which is great for reducing disease risk. Evenings and mornings are usually cool even in the middle of summer.

Viticulturist: Troy McInnes (vineyard manager) and Chalmers Family

Growing tips and tricks: Budding early and ripening late, Aglianico is best suited to dry, warm climates. For this reason, it has flourished in southern Italy (and now in Australia), particularly in soils of volcanic origin, but in general, this variety can adapt to many types of soil. In Italy, in some viticultural zones (Taurasi DOCG and Aglianico del Vulture DOC), it can grow at 700–900 m altitude, but its late ripening nature and high natural acidity make it unsuitable to cold climates. It can have some problems with extreme heat waves, although we have not observed pronounced adverse effects as long as the vines are hydrated. It has thin canes, low vigour and requires extra nutrition when young to establish strong architecture. At Heathcote, it's planted on our highest, rockiest site in an exposed position and it has taken a long time to establish. Needs good crop level management as while the canopy is low vigour, it throws a lot of fruit.

Growing do's and don'ts: Space spur positions out well while setting up. We have grown it on both cane and spur at Heathcote, but went to spur to reduce crop levels. Benefits greatly from crop reduction by shoot thinning and bunch removal. The extreme late ripening (well into April) means that it can be hard to get ripe toward the end, especially if over cropped.

Pruning: single wire unilateral cordon at 4545 vines/ha, spur-pruned to 6–7 × 1 clear bud spurs. Over productive when cane pruned.

Canopy management: Growing tip is fully open, cottony, coloured green or copper–yellow. Leaf blade is medium–small, pentagonal, 3-lobed or 5-lobed. Has a closed V-shaped petiolar sinus with lobes slightly overlapping, lateral sinuses shaped like a closed U. The profile is flat with a medium blistering of blade in the upper surface. Strong, thin canes, downward growth habit. VSP wires help to keep the canopy open. Canopies are smaller than most. Aglianico requires a bit more water and nutrition than the rest of the block, especially early in the season to push the small canopy early, creating vine balance to drive the fruit through to maturity. This site is low in potassium (K) and Aglianico suffers badly if this is not rectified with regular foliar application of K.

Irrigation: In this hard site it needs more irrigation than in a fertile site. However, it needs to be applied carefully as overwatering will produce large, tight bunches. Recommend irrigation from budburst to flowering with regular watering then you can back off. Our Heathcote Aglianico on this site receives almost 50% more irrigation than the lower elevation part of the vineyard, which is on deeper topsoil.

Fertiliser: Organic composted cow manure is applied at 20 m³/ha every second season (double the rate of the bottom block). Seaweed extract applied by fertigation at 5 L/ha once or twice a year as required. Based on results from petiole analysis, we apply fertigation of mono-potassium phosphate (22.7% phosphate and 28.7% potassium at 25 kg/ha) four times between budburst and Christmas on this block. Two applications of boron from first sign of flowering.

Pest and disease issues: The variety shows a high level of resistance to the most common pests and diseases, especially powdery mildew, although it is susceptible to botrytis and other bunch rot issues in humid and wet seasons because of its big tight bunch and potential overcropping.

Budburst: We have never seen a budburst problem. Late budburst.

Flowering date: Flowering dates are normal with no problems. Shows mild hen and chicken in most seasons.

Veraison date: Late. At least two weeks after most varieties. Very extended period of veraison (up to three weeks), with the tails of the bunches veraising much later than the top.

Harvest: Very late, last fruit to pick on the vineyard; well into April.

Yield: Bunches are medium-sized, conical or cylindrical, with or without wings, medium–tight density. Berry medium-sized, round; skin is uniform blue–black colour, medium to thick and covered by abundant bloom. Bunch weights average 150–200 g. Average yield for Chalmers Heathcote 6–9 t/ha (thinned).

Winemaker: Chalmers (Kooyong Winery).

Winemaking notes: Generally reaches phenolic ripeness at a low Baumé because it's ripening in the cooler autumn period. Rarely requires acid addition. The 2011 Aglianico fruit intake was 12.2 Baumé, 3.11 pH, 8.4 titratable acidity. Finished wine: Alcohol 12, pH 3.43, titratable acidity 6.

Domestic or export market: Domestic and UK.

Markets and marketing: RRP is \$45. This is our top wine. We have a lot of faith in the variety for its ability to produce elegant, structured wines that can age beautifully (we have a 2005 wine still on the market as a museum release, which is still drinking beautifully). We also make our Chalmers Rosato from Aglianico RRP is \$24. It's high acid, has pretty fruit and a pleasant tannin that can work really well for a dry, savoury style rose.

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Negro Amaro | Nero d'Avola | Nosiola | Pecorino | Piediroso | Pinot Bianco | Pinot Nero | Pinotage | Prosecco
Refosco | Ribolla Gialla | Sagrantino | Sangiovese | Schioppettino | Teroldego | Uva di Troia | Verdicchio | Vermentino

Nero d'Avola

Nero d'Avola is the most widely planted and important red grape in Sicily, Italy. It produces wines of good colour, intensity, full-bodied and savoury flavours with good ageing potential. The Nero in the name obviously refers to the black colour of the grapes; d'Avola refers to the town and region of Avola in the south-eastern part of Sicily where this variety produces some fine wines. There are approximately 19,000 ha of Nero d'Avola planted in Sicily.

This variety is one of several from southern Italy that are of interest to winemakers in warm to hot conditions. As more grapegrowers and winemakers become concerned about climate change, they are increasingly looking for wine varieties from southern Italian regions rather than the cooler north.

Nero d'Avola is favoured in warmer climates for two reasons:

- Firstly as a late ripening variety the critical last month of maturation is more likely to be after the hottest part of summer. It likes heat.
- Secondly, the variety seems to be less susceptible to berry damage during heat waves. It is also vigorous and susceptible to powdery mildew.

Nero D'Avola is suitable for most of the warmer areas of Australia, currently with much focus in the McLaren Vale and Riverland districts in South Australia. It appears to have great potential in areas such as Bendigo, Heathcote, Pyrenees and Rutherglen in Victoria, as well as most of the inland regions of New South Wales. Nero D'Avola was first brought into Australia by Chalmers in 1998.

In terms of recent 2016 wine show success, two Nero D'Avola producers have performed well. Brown Brothers 2015 Cellar Door Release (\$20.90 recommended retail price) won the trophy for best single variety red (Class 57 – 97 points) at the 2016 Royal Melbourne Wine Awards. This wine also won a gold medal at the 2016 AAVWS in the Nero D'Avola category (14.5% alcohol). This vineyard was located in Heathcote, central Victoria, and has unfortunately been removed due to poor cropping and prior performance.

The second Nero D'Avola producer who won a gold medal at the 2016 AAVWS was the Thick as Thieves – The Don 2015 Heathcote Nero D'Avola.

Thick as Thieves is a small Yarra Valley-based winery owned by Syd Bradford. Syd spent 10 years working for notable producers such as Pfeiffer Wine, Coldstream Hills, Rochford, Domaine Chandon and Giant Steps/ Innocent Bystander before starting Thick as Thieves in 2009. Thick as Thieves has the freedom to experiment with alternative varieties, such as Nero D'Avola from Heathcote. He sells his wines domestically, but also exports to Japan and Singapore.

The Thick as Thieves Nero D'Avola (The Don) 2015 from Heathcote (\$35 recommended retail price) is Syd's take on the Sicilian stalwart variety, which is often compared with Shiraz in terms of structure and flavour profiles. He added about 3% Viognier to the blend to help caress the brooding red fruits out of their youthful awkwardness. The grapes were picked in late March and chilled before a short, cold soak, it was then de-stemmed to stainless steel open fermenters for an indigenous ferment. Pressed to seasoned Hogsheads and Barriques for eight months elevelage. Natural malo-lactic fermentation. Bottled in December under screw cap.

The Nero D'Avola, two tonnes, was purchased from the Chalmers family vineyard on the Mt Camel range near Colbinabbin in the northern part of the GI region of Heathcote in Victoria. The Chalmers family developed the vineyard from scratch with careful rootstock selection to control vigour and east–west row orientation for even exposure and free flowing air-drainage to reduce disease risk.

The Heathcote vineyard is an east-facing sloped site comprised of the famous red Cambrian soils of the area. The lower vineyard is deep, red clay–loam, while the higher vineyard is a complex rocky terrain of ironstone, dolerite, green basalt and jasper. The first vines were planted in September 2009, and the site holds 24 different varieties already and many vinification experiments are being conducted on the individual characteristics of the soils of different blocks within the site. Parcels of fruit from this vineyard are also sold to other winemakers.

Nero d'Avola

Region/sub region: Heathcote/Mt Camel Range

Synonyms: Nero D'Avola (Calabrese, Calabrese Nero, Calabrese d'Avola, Calabrese Dolce, Calabrese Pizzutello, Calabrese Pizzuto)

Planting date 2009

Rootstock or own roots: Grafted to 110 Richter and 420A

Area under plant: Heathcote vineyards total 25.6 ha, Nero d'Avola – 3.0 ha

Clone: MAT 1: selected by Matura Group, Italy

Soil type: Red Cambrian soils

Slope: East facing

Elevation: 180–200 m above sea level

Climate and weather: MJT 21.0–22.9 °C zone.

Viticulturist– Bruce Chalmers

Pruning: Spur-pruned to one bud.

Growing tips and tricks: The vineyard is planted at a high density of 4,450 vines/ha and VSP trained, with cordon wire set low at 750 mm above the ground. Originally cane pruned, but are very fruitful, thus now spur pruned to one bud only. Requires attention to shoot thinning through the season. Nero d'Avola has a downward growth habit, and thus needs to be trimmed and foliage lifted to promote bunch exposure. Chalmers is transitioning to an organic production system in Heathcote, so the vineyard only gets copper and sulfur treatments. The production of Nero d'Avola

is good and consistent. This variety typically grows in hot climates, prefers sandy and hilly soils and can give good results in dry and low–medium fertile soils. It is high vigour and produces medium–large bunches. It needs shoot thinning during the growing season to balance the canopy. In some situations, basal bud fruitfulness can be poor, so cane pruning might be preferred, especially in the cooler climates of Australia.

Irrigation: If you are wanting to plant something where it's going to get hotter and there's going to be less water, it's a great variety, but it needs a lot of active crop and canopy management. In Heathcote, Nero d'Avola requires little to no water to produce.

Fertiliser: not provided

Pest and disease issues: Susceptible to powdery mildew and downy mildew; medium resistant to the others pests. On the Heathcote site, no more susceptible to fungal pathogens than other grape varieties. Berries are large and thin skinned.

Budburst: Mid season

Flowering: Early

Veraison date: Mid season

Harvest date: Mid season, hard to get to ripen beyond 12.5 Baumé. In Heathcote, mid March harvest typically.

Yield: Hand harvested, 8–10 t/ha yields; berries are purplish–black, and small to medium in size.

Winemaker information: Syd Bradfield

Winemaking notes: 14.2% alcohol – tannins very similar to Heathcote Shiraz. This was Syd's first time making a Nero D'Avola wine.

Show results: Gold medal 2016 AAVWS in Nero D'Avola class.

Domestic or export market: 120–130 cases all sold domestically.

Markets and marketing: \$35 recommended retail price.

Refosco dal Peduncolo Rosso

Region/sub region: Heathcote

Vareital: Refosco dal Peduncolo Rosso

Synonyms: Rifosc dal Pecol Ross

Planting date: 2014

Rootstock or own roots: Own roots

Area under plant: 0.21 ha

Clone: VCR 14

Soil type: Rich, red Cambrian soil, clay–loam, deep and with excellent water-holding capacity. Slightly acidic at 5.7 pH.

Slope: 0.08 m gradient (45 m fall over 530 m run). East-facing slope.

Elevation: 150–195 m above sea level.

Climate and weather: Heathcote is a long, narrow region and our site is in the northern part of the GI, which is around 2 °C warmer on average and receives about 5–10 mm less rainfall a month than the south of the district. Average annual rainfall is 515 mm. Rainfall is reasonably evenly spread across the year, with slightly more in winter and spring – monthly rainfall average of 30–50 mm. The climate is warm and temperate and the site is quite windy. Maximum temperatures average 22 °C a year (January mean max. 30.3 °C; June mean max 14 °C). Summers are hot, only a couple of degrees less than Mildura, but evenings and mornings are cool and there is a lot of wind, which is great for reducing disease risk.

Viticulturist: Troy McInnes (Vineyard manager) and Chalmers Family.

Growing tips and tricks: Refosco dal Peduncolo Rosso tends to do well in hillsides sites in infertile, calcareous–clay soils, but it is relatively adaptable.

It is a vigorous variety that prefers medium or wide training systems. It is thought to not be suited to total mechanisation. It is a late ripener in cooler areas. When it is ripe, the stalks redden, which is where it gets its name from (red peduncle). A very reliable, easy to manage variety. Naturally produces balanced crop levels and has good bunch placement.

Growing do's and don'ts: Do not overcrop, as it might be difficult to get it fully ripe.

Pruning: Single unilateral cane-pruned VSP with two pairs of foliage wires. Planting density of 4545 vines/ha. Lends itself to VSP as it is an upright growing variety, with thinner than average canes. Currently cane pruned; recent planting so monitoring results.

Canopy management: Upright, but requiring lifting wires. Strong, evenly-sized canes. A little smaller than most. Canes can be long, but upright, As with most varieties, trimming at 400 mm above the top wire if required is beneficial to stop the canopy from falling over the top wire. The growing tip is half-open, cottony, coloured whitish–yellow with reddish edges. The leaf blade is large, with a pentagonal or circular shape, 3-lobed. Has a V-shaped petiolar sinus, lateral sinuses are V-shaped with lobes slightly overlapping. The profile is flat with a medium blistering of blade in the upper surface.

Irrigation: Average. Naturally well balanced canopy.

Fertiliser: Organic composted cow manure applied at 10 m³/ha every second season (half the rate of the top block). Seaweed extract applied by fertigation 5 L/ha once or twice a year as required. Two applications of boron from the first sign of flowering.

Pest and disease issues: Has not yet exhibited disease.

Budburst: Mid season

Flowering date: Average flowering timing. Always sets well.

Veraison date: Mid season.

Harvest date: Mid–late.

Yield: Bunch is medium–large, has pyramidal form with one wing, medium density, with red peduncle. Berries are round, medium-sized, with medium thick, uniform blue–black skin, covered by medium bloom; ease of detachment from pedicel. Average bunch weight 150–250 g. Average yield 8–10 t/ha.

Winemaker: Bart van Olphen and Tennille Chalmers (Chalmers Project), Pat Underwood (Little Reddie).

Winemaking notes: Rosé harvest numbers from 11/2/16: Baumé 12.4, pH 3.32, titratable acidity 10.10. Red wine harvest numbers from 18 February 2016: Baumé 13, pH 3.65, titratable acidity 6.2.

Domestic or export market: Chalmers Project made a small batch of Refosco rosé in 2016 that was mainly sold in Melbourne and Sydney restaurants.

Markets and marketing: The flavour profile is interesting and the grape has the potential to make serious wines as well as rosé or juicy reds. Interesting for warmer areas, as in cool places it can be herbal.

Chalmers Merbein vineyard

Fiano

Region/sub region: Murray Darling

Synonyms: Fiano di Avellino, Fiore Mendillo, Latino

Planting date: 2010

Rootstock or own roots: Grafted on 110 Richter

Area under plant: 0.5 ha

Clone: VCR3

Soil type: Red sand and limestone

Slope: 0.04 m gradient (13 m fall over 300 m run)

Elevation: 60 m

Climate and weather: The Mildura Murray–Darling Region has a Mediterranean climate. Annual rainfall total is 290 mm falling evenly across the year (average 20–30 mm/month). The wettest year ever was 2011 at 657 mm; the driest ever was 1982 at 121 mm, 2006 at 123 mm close behind. The general trend is to drier conditions with 11 of the past 15 year being below average rainfall.

Skies are clear on average for 12 days/year; maximum temperatures average 23.6 °C/year (January mean max. 32.3 °C, June mean max 16 °C). Summer is hot with up to 10 days over 40 °C between December and March. The diurnal range is usually very good though, with 15 °C to 20 °C drops at night in summer, (e.g. daytime high 34 °C, night time low 14–19 °C). Winters are mild during the day (around 14 °C), with not too many days under 10 °C maximum. The cold, crisp nights often get below zero in the early hours of the morning.

Viticulturist: Chalmers family

Growing tips and tricks: It has traditionally succeeded in volcanic soils and heavy, clay-based soils, but can produce wines with early-drinking appeal off lighter, sandy soils. A late ripener, it is found in warm to hot climates. It is suitable for different training systems – in the limited area of Italy where the variety is grown, the traditional vertically trained system is used. It is very vigorous, on R110. Very forgiving viticulturally. No special tips.

Growing do's and don'ts: Very viticulture friendly.

Pruning: Set up on commercial two wire, bi-lateral spurred cordon trellis with a catch wire. Cordon wires 400 mm apart with catch wire 300 mm above the top

cordon wire. Hand pruned to approximately 20 × 2 clear bud spurs. Internodes are well spaced, so spur positions are easy to up.

Canopy management: Growing tip: fully open, cottony, whitish colour. Leaf: medium blade, orbicular, 3-lobed or 5-lobed. Has a U- or V-shaped petiolar sinus, lateral sinuses shaped like a closed lyre with lobes slightly overlapped. The profile is flat without hairs on the upper surface, and with very dense hairs on the underside. Very strong, open canopy. Upward and outward growing so it naturally shades fruit and allows air circulation. Excellent natural placement of small berried, thick skinned, bunches.

Irrigation: On the R110, the variety seems to require a little less water than other varieties.

Fertiliser: Big canopy, so it might benefit from less nutrient early. We give it the same fertiliser as the rest of the vines.

Pest and disease issues: Can be a tiny bit sensitive to powdery mildew early in the season around flowering, but otherwise very hardy and appears to have better resistance to mildews than most varieties. Very thick skins.

Budburst: No issues. Budburst a little earlier than most other varieties.

Flowering date: Flowering might also be a whisker earlier than other varieties.

Veraison date: Median season veraison date.

Harvest: Historically around Australia Day weekend. In our other vineyards the Fiano has always been later than Vermentino, but in this planting where it's on R110 and the rest of the vineyard is on 140 Ruggeri, we see it coming off ahead of Vermentino.

Yield: Bunch is medium sized, of pyramidal form, with one developed wing, medium density. Small, elliptical berries; skins are gilded yellow with flecks of amber, thick, and slightly covered by bloom. Average bunch weight is 180 gm and average yield is 20 t/ha.

Winemaker: Bart van Olphen and Tennille Chalmers (Chalmers Project), Elizabeth Richardson (L'Enologa), Ray Nadeson (Lethbridge), Mike Hayes (Symphony Hill).

Winemaking notes: Maturity analysis – 1/3/17: Baumé 12.5, pH 3.45, titratable acidity 6.2. Can even make it from Mildura with no acid additions in the right season.

Garganega

Region/sub region: Murray Darling

Varietal: Garganega

Synonyms Grecanico and Malvasia de Manresa

Planting date: 2010

Rootstock or own roots: Grafted on 140 Ruggeri

Area under plant: 0.02 ha

Clone: VCR4

Soil type: Red sand and limestone

Slope: 0.04 m gradient (13 m fall over 300 m run). East–west orientation. – east facing.

Elevation: 60 m

Climate and weather: The Mildura Murray–Darling Region has a Mediterranean climate. Annual rainfall total is 290 mm falling evenly across the year (average 20–30 mm/month). The wettest year ever was 2011 at 657 mm; the driest ever was 1982 at 121 mm, 2006 at 123 mm close behind. The general trend is to drier conditions with 11 of the past 15 years being below average rainfall.

Skies are clear on average for 12 days/year; maximum temperatures average 23.6 °C/year (January mean max. 32.3 °C, June mean max 16 °C). Summer is hot with up to 10 days over 40 °C between December and March. The diurnal range is usually very good though, with 15 °C to 20 °C drops at night in summer, (e.g. daytime high 34 °C, night time low 14–19 °C). Winters are mild during the day (around 14 °C), with not too many days under 10 °C maximum. The cold, crisp nights often get below zero in the early hours of the morning.

Viticulturist info: Chalmers Family

Growing tips and tricks: Garganega in Italy has shown a preference for deep, rich soils. The vines require wide training systems (tendone and pergola) in cooler regions, while in the warmer regions spur pruning can be used. The variety is considered to be suitable for full mechanisation. The typical bunch is large, long,

loose and winged. It is highly productive and its vigour requires careful management. A late ripener, the berry skin can turn a light amber colour when approaching maturity. Not suited to very low cordon as the bunches can be very long, up to 350 mm. Very late budburst, up to two weeks after most whites. Extremely vigorous, downward growth habit. VSP recommended.

Growing do's and don'ts: Detailed above.

Pruning: Single wire bi-lateral cordon spur pruned to 11–12 × 2-bud spurs. Early pruning would bring forward budburst.

Canopy management: Large leaves, long, strong canes. Long internode spacing. Downward growth. VSP required. Needs at least three pairs of lifting wires.

Irrigation: Could benefit from less water to restrict vigour.

Fertiliser: Typical nutrient requirement.

Pest and disease issues: We have not had any problems with disease. Bunches are very open.

Budburst: Two weeks later than most whites. In our experience, it is not over productive as it has fewer bunches. Might benefit from cane pruning to increase productivity.

Flowering: Flowering date is a week or two later than the average white.

Veraison: Mid–late season.

Harvest: Mid–late season. Can achieve flavour ripeness at lower Baumé– from 10.5 Baumé. Relatively good acid retention.

Yield: Medium-sized berries, very large bunches, Average bunch weight 200–400 g.

Average yield 15 t/ha.

Winemaker: No winemaking from this block. See **Chalmers Heathcote notes on page 16.**

Malvasia Istriana

Region/sub region: Murray–Darling

Synonyms: (Malvazija Istarska, Malvasia del Carso, Malvasia Fruilano, Polijsakica Drnovk)

Planting date: 2010

Rootstock or own roots: Grafted on 140 Ruggeri

Area under plant: 0.02 ha

Clone: VCR 4

Soil type: red sand and limestone

Slope: 0.04 m gradient (13 m fall over 300 m run)

Elevation: 60 m above sea level

Climate and weather: The Mildura Murray–Darling Region has a Mediterranean climate. Annual rainfall

total is 290 mm falling evenly across the year (average 20–30 mm/month). The wettest year ever was 2011 at 657 mm; the driest ever was 1982 at 121 mm, 2006 at 123 mm close behind. The general trend is to drier conditions with 11 of the past 15 years being below average rainfall.

Skies are clear on average for 122 days/year; maximum temperatures average 23.6 °C/year (January mean max. 32.3 °C, June mean max 16 °C). Summer is hot with up to 10 days over 40 °C between December and March. The diurnal range is usually very good though, with 15 °C to 20 °C drops at night in summer, (e.g. daytime high 34 °C, night time low 14–19 °C). Winters are mild during the day (around 14 °C), with not too many days under 10 °C maximum. The cold, crisp nights often get below zero in the early hours of the morning.

Viticulturist: Chalmers Family

Growing tips and tricks: This vigorous variety produces good and reliable yields, but loses its aromatic nature if overcropped. It has a preference for well-drained soils and thus flourishes on river gravels and hillsides on lighter soils rather than clay. It suits wide-spaced vines; VSP can give good results, but only with well-balanced shoot thinning and summer pruning. Best to keep fruit zone open as it is susceptible to botrytis.

Pruning: Single wire bi-lateral cordon spur pruned to 11–12 × 2-bud spurs.

Canopy management: Growing tip is wide open, cottony, coloured green with yellowish edges. Leaf is medium–large, with pentagonal shape, 3-lobed or entire leaf. Has an open, V-shaped petiolar sinus, lateral superior sinuses are V–U-shaped, while inferior are rare. The profile is revolute. The upper and under surfaces are hairless. Very uniform growth habit, strong, large diameter canes.

Irrigation: Average.

Fertiliser: Average. As with all our varieties (organic composted cow manure + seaweed). Seaweed

fertigation and foliar application will strengthen resistance to disease.

Pest and disease issues: Botrytis susceptible. Seaweed helps thicken the skins, which are a little thin.

Budburst: Normal.

Flowering date: In line with most whites – mid season.

Veraison date: Mid season

Harvest: Mid season

Yield: Cluster is medium size, of cylindrical form with one small wing, semi-compact (from densely distributed berries to single berries with some visible pedicels). Berries are medium sized, spherical, with a waxy bloom and yellowish–green skin. Average bunch weight 150–250 g. Average yield 15–19 t/ha

Winemaker: No winemaking from this block. See **Chalmers Heathcote notes on page 26.**

Winemaking notes: Maturity at harvest 3/2/2016: Baumé 12.2, pH 3.79, titratable acidity 4.9 – not particularly good acid in a hot climate.

Aglianico

Region/sub region: Murray Darling, Mildura

Synonyms: Aglianica, Agnanico, Aglianico Nero, Aglianicuccia, Aglianichella Aglianico di Castellaneta, Aglianico di Puglia, Agliano, Agliatica, Agliatico, Ellenico, Ellanico, Fiano Rosso, Gagliano, Glianica, Ghiandara, Gnanico, Ghiannara, Ghiandara, Olivella di S. Cosmo, Spriema, Cascavoglia, Fresella, Cerasole, Ruopolo, Tringarulo, Uva dei cani, Uva di Castellaneta, Uva Nera

Planting date: 2010

Rootstock or own roots: Grafted on 140 Ruggeri

Area under plant: 0.15 ha

Clones: Taurasi VCR23, Vulture VCR11, Vulture MAT2, Taurasi MAT3

Soil type: red sand and limestone

Slope: 0.04 m gradient (13 m fall over 300 m run).

Elevation: 60 m

Climate and weather: The Mildura–Murray Darling Region has a Mediterranean climate. Annual rainfall total is 290 mm falling evenly across the year (average 20–30 mm/month).

The wettest year ever 2011 was 657 mm; the driest ever was 1982 with 121 mm; 2006 close behind at 123 mm.

The general trend is towards drier conditions with 11 of the last 15 years receiving below average rainfall. Skies are clear on average 122 days/year; maximum temperatures average 23.6 °C/year. (January mean max. 32.3 °C; June mean max 16 °C). Summer is hot

with up to 10 days over 40 °C between December and March. The diurnal range is usually very good throughout with 15–20 °C drops at night in summer. (e.g. daytime high 34 °C, night time low 14–19 °C). Winters are mild during the day (around 14 °C), not too many days under 10 °C maximum, and with cold, crisp nights where it often gets below zero in the early hours of the morning.

Viticulturist: Chalmers Family.

Growing tips and tricks: Budding early and ripening late, Aglianico is best suited to dry, warm climates. For this reason, it has flourished in southern Italy (and now in Australia), particularly in soils of volcanic origin but, in general, this variety can adapt to many types of soil. In Italy, in some viticultural zones (Taurasi DOCG and Aglianico del Vulture DOC), it can grow at 700–900 m altitude, but its late ripening nature and high natural acidity make it unsuitable to cold climates. It can have some problems with extreme high temperature heat waves, although we have not observed pronounced adverse effects as long as the vines are hydrated. It can be difficult to establish with thin canes, low vigour and needing extra nutrition when young to establish a strong architecture.

Growing do's and don'ts: Space spur positions out well while setting up. Set up with bi-lateral cordons. The variety benefits greatly from crop reduction through shoot thinning and bunch removal.

Pruning: single wire bi-lateral cordon at 1.5 m vine spacing, spur-pruned to 11–12 × 2-clear-bud spurs. Over productive when cane pruned.

Canopy management: Strong thin canes, downward growth habit. Medium leaf size. VSP wires help with keeping canopy open. Canopies are smaller than most.

Irrigation: Because it has low vigour and is very productive it will manage on a little less water than other varieties. Overwatering will produce large, tight bunches.

Fertiliser: Less in general, as it is naturally productive.

Pest and disease issues: The variety shows a high level of resistance to the most common pests and diseases, especially powdery mildew, although it is susceptible to botrytis and other bunch rot issues in humid and wet seasons.

Budburst: We have never seen a budburst problem. Budburst is normally in the last week of August or early September.

Flowering: Flowering dates are normal with no problems. Can be prone to hen and chicken, some clones more than others.

Veraison: Late. At least two weeks after most varieties. Extended period of veraison, with the tails of the bunches veraising much later.

Harvest: Very late, last fruit to pick on the vineyard. Usually late March to late April.

Yield: Medium berry size. Bunch weights average 220–280 g. Average yield for Chalmers Merbein 13–17 t/ha (thinned).

Winemaker: Bart van Olphen and Tennille Chalmers

(Chalmers Project) and we also sell grapes from this block to Ray Nadeson (Lethbridge Wines, Geelong), Elizabeth Richardson (L'Enologa, Mildura).

Winemaking notes: In 2016 Chalmers Project made individual vinifications of each clone. It was a particularly hot and early season where the Aglianico accumulated sugar and drop acidity, which was unusual. However, it is interesting to see the inter-clonal comparison:

VCR23: 7/3/16: Baumé 13.6, pH 3.84, TA 5.3

VCR11: 7/3/16: Baumé 13.7, pH 3.83, TA 5.3

MAT2: : 7/3/16: Baumé 13.8, pH 3.83, TA 5.4

MAT3: : 7/3/16: Baumé 13.8, pH 3.83, TA 5.6

Domestic or export market: Chalmers Project is very small batch and sold mostly to on-premise accounts in Melbourne and Sydney, wine bars and food venues with good wine staff on the floor.

Markets and marketing: Chalmers Project is a range that takes the results of in-house experimentation with the many Chalmers varieties and makes them publicly available. It is super small batch, with only 50 dozen made across the four clones. Savvy sommeliers are interested to see the difference a clone makes, so these wines were well received. Their RRP is \$32.

Refosco dal Peduncolo Rosso

Region/sub region: Murray–Darling

Vareital Refosco dal Peduncolo Rosso

Synonyms Rifosc dal Pecol Ross

Planting date: 2010

Rootstock or own roots: Grafted on 140 Ruggeri

Area under plant: 0.04 ha

Clones: VCR14

Soil type: Red sand and limestone

Slope: 0.04 m gradient (13 m fall over 300 m run).

Elevation: 60 m above sea level.

Climate and weather: The Mildura Murray–Darling Region has a Mediterranean climate. Annual rainfall total is 290 mm falling evenly across the year (average 20–30 mm per month). The wettest year ever 2011 was at 657 mm, the driest ever was 1982 at 121 mm, and 2006 was close behind at 123 mm. The general trend is to drier conditions with 11 of the past 15 years recording below average rainfall. Skies are clear on average for 122 days a year. The maximum temperatures average 23.6 °C/year (January mean max. 32.3 °C, June mean max 16 °C). Summer is hot with up to 10 days over 40 °C between December and March. The diurnal range is usually very good, with 15–20 °C drops at night in summer (e.g. daytime high 34 °C, night time low 14–19 °C). Winters are mild during the day (around 14 °C),

with not too many days with a maximum under 10 °C, and with cold, crisp nights where it often gets below zero in the early hours of the morning.

Viticulturist: Chalmers Family.

Growing tips and tricks: Refosco dal Peduncolo Rosso tends to do well in hillsides sites in infertile, calcareous–clay soils but it is relatively adaptable. It is a vigorous variety that prefers medium or wide training systems. It is thought to not be suited to total mechanisation. It is a late ripener in cooler areas. When it is ripe, the stalks redden, which is where it gets its name from (red peduncle). A very reliable, easy to manage variety.

Growing do's and don'ts: Do not overcrop it, as it can be difficult to finish it off.

Pruning: Single wire bi-lateral cordon spur pruned to 11–12 × 2-bud spurs. Lends itself to VSP as it is an upright-growing variety, with thinner than average canes.

Canopy management: Upright, but requiring lifting wires. Strong, evenly sized canes. The canopy is a little smaller than most. Canes can be long, but upright. As with most varieties, trimming at 400 mm above the top wire is beneficial to stop the canopy from falling over.

Irrigation: Average water requirement on our site, for a naturally well-balanced canopy.

Fertiliser: Typical. We have fertilised all mother blocks the same, for reasons of comparison. We use an annual

application of organic composted cow manure applied post harvest at 25 m³/ha to supply all gross nutrients. Throughout the year, soil conditioners (such as seaweed products) can also be applied by fertigation to increase carbon.

Pest and disease issues: No specific experience with disease.

Budburst: Mid-late.

Flowering date: Mid. Always sets well.

Veraison date: Average for reds, at our site. First or second week of January. Varies with the years.

Harvest date: Considered a late ripener in its native Friuli where it's cooler. It's earlier in our hot climate. One of the first reds ripening alongside the late whites.

Yield: Medium sized berries with average bunch weight 250–300 g, Average yield 13–15t/ha.

Winemaker: Dave Bowley from Vinteloper has made wine from this block.

Winemaking notes: No wine made except small experiments, but this is an example of maturity at harvest from 12 February 2015: Baumé 13.6, pH 3.63, titratable acidity 6.2

Tahbilk Wines

Marsanne

Marsanne is a traditional variety originating in the Northern Rhone and Hermitage regions of France. It is one of eight grape varieties permitted in the Cotes de Rhone appellation. It is grown in only four other countries outside France: Australia (200 ha), America (mostly California/Washington State – 38 ha), Italy (50 ha) and Switzerland (47 ha).

In the Rhone, Marsanne is often blended with Roussanne and occasionally Viognier. Tahbilk Wines holds the largest and oldest single holding of the variety in the world. Tahbilk's history with Marsanne can be traced back to the 1860s with the sourcing of White Hermitage cuttings from the St Hubert's Vineyard in Victoria's Yarra Valley. The grape was Marsanne and although none of these original plantings have survived, Tahbilk still produces Marsanne from plantings dating back to 1927.

Until 1998 the fruit from these 1927 vines formed part of the whole of Estate Marsanne blend. Tahbilk made a decision in 1998 to release the 1927 vine Marsanne separately and to pick them early to retain their higher natural acidity, with a view to produce a wine that would only begin to reveal its true self after six to seven years in the bottle. The 1998 vintage had its

inaugural release in 2006, which has since garnered an enviable reputation from performances in wine shows and from wine writers.

Tahbilk Marsanne has a dedicated worldwide following due to its marvellous character and complexity and ability to team wonderfully with food at all stages of development. When young, the nose and palate exhibit intense aromas and flavours of lemon, peach and tropical fruits with a dry mineral raciness; whilst with bottle age, these will become more complex and develop into the familiar honeysuckle fragrance and character traditionally associated with Marsanne.

Tahbilk Wines has really been the benchmark producer of Marsanne in Australia, regularly winning wine show awards across the country for this lovely white Rhone varietal. Since 1987, Tahbilk Wines Marsanne has won 155 gold medals in national and international wine shows. In 2016, Tahbilk Marsanne received a gold medal at the Sydney Royal Wine Show in CLASS: 15 Other White varietal wines (vintage 2015) for their 2015 Marsanne (95 points), a gold medal at the Sydney Royal Wine Show in CLASS: 18 White blends and/or other varietal wines, 2014 and older, for their 2010 1927 vines Marsanne (97 points), and a gold medal and trophy (Best Commercial Volume Wine) at the Australian Alternative Varieties Wine Show (AAVWS) for their 2016 Marsanne.

Marsanne

Region/sub region: Goulburn Valley/Nagambie Lakes

Synonyms: Avilleran, Ermitage, Valais (Switzerland), Grosse Roussette, Marsanne Blanche and Roussette de Saint-Peray (Robinson et al. 2012). It is commonly mistaken for Roussanne.

Planting date: Old block is planted in 1927, other blocks were planted in 1980, 1986, 1988 and 1996.

Rootstock or own roots: 1927 block is own roots, later plantings are on rootstock.

Area under vines: total under Marsanne is 26 ha, 1927 block is 6.7 ha.

Clone: Unknown – old.

Soil type: Sandy loam duplex soil (DR2.2 – soil classification).

Slope: On flat ground on old course of Goulburn River.

Elevation: 140 m above sea level.

Climate and weather: 600 mm rainfall from July to June in the year(s) of harvest – MJT 21.0–22.9o °C zone.

Viticulturist: Neil Larson (Production Manager).

Growing tips and tricks: Easy variety to grow, older vines have a great natural canopy balance. Vines seem to self-regulate well. Younger vines do have more vigour. Canopies are left to sprawl. Spur-pruned vines tend to produce a nice natural balance.

Pruning: Cane pruned for some time, now all spur pruned.

Canopy management: Spur pruned, sprawling canopy, little work on canopy management as vines have nice balance between vegetative growth and fruit yield. Robinson et al. (2012) state that Marsanne is vigorous, fertile and productive. Best pruned short and suited to poor, stony soils.

Irrigation: Drip irrigated.

Fertiliser: Petiole tests conducted annually and nutrition adjusted accordingly. Using own compost made from grape marc from winery and working well.

Pest and disease issues: no real issues from Tahbilk perspective, but Robinson et al. (2012) state that Marsanne is susceptible to powdery mildew, mites and botrytis bunch rots. Large bunches, but small berries.

Budburst: Mid season bud burst (Robinson et al. 2012 say that it is late-budding).

Harvest date: Mid-season ripening, typically harvested in early March, but will be mid-late March in 2017.

Yield: averages around 10 t/ha production across Tahbilk's 26 ha.

Tahbilk start picking the 1927 block at approximately 10.5 Baumé (8.3 g/L titratable acidity and pH 3.28), and use it also for a sparkling Marsanne at this early stage. Marsanne is picked over four different picking dates between 10.5–12.5 Baumé. Marsanne doesn't appear to change too much in flavour characteristics over this range of Baumés. When it is around 12–12.5 Baumé, they are adding typically 1.0–1.5 g/L tartaric acid. Each of the four harvests are fermented separately and then blended back to produce the required Estate blend.

Winemaker: Alan George and Neil Larson.

Winemaking notes: Picked over four harvest dates due to logistics of harvesting total 26 ha. Unwooded and bottled early.

Show results: 155 gold medals since 1987.

Domestic or export market: Mostly domestic sales, but serious exports to UK, USA and Sweden, and growing in China, in particular for Tahbilk Marsanne.

Markets and marketing: In 2016, 500 cases of 1927 vines Marsanne was made (recommended retail price \$45/bottle) and 18,000 cases of the standard estate Marsanne was produced (recommended retail price \$16.95/bottle).

Fighting Gully Road

Aglianico

Region/sub region: Alpine valleys

Planting date: winter 2009

Rootstock or own roots: R99 and R110

Area under plant: 1.1 ha

Clone: Vulture and Taurasi

Soil type: deep alluvial gravelly clay loam. Limed to pH 6.5.

Slope: negligible

Elevation: 230 m

Climate and weather: av rainfall 825 mm

Viticulturist: Mark Walpole

Growing tips and tricks: Staked bush vines on a 2.75 m quincunx system. Un-irrigated.

Growing do's and don'ts: Surprisingly sensitive to wind damage and sunburn. Blows to pieces in spring when shoots are approx. 45–60 cm long.

Pruning: Head trained to about 4–5 × 2 bud spurs. Considering 2 × 5 bud rods and replacement spurs.

Canopy management: Pendulous, brittle shoots. Should be supported in this sort of environment. Drooping shoots create laterals and small secondary bunches which need to be removed. Large number of (large) laterals makes pruning more expensive. Considering installing trellis to support shoots and open fruit to morning sun.

Irrigation requirement: Not sure. Current system of zero irrigation has been okay.

Fertiliser requirement: Only foliar P applied. Some foliar N early in the season. All other base nutrients applied pre-planting. Clover dominant sward is present.

Pest and disease issues: Seems sensitive to downy mildew. Very tight bunches sensitive to botrytis.

Budburst date: Mid to late season. I've had no frost problems.

Flowering dates: Flowering is late but seems to go through in a couple of days.

Veraison date: First week of February.

Harvest date: Late April (late March in 2016)

Yield and tonnage info: About 1 kg/vine on average. Bunches large – probably 250 g+. Thinned to one bunch per shoot.

Winemaker: Mark Walpole and Adrian Rodda

Winemaking notes: Baumé 13+ if we can; 3.4 pH; about 7.5–8.0 TA. Cool fermentation. Very gentle handling to avoid extraction of hard tannins. Lone elevage in thick-staved barrels.

Show results if any: Gold and trophy at 2016 AAVWS

Domestic or export market: Domestic sales only at this stage.

Markets and marketing: On premise and selected specialist retail outlets. Packed in imported Italian-made six-bottle wooden boxes.

De Bortoli King Valley

Sangiovese

Sangiovese is the most commonly grown red wine variety in Italy. It is best known as the variety behind Chianti, Tuscany's flagship wine. It is also grown throughout Central and Southern Italy. Sangiovese is a very large family; in fact this grapevine is characterised by a high intravarietal phenotypical variability that confirms the variety's multiclonal origin.

Sangiovese is very adaptable to different climates, but having an early budburst, it can be susceptible to spring frosts. It prefers less fertile soils and low-vigour sites. It is a relatively high yielding variety.

Summer pruning and bunches thinning is advisable in some years to avoid possible attacks of botrytis and to improve the quality. Vigorous and susceptible to powdery mildew and botrytis bunch rot. It is also susceptible to attacks of mites.

While soils with low fertility are ideal and help to control some of the variety's vigour, for the best quality, yields need to be kept in check as the vine is notably vigorous and prone to overproduction. Wine made from high-yielding vines tends to produce wines with light colour,

high acidity, and less alcohol, which are likely to oxidise prematurely due to a lower concentration of tannins and anthocyanins in this variety.

In 2016, at the Australian Alternative Varieties Wine Show (AAVWS) two Sangiovese wines won gold medals: the 2014 Fighting Gully Road Sangiovese from Beechworth and the 2014 DeBortoli Bella Riva Sangiovese from the King Valley. I wanted to highlight the DeBortoli Bella Riva Sangiovese from the King Valley here in this article because the King Valley region has been producing award winning Sangiovese and other varieties for many years.

The King Valley has a wonderful Italian heritage and produces several rustic Mediterranean wines, including Sangiovese, Pinot Grigio and Nebbiolo. The De Bortoli vineyard in King Valley covers more than 420 hectares, nestled along the cool, clear riverbank at the base of the Victorian snowfields. It was initially planted in 1994, but the 15.4 ha of Sangiovese wasn't planted until 1998 and 1999. Sangiovese is very well suited to the King Valley as well as more maritime climates. The vineyard was planted on sandstone and shale deposits washed down the river over time.

Sangiovese

Region/sub region: King Valley (2 km south of Moyhu)

Synonyms: Nielluccio, Sangiovese, Sangiovese Grosso, Sangiovese Piccolo, Brunello, Prugnolo Gentile, Morellino.

Planting date: 1998 and 1999

Rootstock or own roots: on rootstock

Area under plant: 15.4 ha

Clone: H6V9 and MAT 7

Soil type: sandy to clay loam soils

Slope: Flat vineyards

Elevation: 172 m above sea level

Climate and weather: MJT 19.0–20.9 °C zone.

Viticulturist: David Thwaites

Pruning: Cane pruned to two canes and arched.

Canopy management: East–west row orientation, with ballerina trellis to the northern side.

Irrigation: Drip irrigated.

Fertiliser: Petiole tested annually and fertiliser adjusted accordingly.

Pest and disease issues: Nothing different to other varieties in the King Valley.

Budburst: Earliest of red varieties in the King Valley.

Harvest date: Harvest is typically mid–late March in the King Valley.

Yield: 7–8 t/ha

Winemaker: Steve Webber (Yarra Valley).

Winemaking notes: Fruit is picked and fermented in 7 tonne and 15 tonne fermenters for 10–12 days. The wine is then pressed, settled and matured in used French oak casks for 12 months before bottling. Wine analysis: Alc 14.0%, pH 3.51, titratable acidity 6.4

Show results: Gold at 2016 AAVWS (2014 Sangiovese).

Domestic or export market: Around 9,000 case production, marketed both to domestic and international markets.

Markets and marketing: \$14.99 recommended retail price

Fighting Gully Road

Tempranillo

Tempranillo is a variety grown in many Spanish wine regions. It is grown in Portugal under the name Tinta Roriz or Aragonez (in Alentejo). In Spain, the Tempranillo wine grape variety is the backbone of the wines of the Rioja and the Ribera del Duero regions in northern and central Spain. In these regions, it is often blended with varieties such as Graciano and Grenache. In the 2000–2010 decade, Tempranillo planting increased worldwide by 140,000 hectares – the largest increase of any other grape variety (Anderson & Nanda, 2013).

The area of Australian vineyards planted to Tempranillo is increasing steadily. In 2000 only 41 hectares were planted, but by 2010 the area had grown to 476 hectares and over 300 producers (<http://www.vinodiversity.com/tempranillo-on-rise.html>). Tempranillo wine is being made in many Australian wine regions from the Granite Belt in Queensland to Beechworth in Victoria, to McLaren Vale and the Barossa in South Australia to Geographe and Margaret River in Western Australia.

Its name is the diminutive of the Spanish temprano, a reference to the fact that it ripens several weeks earlier than most Spanish red grapes. In Australia, it tends to produce thick skinned, medium–large sized bunches and berries. Yields can be highly variable from season to season, but ripens early. Tempranillo is sensitive to powdery mildew, eutypa dieback and rust mites. It is also a high vigour variety, with large leaves and needs to be matched with a low vigour potential site. Tempranillo is sensitive to wind and extreme drought. In 2016, at the Australian Alternative Varieties Wine Show (AAVWS) two Tempranillo wines won gold medals: the 2013 Fighting Gully Road Tempranillo from Beechworth, and the 2015 Mayford Wines Tempranillo from the Alpine Valleys.

I wanted to highlight the Fighting Gully Road Tempranillo here in this article because it has been a solid performer over the years at the AAVWS, and the owner, Mark Walpole, a real leader in trialling and adopting alternative varieties in Australia.



Figure 22. Mark Walpole.

Mark planted the first vines at the Fighting Gully Road vineyard site in 1997. The site rises up to the top of the Beechworth plateau escarpment above the Murrumbidgee Basin, to the south of Beechworth. The north- and west-facing lower slopes were planted to the red Bordeaux varieties; while the upper and east-facing slopes were planted to Pinot Noir. Over subsequent years, small areas have been re-worked to Tempranillo, Shiraz and Sangiovese. The Tempranillo was top worked to some Pinot Noir vines in 2008. The Tempranillo clone is unknown; cuttings were collected from Denman Estate in the Hunter Valley 1988, but not much is known about the history before that.

The Fighting Gully Road site is planted at elevations between 530 m and 580 m above sea level. The heat degree day summation averages around 1600; and it receives around 850 mm of rainfall a year. The vineyard is characterised by prevailing winds from the north-west. During the growing season these breezes have lower levels of humidity and ensure that the vines have restrained vegetative growth and remain disease free. Days are cool, but the slopes surrounding the vineyard ensure cold night air drains away, so only the very lowest reaches of the vineyard are susceptible to spring frost.

The Fighting Gully Road vineyard is located on the extreme southern edge of the Beechworth region on decomposed shales and mudstone. The soils are extremely well drained, allowing vineyard machinery access to under almost any circumstances.

The 2013 Tempranillo is a hand-picked and sorted, de-stemmed, lightly crushed, wild open ferment, 28 days on skins, matured in French oak (50% new) for 18 months. The wine shows a spicy, cherry bouquet that leads as straight as an arrow to the medium-bodied palate. Mark makes a Tempranillo style more traditionally reserve in style, thus he only releases after two years in the bottle.

Reference: Anderson, Kym & Nanda Aryal, 2013. *Which winegrape varieties are grown where?* Evidence from a new database, December 2013. Downloaded on 30 May 2017 (<https://www.adelaide.edu.au/wine-econ/databases/winegrapes-front-1213.pdf>).

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Tempranillo

Region/sub region: Beechworth

Synonyms: Aragonez, Cencibel, Tinto Fino, Tinto Madrid, Grenache de Logrono, Tinto de la Rioja, Tinto de toro, Jacivera, Tempranilla, Ull de Llebre, Tinta Roriz, Tinto de Santiago

Planting date: 1998

Rootstock or own roots: Mixture of 5C Teleki, 1103 Paulsen and SO4

Area under plant: 0.4 ha

Clone: Cuttings collected from Hunter Valley in 1988 from Denman Estate, which was removing this vineyard.

Soil type: Red sedimentary mudstone on the edge of the escarpment – with metamorphic granite

Elevation: 575 m

Climate and weather information: The heat degree day summation averages around 1600; and it receives around 850 mm rainfall a year. MJT 19.0–20.9 °C zone.

Viticulturist: Mark Walpole (aka alternative varieties guru).

Growing tips and tricks: An extremely vigorous variety with large leaves. Variable producer from year to year. The first node is often unproductive and thus more variable under spur pruning. Perhaps better suited to cane or arched cane pruning. Mark typically leaves two canes. Best suited to low potential site, with big bunches and big berries. Mark likes to leaf pluck the bunch zone on the eastern side of the canopy after flowering. Mark's row spacings are 2.75 × 1.8 m vine spacings in row.

Pruning: Cane pruned

Canopy management: See Growing tips and tricks.

Irrigation: Drip irrigated. Tempranillo is sensitive to water stress, maybe due to large leaves and total vine leaf area.

Fertiliser: Mark typically provides a foliar urea spray, but the vines don't appear to suffer any nutritional problems on his site.

Pest and disease issues: Tempranillo is very sensitive to powdery mildew and also to rust mites. Rust mites can cause young leaves to fall off. Mark notes that kangaroos love eating his fruit, maybe due to the higher pH and lower acidity, relative to other grape varieties on his property.

Budburst: Late bud burst on his site – late September to early October.

Harvest date: Variable harvest date based on variations in seasonal crop loads. Mark typically picks his Tempranillo on the same date as his Chardonnay.

Yield: Highly variable season to season. At the Beechworth site it can range from 2.5 t/ha to 9 t/ha, and on his Whorouly site 2.5 t/ha to 7.5 t/ha.

Winemaker: Mark Walpole

Winemaking notes: Typically pick at between 13.5–13.8 Baumé, pH can be very high >4, with very low acid (typically 3.5 g/L). Mark typically adds 4–5 g/L of tartaric acid at the crusher and another 4–5 g/L (yes up to 10 g/L total) to bring the pH back to around 3.7. Mark likes to make more of a Ribera style, in 50% new oak, barrel aged for 18 months, and two years in bottle before releasing.

Show results: Won several gold and silver medals – predominantly at the AAVWS.

Domestic or export market: All sold pretty quickly through the domestic market.

Markets and marketing: Price point is \$32/bottle; only 200 cases and all sells very quickly.

Acknowledgements (Mark Krstic)

I just want to acknowledge the producers of these alternative varieties for the time and generosity at such a busy time at the commencement of vintage 2017.

- Mark Walpole, Fighting Gully Road – discussed his Tempranillo vineyard on 1/3/2017
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- Peter Dry, Viticulture Consultant AWRI – comments and discussion on Nero d'Avola 2/3/2017.
- David Thwaites (Vineyard Manager – DeBortoli King Valley) for discussion on 2/3/2017.
- Syd Bradford and Bruce Chalmers for discussion on Heathcote Nero d'Avola production on 2/3/2017 and 3/3/2017 respectively.

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Western Australia

52 Stones

Arneis

Region/sub region: Geographe/Ferguson Valley

Planting date: 2012

Rootstock or own roots: Own roots

Area under plant: 1 ha

Clone: CVT CN 15

Soil type: Fairly fertile. Deep, fine, sandy loam over a clay loam. Clay-loam layer starts at about 0.5 m depth.

Slope: 10%, south-easterly aspect, with rows running east to west.

Elevation: Approximately 200 m.

Climate and weather information: Mediterranean. The elevation of the vineyard, plus its south-easterly aspect results in marked diurnal differences with quite cool night time temperatures and daytime summer temperatures 20 °C cooler than the coastal city of Bunbury to the west.

Viticulturist info: Jim Campbell Clause.

Growing tips and tricks: Keep fruit well protected from the sun, and keep well watered.

Pruning: Spur pruned and bilateral cordon, with 30 buds/vine.

Canopy management: VSP trained, hedge once in December. Vigorous growth habit, generally fairly uniform and upright. It bears well and shoot thinning is used to manage crop level rather than bunch thinning.

Irrigation requirement: Irrigated regularly throughout the growing season, and often, giving vines a little extra water rather than less.

Fertiliser requirement: Fairly standard fertiliser regime.

Pest and disease issues: Fairly disease free and seems

to have less problems with powdery mildew or botrytis than other white varieties.

Budburst: Early to middle September.

Flowering: No issues with flowering, sets well

Veraison date: Mid January

Harvest date: Mid to late February

Yield : Yield 10 t/ha; bunch number/vine 29.9; bunch weight 230 g. Note : The vines are still young, second crop and 2017 was an unusually year late and heavy. The first crop was 3.2 t/ha and bunch weight 200 g.

Winemaker: Paul Nelson.

Winemaking: Baumé 12.4, pH 3.25. The fruit is hand picked, whole-bunch pressed to stainless and also direct to barrel. In 2017, we made two styles. One is cold fermented (11–12 °C) in tank and the other is fermented in 1–3-year-old oak barrels. The tank portion is floated and clarified before inoculating with cultured yeasts and fermented to a residual sugar level of 5 g/L. The barrel-fermented portion is wild fermented to 4–5 Baumé, then inoculated with cultured yeasts to finish ferment through to dryness. Both batches will be left on lees for four months. The tank portion will have a minimal SO₂ addition and no stirring. One third of the barrel-fermented portion will be lees stirred with no SO₂ additions. The wine will be released in August 2017.

Show results: In 2016 Arneis was awarded silver at the regional Geographe wine show.

Domestic or export market: Domestic sales to Perth and Melbourne.

Markets and marketing: RRP is \$28.00. The wine is sold under the Paul Nelson label which is our alternative wine range and currently consists of the Arneis and a Grenache Mourvedre Tempranillo. It is bottled in the Saverglass Epic bottle and sold in six-packs. It is one of our most popular wines in the cellar door and sells very well in Perth in the on-premise environment, particularly by the glass.

Vineyard 28

Arneis

Region/sub region: Geographe/Harvey

Planting date: 2008

Rootstock or own roots: Own roots

Area under plant: 0.6 ha

Clone: CVT CN 15

Soil type: Bassendean sand overlying sandstone. Sandstone at about 2 m depth, loamy clay layer overlying sandstone, with water table at about 2.5 m depth.

Slope: Minimal, change in slope from highest point to lowest is 2–3 m.

Elevation: 10–20 m.

Climate and weather information: Mediterranean. Warm days generally in high 20 °Cs during summer with a westerly seabreeze. Approximately 5–6 k from the coast. Night time temperatures do cool down.

Experiences daytime temperatures during summer approximately 20 °C cooler than Perth.

Viticulturist: Mark Cumbers.

Growing tips and tricks: Not hard to grow, and loves sandy soil, conditions similar to its native Roero region in Italy. Trying to slow down Baumé increase when growing on sandy soils is a challenge, but is very important.

Growing do's and don'ts: Spur, not cane pruning; water consistently and often on sandy soils.

Pruning: Prefers spur to cane pruning. Have experimented with cane pruning with end results being erratic bud burst and strong apical dominance. Often sets two bunches per shoot.

Canopy management: Trellis height is 2.5 m. VSP trained, hedge once in December just before nets go on. Vigorous growth habit, generally fairly uniform growth. Shoot thin to manage crop load, and only drop damaged, sunburnt bunches. Canopy has a good even

spread, with leaf size not too big. Good strong canes, not as brittle as Nebbiolo.

Irrigation: Irrigated regularly throughout the growing season, 2–3 times a week, regime is 2.2 L/hr for two hours. Have found that if we ease off on irrigation, Baumé rapidly increases due to berry dehydration.

Fertiliser: Following budburst, Arnies does have a yellowy–green leaf colour for the first 2–3 weeks that disappears once the shoots lengthen. Fairly standard fertiliser regime, adding compost under vine due to sandy soils.

Pest and disease issues: Due to tight bunches, it does have a tendency to pop berries out of bunches following rain events post veraison. Otherwise, fairly disease free and seems to have less problems with powdery mildew and botrytis when compared with Sauvignon Blanc or Semillon.

Budburst date: Early to mid September

Flowering dates: Mid November

Veraison date: Early January

Harvest date: End of February

Yield: Bunch weights generally 150–200 g; 4–6 t/ha.

Winemaker: Mark Cumbers.

Winemaking: (Baumé, pH, titratable acidity and alcohol) – Baumé 12.5–13.0; pH 3.15–3.30; titratable acidity 7.0, alcohol 13%. A wine with texture and mouthfeel, and with aging potential.

Show results: Consistently does well at regional wine shows and WA wine shows with gold and silver medals.

Domestic or export market: Domestic only at present.

Markets and marketing: Use a standard-shaped bottle, with same label style as other wines in the Vineyard 28 range. The Arneis provides a point of difference in cellar door.

Tanglefoot

Vermentino

Region/sub region: Peel/Wandering

Planting date: 2010

Rootstock or own roots: Own roots

Area under plant: 0.3 hectares

Clone: H62–1LN

Soil type: Grey–red loam over gravel of variable depth.

Slope: Fairly flat.

Elevation: Approximately 297 m, on the edge of the Darling Range.

Climate and weather information: Mediterranean, hot, dry summers, with very cold winters.

Viticulturist: Rueben Steer

Growing tips and tricks: Spur prune and keep VSP trained. Prune reasonably hard. Vermentino can handle hot and dry conditions.

Pruning: Spur pruned.

Canopy management: VSP trained. Vigorous growth habit, generally fairly uniform and upright. Fairly strong shoots, certainly not brittle. An non-irrigated vineyard controls canopy vigour. Shoot thin to manage crop rather than using bunch thinning.

Irrigation requirement: Non-irrigated

Fertiliser requirement: Fairly standard fertiliser regime.

Pest and disease issues: Fairly disease free and seems to have less problems with powdery and botrytis than other white varieties.

Budburst: end of October

Flowering dates: Quite late, mid December

Veraison date: Early February

Harvest date: Mid February

Yield and tonnage info: Bunches are large, similar in size to Zinfandel and Muscat with big shoulders and long. Bunches also tightly packed. Typical yield of approximately 5 t/ha.

Winemaker: Rueben Steer

Winemaking notes: Baumé 11.0–12.0, typically being picked around 11.5; pH 3.2–3.3; Alcohol 12.5–13.0%.

Show results if any: Consistently wins bronze medals at local regional shows.

Domestic or export market: Domestic only.

Market and marketing strategies: Do nothing special in regards to packaging and promoting Vermentino.

Hopping Stones

Vermentino

Region/sub region: Margaret River/Yallingup

Planting date: 2006

Rootstock or own roots: Majority on own roots, some on Schwarzmann

Area under plant: 0.54 hectares.

Clone: H62–1LN

Soil type: Gravelly ironstone loam of variable depth.

Slope: Slightly undulating, on top of a hill. N–S row orientation.

Elevation: Approximately 150 m

Climate and weather information: Mediterranean. Fairly exposed and windy. Wind from the south to south-easterly, with cool nights during summer.

Viticulturist: Lynette and Phil Foster.

Growing tips and tricks: Cane prune. Use minimal water, and apply water as needed. Crop levels can be high. Generally don't fruit thin, apart from thinning out greener bunches. Manage canopy and fruit exposure by having a mix of shaded and exposed bunches.

Pruning: Cane pruned, with 18–20 buds per vine

Canopy management: VSP trained, hedge once in December. Vigorous growth habit, generally fairly uniform and upright. Fairly strong shoots, certainly not brittle.

Irrigation requirement: Irrigate less during growing season compared with other varieties, as too much water results in high vigour.

Fertiliser requirement: Fairly standard fertiliser regime.

Pest and disease issues: Fairly disease free and seems to have less problems with powdery mildew and botrytis than other white varieties.

Budburst date (are there any issues at budburst) – mid

September

Flowering dates: Third week of November.

Veraison date: Early February

Harvest date: End of February

Yield and tonnage info: Typical yield of 12–18 t/ha. Large bunches.

Winemaker info: Mark Warren

Winemaking notes: Baumé 9.9, pH 3.10, titratable acidity 7.3 at harvest. At bottling, alcohol 10.1% and titratable acidity 6.3g/L. All stainless steel fermented.

Show results: Don't generally enter shows.

Domestic or export market: Domestic only (cellar door, Perth, Sydney and Melbourne).

Market and marketing information: Labelled under the Marq Wines brand. The price point \$25.00, and bottled into a Riesling bottle as the style made is reminiscent of Riesling.

Ferngrove Estate

Malbec

Region/sub region: Great Southern/Frankland River

Planting date: 1998

Rootstock or own roots: Own roots

Area under plant: 3.56 hectares

Clones: Unknown

Soil type: Shallow gravel over red, friable clay.

Slope: Row orientation is north–south

Elevation: Approximately 230 m

Climate and weather information: Mediterranean in terms of dominant winter–spring rainfall, but with greater continentality. Cool climate. 610 mm average annual rainfall; 215 mm average Oct–April. Hot summers, cool nights.

Viticulturist: Chris Zur

Growing tips and tricks: Seems to be a very adaptable variety that performs in both warm and cool seasons. Don't start irrigating too late, as canopy size can suffer.

Pruning: Spur

Canopy management: VSP trained. Produces a moderately vigorous canopy.

Irrigation requirement: Typical irrigation requirements, but don't delay irrigation.

Fertiliser requirement: Fairly standard fertiliser regime. We petiole test annually and use these results as a reference for our nutritional requirements.

Pest and disease issues: Fairly disease free. Wildlife love it. Net it if you have bird or kangaroo pressure.

Budburst date: Late September

Flowering dates: Mid–late November. Can be susceptible to poor fruit set.

Veraison date: Mid January

Harvest date: Early to mid April.

Yield and tonnage: Long-term average 7.5 t/ha; average bunch weights approximately 110 g.

Winemaker: Marco Pinares and Marelize Russouw

Winemaking notes: Baumé 14 ; pH 3.45–3.55; titratable acidity 5.8–6.0.

Show results: Consistent 94 points and above from wine writers.

Domestic or export market: Both

Markets and marketing: Versatility of the variety. Products made include a sparkling Malbec, a Malbec Cabernet Rose, and premium and super-premium straight varietal wines.



Figure 23. A bee sitting on Malbec bunches. Picture courtesy of Ferngrove 2017[®].

Aravina Estate

Tempranillo

Region/sub region: Margaret River/Yallingup

Planting date: 2014

Rootstock or own roots: Own roots

Area under plant: 1.0 hectares

Clones: Block is a mix of five clones: Pingus Clone 261 (Tinta del Pais CL-261); Pingus 306 (Tinta de Toro CL-306m); Pingus Clone 98 (Tinta del Pais CL-98); Pingus Clone 32 (Tinta del Pais CL-320); and Pingus Clone 326 (Tinta de Toro CL-326).

Soil type: Gravelly ironstone loam of variable depth, over clay. Clay at depth of 1–1.5 m. Free-draining soil on top of a ridge.

Slope: Sloping block at highest point in vineyard.

Elevation: Approximately 140 m

Climate and weather information: Mediterranean. Wind from the south to south-east, with cool nights during summer.

Viticulturist: Ryan Gibbs

Growing tips and tricks: Control vigour early, and be mindful of bud numbers left at pruning. Needs constant water to keep canopy happy and vibrant. Water frequently, using small drinks and often.

Pruning: All spur pruned at the moment, but might cane prune one or more clones depending on the wine style being made.

Canopy management: VSP trained. Each clone has a different growth habit, generally fairly uniform and upright and vigorous growers. All have a tendency to drop basal leaves if water stressed. Berry size, bunch structure and bunch size varies from clone to clone. We do some bunch thinning pre veraison of 'ratty', elongated and small bunches, followed up by some bunch thinning post veraison of green bunches.

Irrigation: Water often to maintain canopy health.

Fertiliser requirement: Fairly standard fertiliser regime.

Pest and disease issues: Fairly disease free.

Budburst date: Mid September

Flowering dates: Early December

Veraison date: Mid January

Harvest date: Varies. For rosés – mid March. For table wines – early April.

Yield and tonnage: Typical yield of 10–12 t/ha.

Winemaker: Ryan Agiss

Winemaking notes: For rosés – Baumé 12–12.5; pH 3.5–3.8; titratable acidity 7–8. Table Wines – Baumé 14–14.5; p 3.6–3.8; titratable acidity 5–6.5.

Markets and marketing: New products



Figure 24. Tempranillo clones from left to right are: 326 del Toro, medium vigour and yield; 32 del Pais, higher vigour and moderate yields; 98 del Pais, medium yield and vigour; 261 del Toro, high vigour and medium yield; 306 del Toro, lower yield higher vigour. Picture courtesy of Ryan Agiss, Aravina Estate.

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Research

Practical management of grapevine trunk diseases

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Grapevine trunk diseases

Eutypa dieback (ED) and Botryosphaeria dieback (BD) are major trunk diseases worldwide, causing significant yield reduction and threatening the sustainability of Australian vineyards. Fungal species of the Diatrypaceae and Botryosphaeriaceae infect vines primarily through pruning wounds and colonise wood, causing dieback and death.

Trunk diseases rank in the top five priority diseases of the Australian winegrape industry, and are becoming more prevalent as vineyards mature.



Figure 25. Vine with trunk canker.

Research led by the South Australian Research and Development Institute (SARDI), in collaboration with the National Wine and Grape Industry Centre (NWGIC) with funding from Wine Australia and industry, has focused on developing practical management strategies for grapevine trunk diseases such as eutypa and botryosphaeria dieback. The aim of this project is

to determine the extent and distribution of ED and BD pathogens, and develop efficient methods of pruning wound management and control of these diseases



Figure 26. (a and b) Wedge and central staining in the trunk wood caused by Eutypa and Botryosphaeria dieback pathogens.

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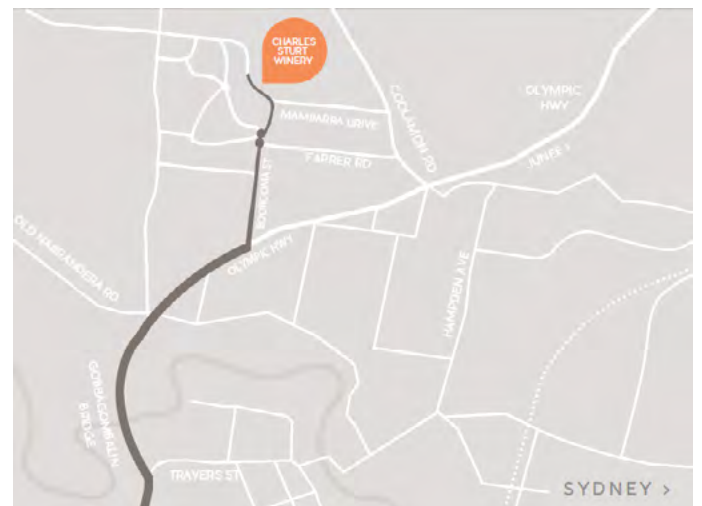
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Research highlights

Inoculum dispersal throughout the pruning season

A three-year study investigated the spore dispersal patterns of ED and BD pathogens using Burkard spore traps. DNA-based molecular tools were developed to detect inoculum from spore trap tapes, and showed that spore dispersal patterns vary in regions with different climates. Rainfall was confirmed as the primary factor that triggers the release of spores, with as little as 0.2 mm of rain initiating spore release. Since wine regions in Australia are widely distributed with highly diverse climates, the comprehensive spore trapping in four major wine regions in this study provides beneficial information on the spore release patterns of ED and BD pathogens in these regions. Once the data from this and current research are analysed, the critical times of the year when ED and BD spores are abundant in vineyards will be determined, which will help growers make decisions on the best time to prune their vines to avoid infection or to apply pruning wound protectants.



Figure 27. Burkard spore trap.

Duration of pruning wound susceptibility

Vineyard trials in McLaren Vale, SA and Wagga Wagga, NSW have provided new information on the timing and duration of wound susceptibility to ED and BD pathogens. Results revealed that wounds were highly susceptible for two weeks following pruning, after which the susceptibility often decreased sharply, at varying rates for each of the pathogens evaluated and between years.

Detached cane assays conducted in the greenhouse showed that wound susceptibility did not differ between cultivars commonly grown in Australia. These results suggest that, at these trial locations, there might be little advantage in choosing one pruning time over another in terms of minimising the risk of infection by trunk disease pathogens. However, results highlight the importance of protecting pruning wounds for at least two weeks post-pruning.

Further research is required to evaluate ED and BD pathogens in other regions to provide localised recommendations for Australia's diverse range of climates.



Figure 28. Exposed spore tape on the drum, used for trapping spores in vineyards.

Optimise timing of wound protection treatments

Field trials were established to assess fungicide application timing relative to pruning for controlling ED and BD.

The results indicate that the fungicides pyraclostrobin, fluazinam and tebuconazole can control ED and BD when wounds are treated up to six days after infection, and will continue to provide control of both pathogens for 1–2 weeks. Therefore, if applied six days post-pruning, a single application could provide up to three weeks of wound protection.

This is likely to improve logistics for grape-growers and, together with effective fungicide application with commercial sprayers, will encourage greater adoption of wound protection strategies to control grapevine trunk diseases.

Remedial surgery to control botryosphaeria dieback

Remedial surgery, which has previously been shown to control ED, was evaluated as a curative control strategy for grapevines with BD.

Three vineyards (own-rooted and grafted) were assessed for visual symptoms, followed by cutting trunks at different heights and recording the severity of cross-sectional staining in remaining stumps. Wounds were painted and then vines were monitored for water-shoot production and visually assessed for disease severity.

The vines recovered and were able to produce new shoots after remedial surgery, although grafted vines tended to produce shoots from the rootstock rather than the scion. The severity of dieback in untreated vines increased by 5–10% each year which, with no intervention, would eventually lead to vine death.



Figure 29. Trunk being cut at mid-point between ground and crown.

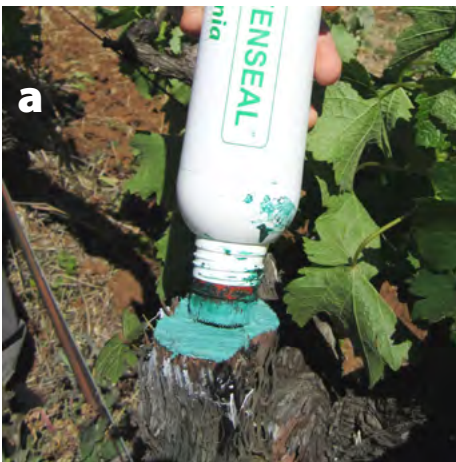


Figure 30. (a and b) Cut trunks are sealed with pruning wound dressing following remedial surgery.

To date, no symptoms have been recorded on vines treated with remedial surgery, but vines will continue to be monitored to determine the strategy's long-term success. Future research will investigate remedial surgery for grafted vines and evaluate novel methods of water shoot induction to try and improve the technique's success.

Identify tolerant or resistant germplasm

The SARDI germplasm collection, located in the Barossa Valley, was visually assessed for symptoms of trunk disease. Cultivars with low disease severity were selected for evaluation of disease progression.

Results showed that cultivar susceptibility to dieback varies, with some germplasm identified as having tolerance potential. Preliminary evidence of reduced susceptibility in some clones and rootstocks warrants further investigation.

Impact of drought and regulated irrigation

Water deficit trials were established in the Riverland and Barossa Valley regions of South Australia in 2011 and 2008, respectively. The trial results showed increased water stress did not increase the susceptibility of canes to colonisation by trunk disease pathogens, suggesting that drought and deficit irrigation practices are not likely to contribute to an increased prevalence of grapevine trunk disease in Australian vineyards.

Summary

These outcomes provide new information that is leading to improved strategies being adopted for managing trunk diseases, which will increase vineyard longevity in Australia's diverse climates.

Current research aims to develop new and improved management strategies to prevent and control grapevine trunk diseases. It will also contribute to improving vineyard performance by identifying clones and rootstocks with tolerance to trunk disease and provide new knowledge on the role of vine propagation in disease spread. A better understanding of the epidemiology of trunk disease pathogens will allow targeted control methods, thereby reducing vineyard inputs.

Improved application methods will optimise chemical fungicides use to control trunk diseases. Biological and alternative wound protectants will help minimise adverse effects on the environment.

Management of Botrytis in cool climates

Darren Fahey, Department of Primary Industries (DPI), NSW

Take home messages

- Adopt holistic approaches to Botrytis and non-Botrytis bunch rot control as numerous management options may be required within the one season.
- Ensure product compatibility when selecting and using biological inputs.
- Coverage is paramount, ensure all spray equipment is set up correctly to cover entire flower and bunch structures.
- Leaf removal of the bunch zone offers potential to assist in drying bunches from surface wetness. This measure also allows for greater spray coverage of flowers and bunches.

Introduction

Botrytis and non-Botrytis bunch rots are weather-driven diseases known to cause significant loss of grape yield and wine quality. Temperature and the duration of surface wetness are key environmental factors that promote bunch rot development.

In the Canberra and Tumbarumba wine regions, weather-driven disease events occur with some severity across vintages. Anecdotal reports indicate commercially produced *Trichoderma* species used on different grape varieties have been effective in the control of Botrytis. However, statistically analysed trials on the efficacy of *Trichoderma* and other biological products is not well reported. Therefore, evidence to support the use of bio-fungicides to manage Botrytis and non-Botrytis in cooler NSW wine regions is required.

Two commercially available biological *Trichoderma* products supplied by Organic Crop Protectants (<http://ocp.com.au/>) were used in this trial; Colonizer® *T koningii* (Td67) and Antagoniser® *T harzianum* (Td81b),

an unregistered *Bacillus subtilis* strain supplied by Bayer (<http://bayercropscience.com.au/cs/default.asp>) was also used under research licensing.

These were compared with current grower's practice utilising chemistry, leaf removal at 80% capfall, a mixed treatment consisting of a combination of current practice chemistry and *B. subtilis* and finally a control treatment without any Botrytis fungicide application.

Application strategy

In 2015/16 an experimental trial was conducted across four separate vineyards, two sites were located at Murrumbateman (Sites 1 & 2) on Riesling and two further sites at Tumbarumba (Sites 3 & 4) on Chardonnay vines to assess 6 treatments (Table 1) which were replicated 5 times across panels of 9 vines in each vineyard with a total of 45 vines assessed for each treatment. The treatments were arranged in a randomised complete block design.

Timing of spray applications followed current farmer's practice occurring between 20–80% capfall. This timing was also consistent with the manufacturer's recommendation for the application of biological products, with all products assessed as compatible according to the manufacturer. Leaf removal was carried out at 80% capfall (EL 25) with water applied to this and control treatments at the same time as other treatments, to ensure all treatments received the same amount of applied water. Applications of products to all treatments were carried out on the same day using individual 15L calibrated knapsack spray equipment for each separate product. All products were applied at manufacturer's application and water rates per hectare.

No other spraying was conducted across the trial sites except for routine copper and sulphur sprays conducted by landholders to control powdery and downy mildews.

| Treatment | Product/Actives | Date applied Tumbarumba | Date applied Canberra |
|------------------------------|---|---|--|
| T1 = Control | Water | 11/11/15, 23/11/15, 6/1/16, 20/1/16 | 20/11/15, 1/12/15, 19/1/16, 3/2/16 |
| T2 = Control + Leaf Removal* | Water | 11/11/15, 23/11/15, 6/1/16, 20/1/16 | 20/11/15, 1/12/15, 19/1/16, 3/2/16 |
| T3 = Current Practice | Scala® pyrimethanil 400 g/L (Group I) Teldor® fenhexamid 500 g/L (Group 17) Rovral® iprodione 250 g/L (Group B) | 11/11/15 23/11/15 6/1/16, 20/1/16 | 20/11/15 1/12/15 19/1/16, 3/2/16 |
| T4 = Trichoderma | Colonizer® <i>T. koningii</i> (Td67) 1011 cfu/gram | 11/11/15, 23/11/15 | 20/11/15, 1/12/15 |
| | Antagoniser® <i>T. harzianum</i> (Td81b) 1011 cfu/gram | 6/1/16, 20/1/16 | 19/1/16, 3/2/16 |
| T5 = Bacillus | Unregistered - <i>B.subtilis</i> 262g/kg | 11/11/15, 23/11/15, 6/1/16, 20/1/16 | 20/11/15, 1/12/15, 19/1/16, 3/2/16 |
| T6 = Mixed | Scala® Teldor® Fenhexamid 500 g/L Unregistered - <i>B.subtilis</i> 262g/kg | 11/11/15 23/11/15 6/1/16, 20/1/16 | 20/11/15 1/12/15 19/1/16, 3/2/16 |

Table 1: Treatments, chemicals and dates applied at Tumbarumba and Canberra.

Growth Stages @ Tumbarumba : 11/11/15 - 20% Flowering (EL 21), 23/11/15 - 80% Cap-fall (EL 25), 6/1/16 - Veraison (EL35), 20/1/16 - Mid Veraison (EL 37), * Leaf removal conducted @ (EL25) 80% Cap-fall.

Growth Stages @ Canberra : 20/11/15 - 20% Flowering (EL 21), 1/12/15 - 80% Cap-fall (EL 25), 19/1/16 - Veraison (EL35), 3/2/16 - Mid Veraison (EL 37), * Leaf removal conducted @ (EL25) 80% Cap-fall.

Outcomes

Rainfall throughout the summer of 2015/16 vintage posed a medium risk across both regions albeit a lower risk against the previous vintage of 2014-15 for Botrytis and non-Botrytis bunch rots. Tumbarumba rainfall for Jan 2016 was more than twice the long term mean for January (130yrs BOM data). Figures provided in left hand columns of Table 2. Sourced from the NSW DPI weather station network which can be accessed using the following link: https://www.awri.com.au/industry_support/weather-nsw/

| Rainfall (mm) 2015/16 | Canberra (Four Winds) | BOM (station 070358) | Tumbarumba (Courabyra) | BOM (station 072043) |
|-----------------------|-----------------------|----------------------|------------------------|----------------------|
| December | 25 | 19.6 | 44.8 | 43.2 |
| January | 78.2 | 68.5 | 137.8 | 113.2 |
| February | 35.6 | 11.0 | 32.8 | 19.4 |

Table 2: Seasonal rainfall figures in millimetres (mm) for Canberra and Tumbarumba 2015/16.

Just prior to commercial harvest (February 10, 2015) the level of incidence and severity of Botrytis infection on bunches was estimated from 20 randomly selected bunches per replicate. The Botrytis assessment was conducted with the aid of a standard area diagram (Evans et al. 2012). Non-Botrytis rots were evident across the trial however this data is not included in the following results.

Looking at results from the Tumbarumba site 3 (Figure 1), Botrytis was present in all treatments with Botrytis incidence and severity statistically significantly higher

Site 3: Incident and Severity

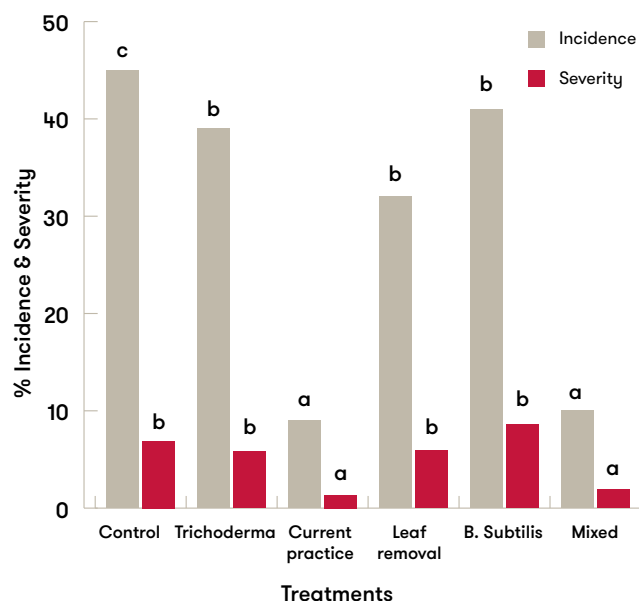


Figure 1: Incidence and Severity of Botrytis on February 9, 2016 in an experimental Site 3 at Tumbarumba. Different letters indicate significantly different values at P<0.01.

in both biological, leaf removal and control treatments compared to the current practice and mixed treatments which resulted in the lowest incidence and severity levels. This result was mirrored at Site 4 (results not shown) where the current practice and mixed treatments again resulted in statistically significant lower incident and severity to all other treatments.

Trial results from both Canberra sites contrasted those from Tumbarumba, with higher incidence of Botrytis present in all treatments (Figure 2), albeit no significant difference between any treatments at both sites. The

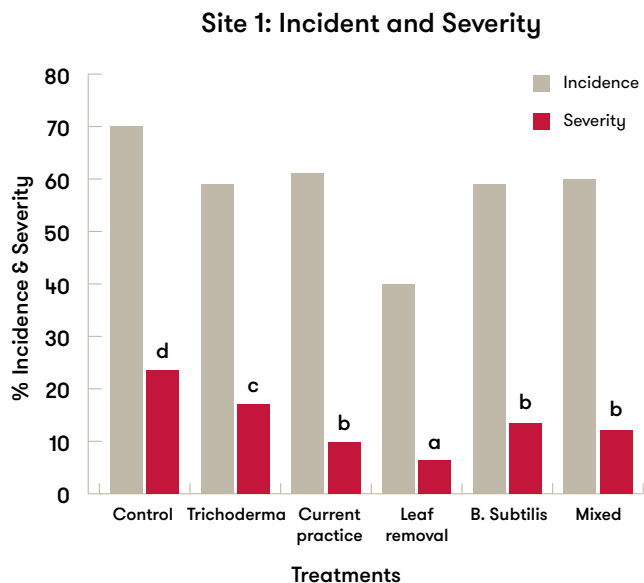


Figure 2: Incidence & Severity of Botrytis on February 22, 2016 in an experimental site at Site 1 Canberra. Different letters indicate significantly different values at P<0.01.

severity of Botrytis was only significantly lower for the leaf removal treatment at Site 1.

Dilution plating on Botrytis Selective Medium showed that no *Botrytis cinerea* grew from any of the inflorescences collected from the Canberra and Tumbarumba vineyards just prior to treatment application (Stage EL23, 20–50% cap fall). This indicates that infection from previous seasons did not result in endophytic *B. cinerea* colonization of the inflorescences. It also shows that at this flowering stage the inflorescences had not been infected by airborne spores from the vineyard environment. It is likely then, that the Botrytis bunch rots at harvest were caused by infection later in the season.



Figure 3: Example of Botrytis found on Chardonnay bunches during incidence and severity scoring at site 3 Tumbarumba.



Figure 4: Leaf removal of the bunchzone in Riesling conducted at site 1 Canberra.

Discussion

The conditions experienced across Canberra and Tumbarumba trial sites were ideal for the development of Botrytis (Figure 3) and non-Botrytis bunch rots in all treatments.

Current practice and mixed treatments undertaken at the Tumbarumba sites proved the most beneficial treatments however, when *B.subtilis* were applied as a single treatment it did not decrease bunch rot incidence or severity therefore highlighting the importance and appropriate use of early flowering fungicide spray applications. The Bayer biological product was applied at the low end of the permit rate at 100g/ha, with the permit range between 100g–5kg/ha, after consultation with Bayer representatives a rate of 250g/100L was suggested as results from other viticultural trials have proven to be beneficial.

Natural isolates of *Trichoderma* resulted from incubated inflorescences at three of the four trial sites and natural *Bacillus* isolated from bunches at harvest at both Canberra sites, no bunches were analysed from the Tumbarumba sites. There was no relationship between the *Bacillus subtilis* and *Trichoderma* applied with the commercial product during the season and the *B. subtilis* and *Trichoderma* isolated at harvest, except at site 1 Canberra. Indicating that the commercial product did not survive the conditions experienced throughout the season and further applications of both biologicals may have been required to maintain product efficacy.

Leaf removal at bunch closure to open up the canopy in the bunchzone demonstrated a trend across all sites at

reducing incidence and severity albeit only resulting in a statistical significant difference of lowering severity at site 1 (Figure 4) at Canberra against all other treatments. Given water was applied to bunches in these treatments when any other treatment application was undertaken further investigation of leaf removal is warranted, without the application of water and introduction of leaf removal at other growth stages may provide greater benefit.

Acknowledgements

This work was funded through the Wine Australia Regional Program. The following people contributed to the project: Adrian Englefield and Melanie Weckert (NSW DPI and NWGIC). Thanks to Mal Barclay, Cathy Gairn, Wayne and Jennie Fischer and Neil and Fiona Wholohan for providing vineyard sites and assistance in the trial. James Gardner (Organic Crop Protectants) and Hugh Armstrong (Bayer) are acknowledged for supplying products used in this demonstration.

Further Information

The factsheets available on the Wine Australia website: www.wineaustralia.com

‘Botrytis Management’ provides more information on integrated measures for control of Botrytis bunch rot.

‘Non-Botrytis bunch rots: Questions and Answers’ provides more information on integrated measures for control of non-Botrytis bunch rot.

‘Alternative bunch rot control – Experimental trial’ provides more information for control of Botrytis bunch rot in warmer humid environments.

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Mid row crops for vineyards

Darren Fahey, Department of Primary Industries (DPI), NSW

Take home messages

- Crop residues of legume shoots and roots still provide nitrogen during breakdown.
- Inoculate legume seed at sowing with the recommended strain of rhizobia to maximise N fixation.
- Sowing time, sowing rate, seed quality, germination rate and sowing depth are crucial factors impacting final outcome.
- Discuss appropriate and suitable crop species and varietal selection with your local agronomist, consultant and/or seed supply company.
- Vineyard operators should always practice crop rotation to limit pest and disease pressure.

Introduction

Various winter crops such as brassicas, legumes and pulses are usual suspects in vegetable and broadacre cropping however rarely seen in vineyard production systems. Demonstration trials to investigate their effectiveness to establish without applied irrigation and their ability to capture free nitrogen and generate



Figure 1: Cultivation of mid rows in the Hunter Valley

biomass as a food source to drive healthy biologically active soils in NSW/ACT vineyards was undertaken on vineyard sites in the Hunter Valley and Orange.



Figure 2: Permanent mid-rows in Orange Chardonnay

| Variety | Sowing rate (kg/Ha) | Costs of seed (\$/Ha) |
|--------------------------------|---------------------|-----------------------|
| Faba – Warda | 180 | \$210.00 |
| Field Peas – Morgan | 100 | \$233.00 |
| Fescue – Hummer | 10–20 | \$360.00 |
| Lupins – Luxor | 80–100 | \$205.00 |
| Crimson clover – Soweasy | 8–10 | \$69.00 |
| Forage Brassica – Winfred Rape | 3–5 | \$123.00 |

Table 1: Seed varieties, sowing rates and costs per hectare

| Month | Avg. Air Temp (°C) | | Avg. Soil Temp (°C) 10cm | | Rainfall mm | |
|-----------|--------------------|--------|--------------------------|--------|-------------|--------|
| | Hunter | Orange | Hunter | Orange | Hunter | Orange |
| May | 15.1 | 11 | 17.1 | 12.8 | 20.6 | 122.8 |
| June | 12.1 | 7.6 | 13.5 | 9.5 | 55.2 | 266.8 |
| July | 11.8 | 7.2 | 12.3 | 8.7 | 41.2 | 172.6 |
| August | 11.5 | 7.8 | 13.1 | 9.3 | 36.2 | 90 |
| September | 15 | 9.7 | 15.9 | 11.4 | 66.2 | 185.6 |
| October | 16.9 | 11.9 | 16.7 | 13 | 59.6 | 71.2 |

Table 2: Onsite weather station data showing average air temperature, average soil temperature and rainfall totals for trial period May 2016 to October 2016

| Variety | Fresh Wt (T/Ha) | | Dry Matter Yield (T/Ha) | | N2 fixed (kg/Ha) | |
|-----------------|-----------------|--------|-------------------------|--------|------------------|--------|
| | Hunter | Orange | Hunter | Orange | Hunter | Orange |
| Faba Beans | 53 | 65 | 6.36 | 10.4 | 100 | 170 |
| Field Peas | 42 | 86 | 7.56 | 13.7 | 120 | 200 |
| Crimson Clover | | 51 | | 8.1 | | 120 |
| Forage Brassica | 36 | | 5.04 | | | |

Table 3: Fresh weight, dry matter yield and fixed nitrogen data of the three best performing crops at each site

Note: N fixation assumptions provided via <http://www.soilquality.org.au/factsheets/legumes-and-nitrogen-fixation-south-australia>

In the Hunter Valley there is a tendency to cultivate alternate mid row areas within vineyard blocks each vintage while the adjacent undisturbed row allows tractor access (Figure 1), this is a long held practice aimed at eliminating competition from weeds and breaking up heavier soils to allow water to infiltrate more readily in wetter years. However this practice does have drawbacks such as loss of carbon to the atmosphere, disturbance and loss of soil flora and fauna which may result in collapsed soil structure and possible sodicity issues. Whereas in Orange permanent mid row swards (Figure 2) are typical with either selected grass species and/or mixed naturally grasses and weed species, this situation is utilised to allow grasses to uptake excess rainfall and allow for tractor use at all times, benefits of this practice are retention of soil carbon, biology and maintenance of soil structure.

Methods

Six winter crop species (Table 1), were dry sown in late May of 2016 accompanied with a starter fertiliser CROPLIFT®15 and applied as a band at recommended rate into the top 5cm range along with the inoculated seed at placement into fully cultivated soil at the Hunter Valley site and direct drilled into existing soil at the Orange site. Average soil temperature at both sites remained above that of air temperature for the entire trial period and significant rainfall followed planting across both regions over the winter with record rainfall occurring in the Orange region during the trial period (Table 2).



Figure 3: Faba beans in the Hunter Valley



Figure 4: Field peas reaching great heights in Orange

Outcomes

The timing of sowing in conjunction with good rainfall resulted in excellent crop establishment for all varieties except for Lupins and Fescue. Biomass cuts were undertaken by cutting complete plant structures at the soil surface using garden shear's with the area cut measured using a one by one metre quad. Data was collected from the three best performing crops at each site with the averaged fresh weight, dry matter yield and nitrogen fixation figures provided in Table 3. The crops measured at both sites fully covered the entire mid row areas to the undervine area with tall crop heights achieved at both sites with Faba beans (Figure 3) reaching over 110cm at the Hunter Valley site and Field peas exceeding the height of the cordon wire at the Orange site (Figure 4).

Discussion

This demonstration trial was successful in achieving the aim of producing biomass and N fixation to promote biologically active soils across two separate wine growing regions of Greater NSW/ACT assisted greatly by record rainfalls across several months especially at the Orange site.

However, not all crops succeeded toward achieving the goal. The Lupin crops failed to establish across both regions and this was a fact of being sown later than the suggested recommendation of early April highlighting the importance of sowing times. The Fescue crop also resulted in sporadic and sparse establishment at both sites possible due to the shallow sowing depths, a sowing depth of 10–15cm is recommended.

Field peas was the most productive crop used in this demonstration generating the highest tonnage of dry matter yield and fixed nitrogen across both trial sites. Depending on the management strategies and philosophies the biomass can either be rolled over and left to lay on the soil surface to decay slowly overtime as an excellent source of readily digestible labile carbon which soil biology can feed on and return into the soil or can be cut and thrown under the vine row to be used as a temporary mulch. The use of inoculated legume seeds clearly showed the importance that Rhizobia play in capturing free atmospheric nitrogen in plant roots, (Figures 5 and 6). Faba beans also produced good amounts of biomass and fixed N with bees highly attracted to its flowers (Figure 7). Crimson clover started slow put raced away at the end of the season and was knee deep prior to collecting harvest data in Orange (Figures 8 and 9). Fresh weight moisture percentage of harvested crops ranged between 80–90% highlighting the amount of water captured within plant parts.



Figure 5: Nodules of fixed N on roots of Faba beans



Figure 6: Nodules of fixed N on roots of field peas



Figure 7: Bees foraging and pollinating Faba bean flowers



Figure 8: Crimson clover in the early September 2016



Figure 9: Crimson clover in full flower in October 2016

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More information

The factsheet <http://research.wineaustralia.com/wp-content/uploads/2012/09/2012-03-FS-Cover-Crops-Nutrition1.pdf> provides more information on the relationship between cover crops and vine nutrition.

The factsheet <http://research.wineaustralia.com/wp-content/uploads/2012/09/2012-07-FS-Covercrops-Water-Use.pdf> provides more information on the relationship between cover crops and water use.

Evaluating and demonstrating new disease resistant varieties for warm irrigated areas

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Breeding new grapevine cultivars with high resistance to fungal pathogens presents an opportunity to substantially reduce the use of plant protection agents, and therefore lower production costs and reduce the impact that viticulture has on the environment.

Resistance can be achieved by:

- crossing suitable parent cultivars
- screening for desired disease resistance and other beneficial traits.

The superior selections are then evaluated for their wine-making potential under field conditions for several years before release.

Selecting which varieties to pursue

As part of a previous project supported by Wine Australia, 1200 new varieties from the CSIRO breeding program, which show strong resistance to powdery mildew and reduced susceptibility to downy mildew, were evaluated under field conditions. Based on disease resistance and other physiological traits, 20 white selections with a range of potential wine quality attributes were identified. These vines represent the first generation of mildew-resistant vines produced using marker-assisted selection in Australia.



Figure 31. Plantings of the new disease-resistant varieties in the experimental vineyard at the NWGIC in the 2013–14 growing season.

The first large-scale trial planting of these varieties in NSW was undertaken in the experimental vineyard at the National Wine and Grape Industry Centre (NWGIC) in cooperation with McWilliams Wines in the Riverina during the 2013–14 growing season (Figure 31). This initial planting consisted of 20 white selections that have demonstrated superior plant performance at the Barossa site and produced diverse wine flavours identified as interesting by commercial winemakers during sensory evaluation. Red selections required further evaluation at the Barossa site at that time and consequentially were planted in the 2015–16 season next to the white varieties. Both selections were trained and managed similarly (see Figure 31) and the red varieties now have an established trunk and cordon after the second season.

White varieties

In winter, after the first season of sprawling in the white varieties (2013–14), all vines were pruned to three buds and pruning weights were assessed. These varied considerably by three-fold.

In the second season (2014–15), two shoots were left to grow from these buds to mid spring, and then the best shoot was selected for the trunk and was cut just above above the cordon wire. The total shoot length was measured before these changes, with the growth between varieties varying by about 30%. From the two upper buds and/or laterals the bilateral cordon developed, all vines had reached the appropriate cordon length or more by the end of second season. The training included debudding, fixing the trunk on stacks and the shoots for the cordon on the wires. The vines were sprayed against mites in spring with wettable sulfur and received fertiliser applications. Weed control was managed during the season with herbicide sprays in the vine row and the mid row, and frequent mowing. At the end of this season, the pruning weights were determined and showed four-fold differences across the 20 varieties.

In the third growing season (2015–16), the same vineyard management program was undertaken in relation to weed and mite control, but fertiliser application was increased. The longer shoots that were hanging into the rows were shortened in late spring. Basic berry and juice parameters were determined at harvest together with yield and yield components, with the bunch and berry size showing visual variation (Figure 32). There were considerable differences between the white variety yields and pruning weights, taken in winter, showing more than two- and four-fold differences respectively (Figure 33).



Figure 32. Bunches before harvest in third growing season (2015–16) from the new disease-resistant grape varieties in the experimental vineyard at the NWGIC.

In the past season (2016–17), the the white varieties' performance was further evaluated and two wines were made from each of the 20 varieties. These have been bottled and will be assessed over the next few months for their sensory attributes.

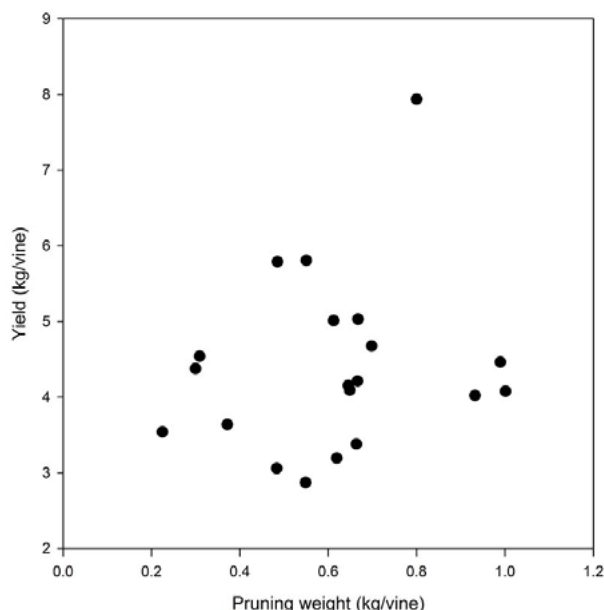


Figure 33. Range of yield and pruning weight levels of 20 new disease-resistant white varieties grown at the NWGIC experimental vineyard, three years after planting.

Next steps

It is anticipated that these white and red disease-resistant varieties will be further assessed over the next few growing seasons to ensure a meaningful evaluation of vine performance and wine characteristics. In particular, a NSW cool-region program will start soon to assess the disease resistance of the new red and white varieties.

VineWatch

May 2017, Primefact 1549, first edition

Adrian Englefield, Development Officer – Viticulture

National Wine and Grape Industry Centre, Wagga Wagga



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VineWatch is the Department of Primary Industries' (DPI) news bulletin for viticulturists, wine makers and wine industry representatives that:

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- includes regional reports from locals with insights into regional issues and seasonal developments.

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- Hunter Valley
- Hilltops
- Mudgee
- Murray Valley
- New England
- Orange
- Riverina
- Southern Highlands
- Tumbarumba.

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- factsheets and resources from DPI and wine industry sources to manage pest, disease and vineyard management issues
- DPI viticulture and wine industry news and events.



Figure 1. DPI Development Officers – Viticulture (L) Darren Fahey and (R) Adrian Englefield

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Appendices

Appendix 1: 'Off label' grapevine permits

All agricultural and veterinary products sold in Australia must be registered for use by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Therefore, in most states, registered products must only be used for those approved purposes that are stated on the label. However, situations do arise whereby chemicals are needed for a use not specified on the label.

In such instances an 'off-label' permit may be obtained through the APVMA Permits Scheme. Such permits allow chemicals to be used legally in ways that are different to the uses specified on the product label and/or allow limited use of an unregistered chemical.

Permits can be downloaded from the APVMA website (<https://portal.apvma.gov.au/permits>).

Table 1. Post-emergent herbicides registered in NSW for use in vineyards. Read the product label before use.

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|--|---|-----------------|------------------------------------|--|---|---|
| 2,2-DPA present as the sodium salt 740 g/KG (S5) | Dalapon 740 SP | J | 7 | 10 kg/ha | Kikuyu, Couch, Johnsons grass | Vines must be at least 4 years old. DO NOT exceed 10 kg/ha per year. Do not allow applications to contact green tissue and buds of vines. Apply as a direct spray into vine rows. Half rate at 10–14 day intervals will improve weed control and minimise risk to vines. |
| Amitrole 250 g/L (S5) | Sabakem Amitrole 47T | Q | 56 | 4–12 L/ha | Broadleaf weeds and grasses | Apply when weeds are small and making active growth. Repeat application may be necessary in 6–8 weeks. Apply as directed spray to weeds only. Use higher rates for larger or more tolerant weeds. |
| Amitrole + Paraquat (S7) | Alliance – 250 g/L Amitrol + 125 g/L Paraquat | Q+L | Not required when used as directed | 3–4 L/ha or 400 mL per 100 L as a spot spray | Young seedling plants only of: annual ryegrass (including glyphosate resistant biotypes), brome grass, barley grass, capeweed, Indian hedge mustard, turnip weed; volunteer cereals – barley, oats, triticale, wheat, wild oats; wild radish. Plus: barnyard grass (max. early tillering), bladder ketmia, cowvine, cranesbill, dove's foot, dwarf amaranth, fleabane (max 6 leaf), field peas, goosefoot, marshmallow, medics, mignonette, Paterson's curse, soursob, speedwell (not ivy-leaf), stoncrop, storksbills, sub. clover, thistles – artichoke, milk/sow, spear, stemless, variegated; three cornered jack, volunteer cotton, volunteer canola (including Roundup Ready® varieties), wireweed, wild lettuce | Spray young weeds during late winter to spring–summer as required. Use higher rate for spring application. Can be combined with residual herbicides for longer-term control. Does not require additional wetter unless spraying at high volume. Where Amitrole + Paraquat is mixed with water at less than 400 mL/100 L of water, add 100 mL Shirwet® 600 or 60 mL BS1000 per 100 L of spray. Spot spray rate assumes a total volume of 1000 L/ha. For lower water volumes increase dilution rate as below: - water volume 250 L/ha: use 1.6 L/100 L - water volume 500 L/ha: use 800 mL/100 L - water volume 750 L/ha: use 530 mL/100 L. |
| | Para-Trooper, Paraglide 10 g/L Amitrol + 250 g/L Paraquat | | | 1.7 L/sprayed ha | Annual weed control | If fat hen or <i>Portulaca</i> spp. is present and Imtrade Para-Trooper herbicide rate is less than the ratio 800 mL/100 L, add 120 mL Imtrade Wetter 1000 per 100 L spray mix. |

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|---|---|-----------------|------------------------------------|--|---|--|
| Carfentrazone-ethyl (S5) | Carfentrazone 240 EC, Elevate, Hammer 400 EC, Nail 240 EC, Spotlight Plus | G | | Rates vary, please read the label, plus recommended label rates of knock-down herbicides. Spot spray 10 mL/100 L plus recommended label spot spray rates of knockdown herbicides | Australian crassula/stonecrop, cape weed, chickweed, common storksbill (maximum 4 leaves), doublegee/spiny emex/three cornered jack, marshmallow, Paterson's curse, sub. clover, wild radish, <i>Crassula</i> spp, <i>Bifora</i> , <i>Bifora testiculata</i> , <i>Arctotheca calendula</i> , chickweed, <i>Stellaria media</i> , <i>Erodium cicutarium</i> , <i>Malva parviflora</i> , <i>Echium plantagineum</i> | Apply as a tank mix with glyphosate paraquat. Adding Spotlight Plus to knockdown herbicides will increase the speed at which treated broadleaf weeds in general develop visible symptoms (compared with results achieved with knockdown herbicides applied alone) and might improve final control of broadleaf weeds, including certain hard-to-kill weeds (marshmallow in particular). Using higher rates and full soil disturbance might improve control of marshmallow in particular. Use the lower rates on younger plants or plants growing under good conditions and the higher rates on older plants or plants growing under less optimum conditions. The lower rate might only provide suppression of cape weed, wild radish, common storksbill and doublegee under poor growing conditions. Application to hardened weeds or drought-stressed weeds, especially under summer conditions might cause only localised injury to weed foliage, which might not enhance final weed control. |
| Diflufenican 25 g/L Bromoxynil 250 g/L (S6) | Bentley, Colt, Cougar, Difluken B, Jaguar | C + F | Not required when used as directed | 500 mL-1 L | Certain broadleaf weeds in cover crops. | Apply during vine dormancy only. Avoid contact with vines. Particular care should be taken if applied in late autumn or early spring, when vines might not be fully dormant. Apply from early post-emergence and when weeds are actively growing. |
| Diquat 200 g/L (S6) | Reglone, Diquat 200, Desiquat, Dia-Kill 200, Ozcrop diquat 200 | L | | 150 L + 1.4 L Agral in 700 L water/ha + 1.6 L/ha Paraquat 250 (S7) | Capeweed | Apply as a directed spray under trees or vines. Under most conditions, Gramoxone 250 at 1.6-3.2 L/ha or Spray-Seed 250 at 2.4-3.2 L/ha will give effective control of grasses and broadleaf weeds in orchards, but where heavy infestations of cape weed occur Diquat 200 should be added to Gramoxone 250 at the rate of 1.5 L/ha. |
| Diquat + Paraquat (S7) | agVantage Di-Par 250, Aqmate Paraquat & Diquat 250 SJ, Spalding Exocet 250, Spray, Seed 250 | L + L | 7 | Boom 2.4-3.2 L/ha Spot spray 240-320 ml/100 L | Most annual grasses and broadleaved weeds. | For inter-row or around butts use high-volume applications. Gramoxone 250, Spray-Seed 250 and Diquat 200 have no effect on brown bark, but care should be taken when spraying For spot spraying and when volume of water applied exceeds 200 L/ha add a wetter at 120 mL/100 L of additional water. Thoroughly wet plant foliage. Use the high rate for dense, more established weed growth. Repeat treatment on regenerated green perennial weeds (such as paspalum and docks) while plants are weakened from previous treatment. Addition of at Oxyfluorfen 240 ml/ha will improve control of small flowered mallow, evening primrose and other weeds sensitive to Oxyfluorfen. Refer to the Oxyfluorfen product label. |

Table 1. Post-emergent herbicides registered in NSW for use in vineyards. Read the product label before use (continued).

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|---------------------------------------|--|-----------------|----------|--|---|--|
| 2,2-DPA-sodium 740 g/kg (unscheduled) | Agspray Atlapon Dalapon 740 SP, Propon | J | 7 | Boom: 10 kg per sprayed hectare | Couch, Kikuyu, Johnsons grass | Vines must be at least 4 years old. DO NOT exceed 10 kg/ha per year. Apply as a direct spray into vine rows. Half rate at 10–14 day intervals. |
| Fluazifop-P 128 g/L (S6) | Fusilade Fort, | A | 28 | 1.65 L/ha | Growing actively at 5-leaf to early tillering: annual (Wimmera) ryegrass, barley grass, barmyard grass, brome grasses, browsfoot grass, Johnson grass, liverseed grass, prairie grass, summer grass (crabgrass), wild oats. Growing actively at 5-leaf to early tillering, innocent weed and stinkgrass growing actively at 3–5-leaf stage, foxtail (TAS) seedlings (<i>Setaria</i> spp.), pigeon grass young vegetative growth (3–6 leaves per shoot) when actively growing. Established plants of couch grass, English couch (rope twitch), water couch, Johnson grass, paspalum, bent grass and kikuyu grass. Wide range of grasses. | Apply in not less than 200 L/ha. Direct the spray to the base of the vine. Young growth is most susceptible at 5 leaves to early tillering when actively growing. Higher rates might be required for more advanced plants. Suppression only beyond the 5-leaf stage. Use the higher rate for well-established infestations or where greater control is required in one season. Or consider a double knock of Spray Seed followed by Fluazifop-P when fresh growth has emerged – may be necessary for couch control. Note: Tank mixes of Fluazifop-P are not recommended, and there should be a minimum of 3 days before any other herbicide is applied. Fluazifop-P does not control winter grass or silver grass. Use the higher rate for well-established infestations or where greater control is required in one season. |
| Fluazifop-P 112 g/L (S6) | Fuzilier, Rootout 212 | A | 28 | 1 L/ha 1–5 L/ha Spot spray at 100 ml/10L | Growing actively at 5-leaf to early tillering: annual (Wimmera) ryegrass, barley grass, barmyard grass, brome grasses, browsfoot grass, Johnson grass, liverseed grass, prairie grass, summer grass (crabgrass), wild oats Growing actively at 3–5-leaf stage: foxtail (TAS) seedlings (<i>Setaria</i> spp.), pigeon grass. Young vegetative growth (3–6 leaves per shoot) when actively growing. Wide range of grasses see label | Apply in not less than 200 L/ha. Direct the spray to the base of the vine. Use the higher rate for well-established infestations or where greater control is required in one season. |

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|-----------------------------|--|-----------------|------------------------------------|---|--|--|
| Glufosinate-ammonium (S5) | Basta, Biffo, Cease, Exile, Exonerate, Exonerate 200 SL, Fascinate 200 SL, Faster-TG 200, Fiestar, Glufosinate 200, Glufosinate-Ammonium 200, Muster, Kelpie | N | Not required when used as directed | <p>1–5 L/ha</p> <p>The recommended rate of use is determined by the following criteria:</p> <ul style="list-style-type: none"> -Weed species -Weed stage of growth -Weed density -Climatic conditions | <p>Annual weeds</p> <p><i>Amaranthus</i> spp., apple of Peru, Argentine peppercress, awnless barnyard grass, barley grass, barnyard grass, billy goat weed, bitter cress, black bindweed (buckwheat), bladder ketmia, bordered panic, brome grasses), calopo, caltrop burr, cape weed, sub. clover, cobbler's peg, common storksbill, crowfoot grass, dead nettle, dwarf crumbweed, fat hen, flax-leaf fleabane, fumitory, green crumbweed, lesser canary grass, liverseed grass, medics (annual), milk thistle, mint weed, New Zealand spinach, Patterson's curse, peanuts, pigweed, pinkburr, potato weed, prairie grass, prickly lettuce, red Natal grass, ryegrass (annual), saffron thistle, St. Barnaby's thistle, sago weed, scarlet pimpernel, setaria, sheep thistle, silver grass, sorghum/sudax, square weed, stagger weed, star of Bethlehem, summer grass, thickhead, three cornered jack, tomato, Townsville stylo, turnip weed, variegated thistle, wheat, wild carrot, wild gooseberry, wild mustard, wild oats, wild radish, wireweed</p> <p>Perennial weeds</p> <p>Blady grass, cape tulip, centro, clover glycine, couch grass, cynodon, cow pea, giant sensitive plant, greenleaf, Johnson grass, <i>Paspalum</i> spp, perennial bindweed, shamrock, sida weed, silver leaf desmodium, siratro, stink grass, white clover, white eye, willow herb.</p> | <p>Apply as a directed or shielded spray. Refer to the label for details on specific application methods.</p> <p>Warnings</p> <p>Do not allow spray or spray drift to contact desirable foliage or green (uncalcified) bark. Refer to the label for instructions on how to avoid potential crop damage and protect crops, native and other non-target plants.</p> <p>Glufosinate-ammonium may be used around trees/vines less than 2 years old provided they are effectively shielded from spray and spray drift.</p> <p>Weed species</p> <p>Apply the appropriate rate to control the least susceptible weed present as per the lists of weeds controlled in the label's tables.</p> <p>Weed stage of growth</p> <p>Use the lower rate when weeds are young and succulent (grasses: pre-tillering; broadleaves: cotyledons to 4-leaf) or the population is very sparse.</p> <p>A median rate should be used for medium sized plants (grasses: tillering; broadleaves: 4-leaf to advanced vegetative) and the high rate should be used when weeds are mature (grasses: nodding–flowering; broadleaves: budding–flowering).</p> <p>Climatic conditions</p> <p>Best results are achieved when applied under warm humid conditions (temperatures below 33 °C with a relative humidity above 50%). Control will be reduced and/or slower under cold conditions. Good results will be achieved under most other conditions, however, poor results can occur under hot, dry conditions.</p> <p>Weeds that have been hardened or stunted in growth due to stressed conditions should be treated at the maximum rate.</p> <p>For weed density, coverage and perennial weeds see the label.</p> |

Table 1. Post-emergent herbicides registered in NSW for use in vineyards. Read the product label before use (continued).

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|---|--|-----------------|------------------------------------|--|--|---|
| Glyphosate 360 g/L present as ipa and/or mono-ammonium salts (S5) | Accendis 360, Banish 360, BioChoice 360, Country Glyphosate 360, Glyphosate 360 SL, Glistar 360, Glyphosate 360, Aquatic 360, Pestmaster Aqua-Tech 360, Roundup Biactive, Sanos 360, SquareDown 360, Weedmaster Duo, Wipe- Out 360, Wipe-Out Bio | M | Not required when used as directed | Annual weeds: Boom: 2–3 L per sprayed hectare Perennial weeds: Boom: 3–9 L per sprayed hectare. Weed-wiping equipment: 1 L mix: 2 L water. | Broad spectrum. Hard-to-kill perennials (couch, paspalum, etc.) require higher rates. Use low rates where weeds are less than 15 cm high | Apply as a directed or shielded spray or using wiper equipment. Do NOT apply as a spray near or vines less than 3 years old unless they are effectively shielded from spray and spray drift. Do NOT allow wiper surface to contact any part of the vine. Do NOT allow spray or spray drift to contact green bark or stems, canes, laterals, suckers, fresh wounds, foliage or fruit. Do NOT allow wiper equipment to contact vines. |
| Glyphosate–ipa/mas 450 g/L (S5) | AllOut 450, ClearUp 450, Eradicator 450, Glistar 450, Glymont 450, Glyphos Classic 450, Glyphosate 450, Glyphosate 450 CT, Glyphosate 450 SL | M | Not required when used as directed | Annual weeds: Boom: 1.6–2.4 L per sprayed hectare Perennial weeds: Boom: 2.43–4.8 L per sprayed hectare. | | |
| Glyphosate ipa/mas 540 g/L (S5) | Credit, Sickle 540 | M | Not required when used as directed | Annual weeds: Boom: 1.35–2 L per sprayed hectare Perennial weeds: Boom: 2–4 L per sprayed hectare. 850 mL–2.5 L/ha | Australian crassula/stoncrop, cape weed, chickweed, common storksbill (max. 4 leaves), doublegee/spiny emex/three cornered jack, marshmallow, Paterson's curse, sub. clover, wild radish | Using higher rates and full soil disturbance can improve control of small, flowered mallow in particular. Use the lower rates on younger plants or, plants growing under good conditions, and the higher rates on older plants or plants growing under less optimum conditions. |
| Glyphosate- ipa 432 g/L + carfentrazone-ethyl 7.2 g/L (S5) | Broadway | M + G | Not required when used as directed | | | When using Broadway Herbicide as a spot spray, apply in sufficient water (minimum 500 L/ha) to thoroughly wet all weed foliage to the point of run-off. Adding standard rates of a non-ionic surfactant might improve weed control. Do NOT allow spray or spray drift to contact green bark or stems, canes, laterals, suckers, fresh wounds, foliage or fruit. |

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|--|--|-----------------|------------------------------------|---|---|--|
| Haloxifop 520 g/L (S6) | Verdict, Haloxifop, Jasper, V Agro-Essence, Convict, Exert, Firepower, Haloxifop, Haloxyken, Hermes, Recon | A | Not required when used as directed | Annual grasses: 200 mL/ha; perennial grasses: couch, Rhodes, slender rats tail 400–800 mL/ha <i>Paspalum</i> spp | Perennial grasses: couch, Rhodes grass, slender rats tail grass, buffel grass, green panic, Johnson grass, kikuyu, <i>Paspalum</i> spp., <i>Setaria</i> spp. Annual grasses: annual ryegrass, barley grass, barnyard grass, brome grass, crowfoot grass, lesser canary grass, liverseed grass, Mossman river grass, paradoxa grass, summer grass, volunteer cereals, wild oats | Spray should be directed to base of vine. Avoid contact with fruit and foliage. When using perennial rates, annual grasses are also controlled. Spot spray: Use 25 mL to 50 mL/100 L of water. Use higher rate on late tillering mature grasses. |
| Haloxifop 130 g/L (S6) | Asset, Gallant, Judgement, | A | Not required when used as directed | Annual grasses: 800 mL/ha Perennial grasses: Couch: 1.6–2.3 L/ha <i>Paspalum</i> , Johnson grass: 0.8–1.6 L/ha | Refer to the glyphosate product label (such as Ripper™, 480, Roundup®, Roundup CT®, PowerMax®, Touchdown® or Touchdown HITECH®). | Adding Oxyfluorfen to glyphosate products will improve knockdown and increase the speed at which treated weeds develop visible symptoms of phytotoxicity (compared with results achieved with glyphosate applied alone) and give control of annual nettles, (<i>Urtica</i> spp.), barley grass, Paterson's curse, small-flowered mallow and storksbill. For glyphosate rates, refer to the appropriate label. DO NOT apply the tank mix of glyphosate and Oxyfluorfen near trees or vines less than 3 years old unless they are effectively shielded from spray and drift. |
| Oxyfluorfen 240 g/L plus a glyphosate product at its recommended label rate (S7) | Goal, Point Herbicide, Striker | G+M | Not required when used as directed | 75 mL/ha + a glyphosate product at its recommended label rate. | Refer to label of the paraquat or diquat/paraquat products (such as Spray-Seed® or Tryquat® 200). | Adding Oxyfluorfen in a tank mix with a paraquat or diquat/paraquat product will improve control of small flowered mallow, evening primrose and other weeds sensitive to Oxyfluorfen. For the paraquat or diquat/paraquat product rate, refer to the appropriate label. |
| Oxyfluorfen 240 g/L ha plus a paraquat or diquat/paraquat (S7) | | G+L | | 250 mL/ha + a paraquat or diquat/paraquat product at its recommended label rate. | | |
| Paraquat 135 g/L + Diquat 115 g/L (S7) | Spray Seed 250, Blowout, Brown Our 250, Combik 250, Di-Par 250, E05, Kwirknock 250, Paraquat/Diquat, Paraquat + Diquat 250, Pre-Seed 250, Revolver, Scorcher 250, Speedy 250, Spray & Sow, Spray Our 250 | L | Not required when used as directed | Spot spraying: 240–320 mL/100 L. Add 170 mL Agral or 100 mL BS1000 per 100 L Boom: 2.4–3.2 L/ha. If volume of water applied exceeds 200 L/ha, add 200 mL Agral or 120 mL BS1000 per 100 L of additional water. | Broad spectrum. For rapid kill of a wide range of annual grasses and broadleaf weeds. | Thoroughly wet plant foliage. Use the high rate for dense, more established weed growth. Repeat treatment on regenerated green perennial weeds (such as paspalum and docks) while plants are weakened from previous treatment. Adding Spark at 250 mL/ha will improve control of small-flowered mallow, evening primrose and other weeds sensitive to Spark. Note: Spot spray rate assumes 1000 L water/ha. For lower water volumes increase dilution rate as below: - water volume 250 L/ha: use 960 to 1280 mL/100 L - water volume 500 L/ha: use 480 to 640 mL/100 L - water volume 750 L/ha: use 320 to 430 mL/100 L - OR Measure how much spray is required to cover an area of 100 m ² using your normal application volume. - Your dilution rate is 24–32 mL of Paraquat + Diquat 250 in this volume. |

Table 1. Post-emergent herbicides registered in NSW for use in vineyards. Read the product label before use (continued).

| Chemical (Poisons Schedule) | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|---|--|-----------------|------------------------------------|---|--|---|
| Paraquat (S7) | Gramoxone 250, Nuqua 250t, Explode250, Nuquat 250, Paradox 250, Para-Ken 250, Para-Ken 334, Paraquat 250, Paraquat 250 SL, Shirquat® 250, Sinmosa 250, Spraytop® 250 SL, Uniquat 250 | L | Not required when used as directed | Knapsack: 50 mL Paraquat plus 30 mL non-ionic wetter/15 L (add 30 mL diquat if cape weed is present). Boom: 1.7 L/ha Add diquat if cape weed is present. See label for rates. | Broad-spectrum annual weed control. Most active against grasses. See label for rates at increased wetting agent where fat hen and <i>Portulaca</i> spp. are present. | Spray as necessary for control of annual weeds. Avoid contacting crop foliage. Apply soon after weed emergence and before weeds reach 15 cm in height. Use spraying pressure less than 240 kPa. Repeat sprays as required. Paraquat 250 will not harm vines with mature brown bark. Use the higher rate for dense weed growth. If product rate is less than 400 mL/100 L, add 100 mL Agral or 60 mL BS1000/100 L of spray mix. |
| Pine oil (S6) | BioWeed | unspecified | 0 | 1L/ 4L water | Broad-spectrum nonselective weed control. Claims in advertising to act as a pre-emergent and weed seed killer (not on label). | This product does not work in the same manner as a petrochemical herbicide and failure to change your approach to application can lead to disappointing results. Ensure that all weed foliage is totally covered with spray as pine oil is a contact spray only. Partial coverage will only give partial control. Use a foaming nozzle or spraying tips that apply 2 L/minute. A water volume of 600 L/ha is recommended or 1 L BioWeed™ to 4 L water. |
| Quizalofop-P-ethyl 100, 200, 250 & 480 g/L (S6) | Conquest Atomic Selective Herbicide, Elantra, Elantra Xtreme, Leopard, Leopard 200 EC, Quinella 100 EC, Quinella Upgrade, Quiz, Quizalofop-P-ethyl 200 EC, Sextant, Tiger. | A | Not required when used as directed | See label for directions | Selected post-emergent systemic grass control. See label for details to control awnless barnyard, crowsfoot, paspalum, Johnson grass and likuyu. | Apply when weeds are actively growing. Use a minimum of 800 L of prepared spray/ha. Thoroughly wet target weeds (especially well established clumps) without causing run off. Repeated sprays might be necessary for perennial grass species. Always add a surfactant/wetting agent at the recommended rate. Check label for details. |
| Quizalofop-P-tefuryl 120 g/L (S6) | Pantera, Buzzard, Quizalofop-P-Tefuryl | A | Not required when used as directed | 125–250 mL/100 L | Awnless barnyard grass, crowsfoot grass, kikuyu, paspalum, Johnson grass. | Apply when weeds are actively growing. Use minimum of 800 L of prepared spray/ha. Thoroughly wet target weeds (especially well established clumps) without causing run off. Repeated spraying might be necessary for perennial grass species. Always add a surfactant/wetting agent at the recommended rate. Check label for details. |

Table 2. Residual herbicides registered in NSW for use in vineyards: Long-term pre-emergent control of a range of weeds depending on rate, soil and moisture. Read label before use.

| Chemical | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|------------------------------------|--------------------------|-----------------|------------------------------------|--|--|--|
| Dichlobenil 40 g/kg (S6) | Casoron G 4 | 0 | Not required when used as directed | 101–152 kg/ha | Annual grasses and broadleaf weeds. | For bearing and non-bearing vines Spread granules evenly over the soil of the area to be treated. Remove existing weeds by hand, desiccation or cultivation. Use a higher rate on heavier soils. |
| Isoxaben 750 g/kg (S5) | Gallery 750 | 0 | Not required when used as directed | 375–750 g/ha | Amaranth, bittercress, black nightshade, cape weed, clover, fat hen, flatweed, hedge mustard, mallow, milk thistle, Paterson's curse, plantain, scarlet pimpernel, wild radish, wireweed. Isoxaben has negligible activity on grasses | Apply to weed-free, even soil surface. Needs 12.5 mm moisture via rainfall or irrigation within 21 days of application to be activated. Mix with pendimethalin or oryzalin to provide additional grass weed control. |
| Napropamide 500 g/kg (Unscheduled) | Devrinol WG | K | Not required when used as directed | 4.5 kg/ha for light to medium soils, 6.7 kg/ha for heavy clay soils apply in 500–1000 L of water/ha as a band spray. | Annual ryegrass, barnyard grass, crowfoot grass, innocent weed, liverseed grass, pigweed, potato weed, redshank, sowthistle, stinkgrass, summer grass, winter grass. | Soil must be free of weeds and trash and must have a fine tilth Apply at 500–1000 L of water/ha. Apply as a directed band spray, avoiding contact with fruit or foliage. In irrigated areas apply in early spring and follow with sprinkler irrigation to 5 cm soil depth within 10 days of application. |
| Norflurazon 800 g/L (Unscheduled) | Zoliar 800 DF, Zoliar DF | F | Not required when used as directed | 2.5 kg/ha | Annual ryegrass, barley grass, blackberry nightshade, brachiaria caltrop, cape weed, chickweed, common sowthistle, dandelion seedlings, curled dock seedlings, false caper seedlings, fat hen, Indian hedge mustard, spiny burgrass, medic, hedge mustards, paspalum, Paterson's curse, plantain seedlings, portulaca, prairie grass, prickly lettuce, great brome, scarlet pimpernel, shepherd's purse, silver grass, skeleton weed seedlings, sorrel seedlings, soursob, stinkgrass, stinking roger, sub. clover, summer grass, three-cornered jack, variegated thistle, wild oats, wild radish, wild turnip, winter grass, wireweed, witch grass, yellow weed, Yorkshire fog grass. | Apply using a boom spray to bare ground before weed emergence. Apply as a directed spray in 300–500 L water/ha Avoid contact with foliage or fruit. An application in early autumn will give winter weed control, or in early to mid-spring will give full summer weed control. Not recommended for grapes grown in sand or loamy sand soils with less than 1% organic matter and pH greater than 7.5, as veinal chlorosis might occur. Do not apply to nursery stock. |
| | | | | 5.0 kg/ha | Couch grass+, dandelion, curled dock, false caper, Johnson grass+, skeleton weed, sorrel, soursob + = suppression only Pigweed (<i>Portulaca</i>) | |
| | | | | 1.25 kg/ha ZOLIAR + 2 L/ha simazine 500 g/L 1.9 kg/ha ZOLIAR + 2.0 L/ha Simazine 500 g/L | Barnyard grass, clammy goosefoot, cobbler's pegs, green pigeon grass, redroot amaranth, summer grass, wireweed. | |

Table 2. Residual herbicides registered in NSW for use in vineyards: Long-term pre-emergent control of a range of weeds depending on rate, soil and moisture. Read label before use (continued).

| Chemical | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|--------------------------------|--|-----------------|------------------------------------|--|--|--|
| Oryzalin 500 g/L (Unscheduled) | Surflan 500, Flowable Oryzalin, Stonewall, Accensi Oryzalin, Ospray Oryzalin, Agricrop Prolan, Sharp Shooter, Rygel Oryzalin, Genfarm Oryzalin | D | Not required when used as directed | 4.5 L/ha: up to 4 months' weed control 6.8 L/ha: 6–8 months' weed control Use 200–450 L water/ha | Grasses: barnyard grass, guinea grass, love grass, paradox grass, pigeon grass, spiny burr (gentle Annie/innocent weed), summer grass, crabgrass Broadleaf weeds: deadnettle, fat hen, fumitory, <i>Portulaca</i> (pigweed), sowthistle, wireweed (hogweed) <i>Brassica</i> spp., blackberry nightshade, caltrop, paddy melon, silver leaf. Nightshade controls many annual grasses and broadleaf weeds | Suitable for nurseries and newly planted and established vineyards. For best results, if irrigation or rain is not expected within 21 days after application, then mechanically incorporate into the top 2.5 cm of soil. Soil must be free of weeds, of good tilth, and firm. |
| Oxyfluorfen 240 g/L (S5) | Goal, Point Herbicide, Striker | G | Not required when used as directed | Weed-free soil: 3–4 L/ha Emerged weeds present (4–6 leaf stage). Apply as a tank mix with glyphosate or paraquat + diquat product. See label for details. | Before germination: Amsinckia, barley grass, barnyard grass, blackberry nightshade, bladder ketmia, burgrass, caltrop, cape weed, chickweed, crowsfoot grass, deadnettle, fat hen, giant pigweed, liverseed grass, lovegrass, pigeon grass, pigweed, prickly lettuce, red Natal grass, redshank, ryegrass, <i>Sesbania</i> pea, shepherd's purse, small flowered mallow, soursob, sow thistle, starburr, stinkgrass, summer grass, thornapple, white eye, wild mustard, wild radish, wireweed. Seedlings: Amsinckia, belvine, cape weed common, cotula, crowsfoot grass, deadnettle, groundsel, liverseed grass, pigweed, potato weed, redshank, shepherd's purse, sow thistle, stinging nettle, stinkgrass, wild radish. | Weed-free soil: apply to freshly worked, weed-free soil. Use the higher rate when longer residual control is required (up to 4 months). Where grass weeds are expected to be a major problem, or when control of a wider weed spectrum is required, mix the lower rate with 4.5 L Oryzalin 500 per treated hectare. Use the higher rate when longer residual activity (up to 4 months) is required. When young seedling grasses and/or broadleaf weeds are present, apply as a tank mix with certain post-emergent herbicides to produce both knockdown and residual control. A non-ionic surfactant should be used in the spray mixture at 100 mL/100 L. Mature, established weeds must be eliminated by mechanical or chemical means before application. See label for more details. Do not apply oxyfluorfen once bud swell has occurred. Use the higher rate when longer residual control is required (up to 4 months). When young seedling grasses and/or broadleaf weeds are present, apply as a tank mix with glyphosate or paraquat or diquat/paraquat to obtain both knockdown and residual control. A non-ionic surfactant such as BS-1000 should be used at 0.1% v/v. Where weed growth is large and dense, weeds must be eliminated before applying Oxyfluorfen, using chemical or mechanical means. |

| Chemical | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|---------------------------------|---|-----------------|------------------------------------|---|--|---|
| Pendimethalin (S5) | Argo 440EC, Cronos 440EC, Cyclone 330 EC, Fist 330, Panida Grande, Pendimethalin 330, Pendimethalin 330EC, Rifle 330, Rifle 440, Romper 440 EC, Stomp 440 | D | Not required when used as directed | See label for directions | Annual ryegrass, asthma plant, barnyard grass, chickweed, caitrop, cobbler's Pegs, crowsfoot grass, deadnettle, dwarf amaranth, fat hen, deadnettle, green amaranth, pigeon grass, pigweed, prickly lettuce, sowthistle, spotted medic, stinking roger, summer grass, winter grass, wireweed | Do not apply pendimethalin to grapevines after bud swell. Precaution: pendimethalin or pendimethalin plus simazine are likely to affect the emergence and growth of green manure crops if they are sown into the treated band within 12 months of application. Use the higher rate on medium to heavy textured soils and the lower rate on light textured soils. Use a directed spray avoiding spray contact with green bark, fruit and foliage. If applied to freshly transplanted trees or vines, soils should be compacted before pendimethalin application to avoid contact with roots. Pendimethalin must be incorporated by a minimum of 5 mm of rainfall or spray irrigation as soon as possible but no later than 10 days after application or weed control can be reduced. For best results, soil surface should be free of weeds, surface litter and clods at the time of application. If small weeds are present at the time of application, pendimethalin should be tank mixed with a knockdown herbicide at the recommended rate. Crop damage and/or reduced weed control can result if pendimethalin is not incorporated successfully. |
| Simazine 500 g/L (Unscheduled) | Simazine 500, Simazine 500 Flowable, Simazine 500 SC, Gesatop 500 SC | C | Not required when used as directed | Boom 2.3–4.5 L/ha. Use 2.3 L/ha on sandy alkaline soils and 4.5 L/ha on heavy soils. In first year of use split applications are preferred. Boom: 1.9–3.8 L/ha Use 1.9 L/ha on sandy alkaline soils and 3.8 L/ha on heavy soils. In first year of use, split applications are preferred. | Annual weeds and grasses: annual ryegrass, annual thistles, barley grass, bindy-eye, brome grass, cape weed, chickweed, common sowthistle, creeping oxalis, fat hen, geranium, ivy-leaf speedwell, nettles, potato weed, Powell's amaranth, redroot amaranth, redshank, shepherd's purse, slim amaranth, wild mustard, wild oats, winter grass, wireweed (not TAS) and suppression of soursob. | NOTE: most of the 500 g/L and 600 g/L products labels state 'grapevines must be established for 3 years' but please check the label. In the first year a split application is preferred. Normally apply to bare, moist soil before weed emergence. Damage might result from using high rates on sandy soils that are low in organic matter. |
| Simazine 600 g/L (Unscheduled) | Gesatop 600 SC | C | Not required when used as directed | Boom: 1.9–3.8 L/ha Use 1.9 L/ha on sandy alkaline soils and 3.8 L/ha on heavy soils. In first year of use, split applications are preferred. | | Mechanical incorporation is not necessary, but for best results 13 mm rain or sprinkler irrigation is required within 2 weeks of application to give herbicide activity in soil. |
| Simazine 900 g/kg (Unscheduled) | Simazine 900 WDG, Simazine 900 WG, Simazine 900DF, Simanex 900 WG, SimaPhos 900, Simaquest 900 WG | C | Not required when used as directed | 1.25 kg/ha for light soil 2.5 kg/ha for heavy soil | | As for above BUT NOTE: most of the 900 g/L products labels state 'for vines established more than 12 months of age' or similar, but please check the label. In the first year split applications are preferred, e.g. use 2.2 kg/ha in July or August and 2.2 kg/ha in October. Warning: do not use on excessively sandy soils, as crop damage might occur. |

Table 2. Residual herbicides registered in NSW for use in vineyards: Long-term pre-emergent control of a range of weeds depending on rate, soil and moisture. Read label before use (continued).

| Chemical | Trade names | Herbicide Group | WHP days | Rates | Weeds controlled | Comments |
|--------------------------|---|-----------------|------------------------------------|---|--|---|
| Trifluralin 480 g/L (S5) | Trigen 480, Triflurex, Trifluralin 480, Tango 480 | D | Not required when used as directed | 1.2 L/ha for light soils 1.7 L/ha for medium soils 2.3 L/ha for heavy soils | Annual ryegrass, barnyard grass, canary grass, caltrop, crab grass, spiny burr grass, pigweed, redroot, redshank, summer grass, soil surface wild oats, winter grass, wireweed. From seed only: Columbus grass, guinea grass, Johnson grass, liverseed grass. | Mechanically incorporate into soil. New plantings: apply during pre-plant cultivation. Apply to established crops in spring after weeds and green manure crop has been ploughed into ground. Refer to label for a suitable method of incorporation. |

Table 3. Chemical desuckering: Non-selective post-emergent 'knockdown' herbicides registered in NSW for use in vineyards. Read the product label before use.

| Chemical (Poisons Schedule) | Trade names | Rates | Weeds controlled | Comments |
|---|----------------|---|---|---|
| Carfentrazone-ethyl 240 g/L (Unscheduled) | Spotlight Plus | 300 mL/100 L sprayed to point of run-off. A minimum volume of 50 L of spray solution per km of vine row (both sides sprayed) is recommended. | Controls unwanted suckers (water shoots) arising from the main stem or trunk. | Applying Spotlight Plus to suckers (water shoots) arising from the main stem will result in rapid burn down and extended regrowth control. Any regrowth might be less vigorous but could need a repeat application for season-long control. Suckers arising from pruned stubs or roots might be less well controlled. More vigorous varieties and grafted vines on vigorous rootstocks might need several applications depending on the growth conditions. Preferably apply with a fully shrouded sprayer designed for the purpose and targeting the basal 60 cm of the trunk. Air-induction, off-centre nozzles such as AirMix OC or similar are preferred to minimise the production of fine, driftable droplets. The optimum nozzle configuration is to have nozzles pointing forwards and backwards to ensure all surfaces of the shoots are sprayed. Use sufficient spray volume to ensure that the spray solution thoroughly wets the foliage and stems of unwanted suckers to the point of run-off. |



The Australian Wine
Research Institute

Agrochemicals registered for use in Australian viticulture

AN ESSENTIAL REFERENCE WHEN
GROWING GRAPES FOR EXPORT WINE

17/18



Compiled by Marcel Essling and Anne Lord
Updated 31 May 2017

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Need help with an agrochemical or general grapegrowing issue?

Contact the AWRI helpdesk for free, confidential, technical support.

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Growing grapes for export wine?... choose the right chemical

Governments around the world set limits for the amount of residue of a fungicide, insecticide or herbicide that is legally allowed in a food, such as grapes or wine. These limits for agrochemicals are commonly referred to as MRLs (maximum residue limits), and for Australia they are listed in the Australian New Zealand Food Standards Code.

Over the past year, Australian wineries have exported wine worth more than \$2.18 billion, mostly to countries that have MRLs vastly different to, and sometimes lower than, those set by our own government. In fact, some chemicals commonly used by Australian grapegrowers do not have MRLs in some of our major export markets. Often this is because grapes are not grown commercially in these countries and, therefore, there is no need to register products for use on grapes. As a result no MRL is set, which means that the importing country will either not allow any detectable residue of the agrochemical in wine, or only permit 'safe' amounts of it.

To ensure that wine meets these requirements, it is necessary to restrict the application of certain chemicals or to avoid their use altogether. Since 1991, some wineries have provided their grapegrowers with a list of recommended fungicides and insecticides and the associated 'export harvest interval' (the minimum number of days between the last application and harvest). The export harvest interval is sometimes much longer than the withholding period stated on the chemical label, and it has been calculated to minimise the likelihood of residues affecting fermentation, affecting sales of the wine and to reduce the exposure of the public to agrochemicals.

The following tables list the preferred agrochemicals for use in the production of grapes for export wine, and any restriction on their use, for the 2017/2018 season. Some biological control agents are also listed. The recommendations have been developed to satisfy the lowest MRL for any of Australia's major wine markets after considering available data on the persistence of the chemical, both on grapes and through winemaking. Many of these data were gathered as a result of a large, multi-agency research effort, funded by Wine Australia and the Dried Fruits Research and Development Council. A list of current MRLs and supporting information can be obtained by visiting the AWRI's website: www.awri.com.au, or by contacting the AWRI helpdesk on (08) 8313 6600 or helpdesk@awri.com.au.

If you are a member of the Australian wine industry and would like to receive email notices from the AWRI on technical issues, including agrochemicals, please visit www.awri.com.au to subscribe to eBulletins.

AWRI Agrochemical search app and online search facility

The AWRI agrochemicals online search facility and agrochemical search app allows the user to rapidly access information contained in the current *Agrochemicals registered for use in Australian viticulture* booklet (often called the 'Dog Book'). These tools also contain additional information derived from the AWRI database i.e. they allow the user to search for products registered for use on targets that are not listed in the Agrochemical booklet. Visit www.awri.com.au/industry_support/viticulture/agrochemicals/ or scan the QR code below to download the app.

Apple iTunes



Google Play



Frequently asked questions

Why does The Australian Wine Research Institute recommend that the application of some active constituents (for example pyrimethanil) be restricted to before 80% capfall?
The recommendations in the tables have been developed to satisfy the lowest maximum residue limit (MRL) for *any* of Australia's major wine markets after considering available data on the persistence of the agrochemical, both on grapes and through winemaking.

In the case of pyrimethanil, it is known that if it is sprayed onto grapes after 80% capfall, residues might be detectable in the resultant wine. Some of the markets to which Australia exports wine have a very low MRL for pyrimethanil, or alternatively, have not announced their position on the course of action they would take if pyrimethanil was detected in wine. To ensure that Australian wine meets MRLs set by all of these markets, the 80% capfall restriction is suggested.

Are there exceptions to these restrictions?

Yes. Products may be used closer to harvest than the suggested restriction period in consultation with the winery/grape purchaser.

A winery may choose to ignore the restriction if the wine made from the grapes will be sold in Australia alone, or to an export market that has an MRL greater than the expected residue or if the market otherwise permits residues of the agrochemical. In this case, the label withholding period is the minimum delay that should be observed between spraying the grapes and harvest.

Can I use a product that is not listed?

Yes. An unlisted product can be used provided that it is in consultation with your winery and used according to the label specifications.

Important points

- GRAPEVINE GROWTH STAGE CAN BE VARIABLE ACROSS A BLOCK. WHEN ASSESSING GRAPEVINE PHENOLOGY FOR THE PURPOSE OF APPLYING AGROCHEMICALS, BASE THE ASSESSMENT ON THE **MOST ADVANCED VINES** IN THE BLOCK TO MINIMISE THE POSSIBILITY OF RESIDUES AT HARVEST.
- To accurately identify the grapevine growth stage, use the chart on page 13. For more information consult Coombe, B. 1995. Adoption of a system for identifying grapevine growth stages. *Aust. J. Grape and Wine Res.* 1:104-110. The chart can also be downloaded from the AWRI website.
- Ask your winery if they have specific chemical recommendations. These might differ from the recommendations suggested below.
- The chemical label provides important information that must be followed including the personal protective equipment to be used when mixing chemicals or entering a vineyard after chemical use. See pages 15 - 22 for more information about re-entry periods.
- When spraying, ensure that the amount of chemical applied never exceeds the rate specified on the manufacturer's label (unless otherwise specified).
- If you are unable to keep to these recommendations, or if you need to spray closer than 30 days before harvest, contact your winery or the AWRI for advice.
- Avoid spraying some types of foliar fertilisers closer than 60 days before harvest, as wine quality might be affected.
- Always read the label on the chemical container. The products mentioned in the table might not necessarily be registered for use in your state.
- Keep a record of agrochemical applications. Some wineries might not accept delivery of grapes without receipt of a signed spray diary from the producer. An industry-accepted spray diary template can be downloaded from the AWRI agrochemical website www.awri.com.au/industry_support/viticulture/agrochemicals/
- Grazing restrictions may apply to vineyards where agrochemicals have been used. Consult product labels for details.
- These recommendations have been developed as a general guide and assume that the wine will be sent to a range of overseas markets, each with differing MRLs. If you only sell wine in Australia, or to only a few countries, contact the AWRI to discuss how the recommendations might differ. The AWRI can also provide advice regarding the persistence of a chemical on grapes or through winemaking, and MRLs for most major export destinations.

How to use the following table

| Active constituent | Activity group | Some registered products | Restriction on use |
|--|-------------------------------|--|------------------------------------|
| Grouped alphabetically within each restriction | Australian agrochemical codes | List of some chemical products available | The recommended withholding period |

3 AGROCHEMICALS REGISTERED FOR USE IN AUSTRALIAN VITICULTURE

Recommendations

| Active constituent | Activity group | Some registered products | Restriction on use |
|---------------------------------|----------------|--|--|
| BLACK SPOT | | | |
| captan ¹ | M4 | Captan, Captan 800 WG, Captan 900 WG, Captan WG | Not recommended for use on grapes destined for export wines. |
| captan ¹ + metalaxyl | M4 + 4 | Duplex WG | |
| benalaxyl + mancozeb | 4 + M3 | Galben M | Use no later than 80% capfall. |
| metiram | M3 | Polyram DF | |
| thiram | M3 | Thiragranz, Thiram DG, Thiram 800 WG | |
| ziram | M3 | Ziragranz, Ziram DG, Ziram Granuflo | |
| chlorothalonil | M5 | Applonil 720, Barrack 720, Barrack Betterstick, Bond 720, Bravo 720, Bravo Weather Stik, Cavalry Weatherguard, Cheers 720, Cheers 720 Weathershield, Chlornil 720 SC, Chloro 720, Chloronil Pro, Chlorothalonil, Chlorothalonil 720, Chlorothalonil 900 WG, Chlortan 720, Conan 720, Conan Sticks 720SC, Echo 720, Echo 900 WDG, Elect 500, Fung-o-nil 500, Unite 720, Whack 720, Whack 900 WG | |
| copper oxychloride | M1 | Cobox 500 WP, Copper Oxychloride WP, Oxydul DF | Use no later than 30 days before harvest. |
| dithianon | M9 | Delan 700 WG, Dinon 700 WG, Dragon 700 WG | |
| mancozeb | M3 | Choice Mancozeb 750 WG, Dithane Rainshield Neo Tec, Fortuna Globe 750WG, Kencozeb 750DF, Mancoflo, Mancozeb 750 DF, Mancozeb 750 WG, Mancozeb DF, Manic WG, Manzate DF, Manzeb, Penncozeb 750DF, Sinozeb 750 WG, Sinozeb Xtend 750 DF, UniZeb 750 DF, Unizeb Disperss 750 DF | |
| BOTRYTIS BUNCH ROT* | | | |
| boscalid ¹ | 7 | Filan | Not recommended for use on grapes destined for export wines. |
| captan ¹ | M4 | Captan, Captan 800 WG, Captan 900 WG, Captan WG | |
| captan ¹ + metalaxyl | M4 + 4 | Duplex WG | Use no later than 80% capfall. |
| fenhexamid | 17 | Teldor 500 SC | |
| fenpyrazamine | 17 | Prolectus | |
| pyrimethanil ² | 9 | Predict 600SC, Protector 400SC, Pyrus 400 SC, Scala 400 SC | |
| azoxystrobin | 11 | Affix 250SC, Amistar 250 SC, Avior 800 WG, Azaka, Azoxystrobin 250, Azoxystrobin 250 SC, Azoxystrobin 500 WG, Connect 800 WG, Kelpie Azoxy 250, Mirador 250 SC, Spartacus 250 SC, Spartacus 500WG, Stellar, Supernova 250SC | |

* Review resistance management strategies on pages 23 to 27.

1. Contact your winery or grape purchaser prior to the application of any captan or boscalid spray.
2. Apply no more than 800 g active per hectare (maximum 2 L of 400 SC and 1.33 L of 600SC formulations).

| Active constituent | Activity group | Some registered products | Restriction on use |
|---------------------------------------|----------------|---|--|
| BOTRYTIS BUNCH ROT* (CONT.) | | | |
| chlorothalonil | M5 | Applonil 720, Barrack 720, Barrack Betterstick, Bond 720, Bravo 720, Bravo Weather Stik, Cavalry Weatherguard, Cheers 720, Cheers 720 Weathershield, Chlornil 720 SC, Chloro 720, Chloronil Pro, Chlorothalonil, Chlorothalonil 720, Chlorothalonil 900 WG, Chlortan 720, Conan 720, Conan Sticks 720SC, Echo 500SC, Echo 720, Echo 900 WDG, Elect 500, Fungo-nil 500, Unite 720, Whack 720, Whack 900 WG | Use no later than E-L 29, berries pepper-corn size (not > 4 mm diameter). |
| tebuconazole + azoxystrobin | 3 + 11 | Custodia | |
| cyprodinil ³ | 9 | Solaris 300 EC | Use no later than E-L 29, berries |
| cyprodinil + fludioxonil ³ | 9 + 12 | Cyprofludox WG, Missile, Switch | pepper-corn size (not > 4 mm diameter) AND do not use within 60 days of harvest. |
| potassium salts of fatty acids | U1 | Ecoprotector | Use no later than 14 days before harvest. |
| hydrogen peroxide + peroxyacetic acid | M + M | Peracetic Acid, Peratec, Peratec PLUS, Peroxy Treat (suppression only) | Use no later than 7 days before harvest. |
| iprodione | 2 | Aquaflow 500 SC, Chief 250 Liquid, Chief Aquaflo, Corvette Flowable, Corvette Liquid, Ippon 500 Aquaflo, Ipral 250, Iprine 250, Iprine 500, Iprodex 250, Iprodione 250, Iprodione Aquaflow 500, Iprodione Liquid 250, Rovral Aquaflo, Rovral Liquid, Shelby 250, Sindon 500 SC, Sinpro 500 SC, Subscribe, Transact | Use no later than 7 days before harvest. Consult your winery/ grape purchaser before spraying within 30 days of harvest. |
| DOWNY MILDEW* | | | |
| captan ⁴ | M4 | Captan, Captan 800 WG, Captan 900 WG, Captan WG | Not recommended for use on grapes destined for export wines. |
| captan ⁴ + metalaxyl | M4 + 4 | Duplex WG | |
| phosphorous acid ⁴ | 33 | Agri-Fos 600, CropDoc 600, Dominator 600, Fungacid 600, Fungi-Fos 400, Fungi-Fos 400 pH 7.2, Grow-Phos 600, Phos Phyt 400, Phosspot 400, Phosspot 400 pH 7.2, Phospot 600, Sprayphos 400, Sprayphos 600, Sprayphos 620, Throw Down, Throw Down 600 | |
| ametoctradin + dimethomorph | 45 + 40 | Zampro | Use no later than 80% capfall. |
| benalaxyl + mancozeb | 4 + M3 | Galben M | |
| dimethomorph | 40 | Acrobat SC, Downright, Sphinx | |
| metiram | M3 | Polyram DF | |
| oxadixyl + propineb | 4 + M3 | Rebound WP | |

* Review resistance management strategies on pages 23 to 27.

3. Do not apply products containing cyprodinil at both flowering and growth stage E-L 29.

4. Contact your winery or grape purchaser prior to the application of any captan or phosphorous acid spray.

5 AGROCHEMICALS REGISTERED FOR USE IN AUSTRALIAN VITICULTURE

| Active constituent | Activity group | Some registered products | Restriction on use |
|---------------------------------------|----------------|---|--|
| DOWNY MILDEW* (CONT.) | | | |
| zineb | M3 | Zineb | Use no later than 80% capfall. |
| mandipropamid | 40 | Revus | Use no later than E-L 26 (capfall complete). |
| azoxystrobin | 11 | Affix 250SC, Amistar 250 SC, Avior 800 WG, Azaka, Azoxystrobin 250, Azoxystrobin 250 SC, Azoxystrobin 500 WG, Connect 800 WG, Kelpie Azoxy 250, Mirador 250 SC, Spartacus 250 SC, Spartacus 500WG, Stellar, Supernova 250SC | Use no later than E-L 29, berries pepper-corn size (not > 4 mm diameter). |
| chlorothalonil | M5 | Applonil 720, Barrack 720, Barrack Betterstick, Bond 720, Bravo 720, Bravo Weather Stik, Cavalry Weatherguard, Cheers 720, Cheers 720 Weathershield, Chlornil 720 SC, Chloro 720, Chloronil Pro, Chlorothalonil, Chlorothalonil 720, Chlorothalonil 900 WG, Chlortan 720, Conan 720, Conan Sticks 720SC, Echo 500SC, Echo 720, Echo 900 WDG, Elect 500, Fungo-nil 500, Unite 720, Whack 720, Whack 900 WG | |
| tebuconazole + azoxystrobin | 3 + 11 | Custodia | |
| amisulbrom + tribasic copper sulphate | 21 + M1 | Amicus Blue | Use no later than E-L 31, berries pea-size (not > 7 mm diameter). |
| trifloxystrobin | 11 | Flint 500 WG (suppression only) | |
| pyraclostrobin | 11 | Cabrio, Cabrio WG | Use no later than E-L 31, berries pea-size (not > 7 mm diameter) AND do not use within 63 days of harvest. |
| copper ammonium acetate | M1 | Cop-IT | Use no later than 30 days before harvest. |
| copper ammonium complex | M1 | Copperguard, Liquicop | |
| copper cuprous oxide | M1 | Ag Copp 750, Nordox 750 WG, Red Copper WG | |
| copper hydroxide | M1 | Blue Shield DF, Champ 500WG, Champ Dry Prill WG, Flo-Bordo, Hydrocop, Kocide Blue Xtra, Kocide Opti, Vitra 400 WG | |
| copper octanoate | M1 | Tricop | |
| copper oxychloride | M1 | Cobox 500 WP, Copper Oxychloride, Copper Oxychloride 500 WP, Copper Oxychloride WP, Coppox WG, Coppox WP, Neoram 375 WG, Oxydul DF, Uni-Guard 500 WP | |
| copper sulfate tribasic | M1 | Bordeaux WG, Cuprofix Disperss, Tri-Base Blue, Tribasic Liquid | |
| copper sulfate tribasic + mancozeb | M1 + M3 | Copman DF, Novofix Disperss | |
| dithianon | M9 | Delan 700 WG, Dinon 700 WG, Dragon 700 WG | |

* Review resistance management strategies on pages 23 to 27.

| Active constituent | Activity group | Some registered products | Restriction on use |
|---------------------------------------|----------------|--|--|
| DOWNY MILDEW* (CONT.) | | | |
| mancozeb | M3 | Choice Mancozeb 750 WG, Dithane Rainshield Neo Tec, Fortuna Globe 750WG, Kencozeb 750DF, Mancoflo, Mancozeb 750 DF, Mancozeb 750 WG, Mancozeb DF, Manic WG, Manzate DF, Manzeb, Penncozeb 420 SC, Penncozeb 750DF, Sinozeb 750 WG, Sinozeb Xtend 750 DF, UniZeb 750 DF, Unizeb Disperss 750 DF | Use no later than 30 days before harvest. |
| metalaxyl - M + copper hydroxide | 4 + M1 | Ridomil Gold Plus | |
| metalaxyl - M + mancozeb | 4 + M3 | Ridomil Gold MZ WG | |
| metalaxyl + copper oxychloride | 4 + M1 | Axiom Plus, Copper Plus, Medley Plus, Metalaxyl + Copper Oxychloride WP, Zeemil Plus | |
| metalaxyl + mancozeb | 4 + M3 | Axiom MZ 720, Max MZ, Maxyl, Medley MZ, Metal-Man MZ 720, Zeemil 720WG, Zeemil MZB 720 WP | |
| sulfur + copper oxychloride | M2 + M1 | Mildex WG | |
| hydrogen peroxide + peroxyacetic acid | M + M | Peratec PLUS (suppression only) | Use no later than 7 days before harvest. |
| EUTYPA DIEBACK | | | |
| cyproconazole + iodocarb | 3 + 28 | Garrison Rapid Pruning Wound Dressing | Dormancy application only. |
| fluazinam | 29 | Emblem, Gem | |
| tebuconazole | 3 | Gelseal, Greenseal | |
| <i>Trichoderma herzianum</i> | NA | Vinevax Bio-Implants, Vinevax Wound Dressing | |
| PHOMOPSIS CANE AND LEAF SPOT | | | |
| captan ⁵ | M4 | Captan, Captan 800 WG, Captan 900 WG, Captan WG | Not recommended for use on grapes destined for export wines. |
| captan ⁵ + metalaxyl | M4 + 4 | Duplex WG | |
| fluazinam | 29 | Emblem, Gem | Dormancy spray only. |
| metiram | M3 | Polyram DF | Use no later than 80% capfall. |
| copper sulfate tribasic + mancozeb | M1 + M3 | Novofix Disperss | Use no later than 30 days before harvest. |
| dithianon | M9 | Delan 700 WG, Dinon 700 WG, Dragon 700 WG | |
| mancozeb | M3 | Choice Mancozeb 750 WG, Dithane Rainshield NeoTec, Fortuna Globe 750WG, Kencozeb 750 DF, Mancoflo, Mancozeb 750 DF, Mancozeb 750 WG, Mancozeb DF, Manic WG, Manzate DF, Manzeb, Penncozeb 420 SC, Penncozeb 750DF, Sinozeb Xtend 750 DF, UniZeb 750 DF, Unizeb Disperss 750 DF | |

* Review resistance management strategies on pages 23 to 27.

5. Contact your winery or grape purchaser prior to the application of any captan spray.

7 AGROCHEMICALS REGISTERED FOR USE IN AUSTRALIAN VITICULTURE

| Active constituent | Activity group | Some registered products | Restriction on use |
|---|----------------|---|--|
| POWDERY MILDEW* | | | |
| boscalid ⁶ | 7 | Filan | Not recommended for use on grapes destined for export wines. |
| difenoconazole | 3 | Digger | Use no later than 80% capfall. |
| hexaconazole | 3 | Viva | |
| metrafenone | U8 | Vivando | |
| spiroxamine | 5 | Prosper 500 EC | |
| sulfur, elemental or crystalline sulfur | M2 | Dusting Sulphur, Dusting Sulphur 900 | Use no later than 12 weeks before harvest. |
| azoxystrobin | 11 | Affix 250SC, Amistar 250 SC, Avior 800 WG, Azaka, Azoxystrobin 250, Azoxystrobin 250 SC, Azoxystrobin 500 WG, Connect 800 WG, Kelpie Azoxy 250, Mirador 250 SC, Spartacus 250 SC, Spartacus 500WG, Stellar, Supernova 250SC | Use no later than E-L 29, berries pepper-corn size (not > 4 mm diameter). |
| sulfur + tebuconazole | M2 + 3 | Unicorn 745WG | Use no later than E-L 31, berries pea-size (not > 7 mm diameter). |
| tebuconazole | 3 | Buzz Ultra 750WG, Folicur 430 SC, Laguna Xtreme 800 WG, Launch, Orius 430 SC, Zolo 430 SC | |
| tebuconazole + azoxystrobin | 3 + 11 | Custodia | |
| cyflufenamid | U6 | Flute 50 EW | |
| paraffinic oil | n/a | BioPest | Use no later than E-L 31, berries pea-size (not > 7 mm diameter). |
| pyriofenone | U8 | Kusabi 300 SC | |
| trifloxystrobin | 11 | Flint 500 WG | |
| pyraclostrobin | 11 | Cabrio, Cabrio WG | |
| penconazole | 3 | Azotic, Delos, Pearl, Ruby 100EC, Topas 100 EC | Use no later than E-L 31, berries pea-size (not > 7 mm diameter) AND do not use within 60 days of harvest. |
| tetraconazole | 3 | Domark 40ME, Mettle 40ME | |
| quinoxifen | 13 | Legend, Quinfen 250 SC | Use no later than E-L 34 (before commencement of veraison) AND do not use within 42 days of harvest. |

* Review resistance management strategies on pages 23 to 27.

6. Contact your winery or grape purchaser prior to the application of any boscalid spray.

| Active constituent | Activity group | Some registered products | Restriction on use |
|--|----------------|--|---|
| POWDERY MILDEW* (CONT.) | | | |
| triadimefon | 3 | Triadimefon 125 | Use no later than 35 days before harvest. |
| triadimenol | 3 | Allitron, Bayfidan 250 EC, Citadel, Triadimenol 250 EC, Tridim 250 EC | |
| copper ammonium acetate | M1 | Cop-IT | Use no later than 30 days before harvest. |
| copper ammonium complex | M1 | Copperguard, Liquicop | |
| myclobutanil | 3 | Mycloss Xtra | |
| proquinazid | 13 | Talendo | |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, David Grays Sulphur Spray, Flosul 800, InnoSulph 800 WG, Kendon Sulphur, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Rutec Sulfur, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | |
| sulfur + copper oxychloride | M2 + M1 | Mildex WG | |
| hydrogen peroxide + peroxyacetic acid | M + M | Peratec PLUS (suppression only) | |
| potassium bicarbonate | M2 | Ecocarb | |

AUSTRALIAN PLAGUE LOCUST

| | | | |
|---|-----|--|--|
| <i>Metarhizium anisopliae</i> var. <i>acridum</i> | n/a | Green Guard SC, Green Guard SC Premium | Use no later than 7 days before harvest. |
|---|-----|--|--|

BUD MITE

| | | | |
|--|----|---|---|
| sulfur, present as polysulfide | M2 | Lime Sulphur | Apply as near as possible to budburst. |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, InnoSulph 800 WG, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | Use no later than 30 days before harvest. |

BUNCH MITE

| | | | |
|--|----|--|---|
| sulfur, present as polysulfide | M2 | Lime Sulphur | Apply as near as possible to budburst. |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, InnoSulph 800 WG, Microsul WG Elite, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Wettable Sulphur | Use no later than 30 days before harvest. |

* Review resistance management strategies on pages 23 to 27.

| Active constituent | Activity group | Some registered products | Restriction on use |
|--|----------------|--|--|
| GARDEN WEEVIL | | | |
| indoxacarb | 22A | Avatar | Use no later than E-L 31, berries pea-size (not > 7 mm diameter) AND do not use within 56 days of harvest. |
| GRAPE LEAF BLISTER MITE | | | |
| paraffinic oil | n/a | Heavy Paraffinic Dormant Spray Oil | Dormancy spray only. |
| petroleum oil | n/a | Stifle, Vicol Winter Oil | |
| sulfur, present as polysulfide | M2 | Lime Sulphur | Apply as near as possible to budburst. |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, David Grays Sulphur Spray, Flosul 800, InnoSulph 800 WG, Kendon Sulphur, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Rutec Sulfur, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulphur WG, Sulgran WG, Sulphur 800 WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | Use no later than 30 days before harvest. |
| GRAPE LEAF RUST MITE | | | |
| sulfur, present as polysulfide | M2 | Lime Sulphur | Apply as near as possible to budburst. |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, Flosul 800, InnoSulph 800 WG, Kendon Sulphur, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Rutec Sulfur, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | Use no later than 30 days before harvest. |
| GRAPEVINE MOTH | | | |
| chlorantraniliprole | 28 | Altacor, Altacor Hort | Use no later than 80% capfall. |
| spinetoram | 5 | Delegate | Use no later than E-L 31, berries pea-size (not > 7 mm diameter). |
| emamectin | 6 | Proclaim, Warlock | Use no later than E-L 31, berries pea-size (not > 7 mm diameter)AND do not use within 56 days of harvest. |
| indoxacarb | 22A | Avatar | |
| <i>Bacillus thuringiensis</i> subspecies <i>aizawai</i> | 11 | Bacchus WG | May be used until harvest. |
| <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> | 11 | Delfin, DiPel DF | |
| <i>Trichogrammanza carverae</i> | n/a | Trichogramma parasitic wasp | |

| Active constituent | Activity group | Some registered products | Restriction on use |
|---|----------------|--|--|
| GRAPEVINE SCALE⁷ | | | |
| paraffinic oil | n/a | Bioclear, BioPest, Heavy Paraffinic Dormant Spray Oil, Trump Spray Oil | Dormancy spray only. |
| petroleum oil | n/a | All Seasons White Oil, D-C-Tron Plus Spray Oil, Sacoa Summer Spray Oil, Stifle, Vicol Summer Oil, Vicol Winter Oil | |
| spirotetramat | 23 | Movento 240 SC (suppression only) | Use no later than E-L 18. |
| LIGHT BROWN APPLE MOTH | | | |
| chlorantraniliprole | 28 | Altacor, Altacor Hort | Use no later than 80% capfall. |
| methoxyfenozide | 18 | Prodigy | |
| spinetoram | 5 | Delegate | Use no later than E-L 31, berries pea-size (not > 7 mm diameter). |
| emamectin | 6 | Proclaim, Warlock | Use no later than E-L 31, berries pea-size (not > 7 mm diameter) AND do not use within 56 days of harvest. |
| indoxacarb | 22A | Avatar | |
| <i>Bacillus thuringiensis</i> subspecies <i>aizawai</i> | 11 | Bacchus WG, | May be used until harvest. |
| <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> | 11 | Delfin, DiPel DF | |
| tetradecenyl acetate + tetradecadienyl acetate | n/a | Isomate LBAM Plus Pheromone, MD LBAM Corto, MD LBAM Flex Pheromone, MD LBAM Pheromone | |
| <i>Trichogrammanza carverae</i> | n/a | Trichogramma parasitic wasp | |
| MEALYBUG⁸ | | | |
| paraffinic oil | n/a | Bioclear, BioPest, Trump Spray Oil | Dormancy spray only. |
| spirotetramat | 23 | Movento 240 SC | Use no later than E-L 18. |
| buprofezin | 16 | Applaud, Scale & Bug, Strident | Use no later than 80% capfall. |
| MEDITERRANEAN/QUEENSLAND FRUIT FLY | | | |
| A baiting program that does not target fruit or foliage is recommended. | | | |
| Control options for fruit fly are subject to APVMA permit conditions. | | | |
| Contact your winery or grape purchaser prior to any 1A, 1B, 2B or 3A insecticide. | | | |

7. Some group 1B insecticides are registered for grapevine scale. Contact your winery or grape purchaser prior to any 1B insecticide application.

8. Consult product label, registration may apply to specific mealybug species.

| Active constituent | Activity group | Some registered products | Restriction on use |
|--|----------------|---|--|
| SNAIL | | | |
| copper complex | n/a | Escar-go, Socusil | Dormancy spray only. |
| metaldehyde | n/a | Meta (pellets), Metarex Snail and Slug bait, Pestmaster Snail and Slug pellets, Slug Out (bait), Slugger Slug and Snail pellets | Ground application only. Use no later than 7 days before harvest. |
| iron EDTA complex | n/a | Multiguard Snail and Slug Killer | Ground application only. May be used until harvest. |
| TWO SPOTTED MITE | | | |
| petroleum oil | n/a | Stifle | Dormancy spray only. |
| sulfur, present as polysulfide | M2 | Lime Sulphur | Apply as near as possible to budburst. |
| sulfur, present as elemental or crystalline sulfur | M2 | Cosamil, Cosavet WG, InnoSulph 800 WG, Microsul WG Elite, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet | Use no later than 30 days before harvest. |
| etoxazole | 10B | ParaMite | Use no later than 21 days before harvest |
| WINGLESS GRASSHOPPER | | | |
| indoxacarb | 22A | Avatar | Use no later than E-L 31, berries pea-size (not > 7 mm diameter) AND do not use within 56 days of harvest. |
| <i>Metarhizium anisopliae</i> var. <i>acridum</i> | n/a | Green Guard SC, Green Guard SC Premium | Use no later than 7 days before harvest. |

Growth stage description

GROWTH STAGE ASSESSMENTS ARE **NOT** AN AVERAGE ACROSS THE VINEYARD. BASE ALL GROWTH STAGE ASSESSMENTS ON THE **MOST ADVANCED VINES** IN THE BLOCK.

Budburst: When the first green tips are visible (E-L 4).

E-L 18: 14 leaves separated, flower caps still in place, but cap colour fading from green.

5% capfall: E-L stage 19-20; flowers have just begun to open and the first caps have lifted and fallen off. No developing berries present.

80% capfall: E-L stage 25; 80% of caps have just lifted and the largest berries are no more than 2 mm in diameter.

E-L 29: Just after berry set, berries peppercorn size (not > 4 mm diameter); bunches tending downwards.

Pre-bunch closure: E-L stage 31; berries have reached pea-size (not > 7 mm diameter); bunches hanging down.

Veraison: E-L stage 35; when 50% of berries begin to soften and sugar starts increasing.

Grapevine growth stage table

| MAJOR STAGES | E-L number | ALL STAGES | |
|--|------------|---|-------------------------------------|
| | 1 | Winter bud | Shoot and inflorescence development |
| | 2 | Bud scales opening | |
| | 3 | Woolly bud ± green showing | |
| 4 Budburst | 4 | Budburst; leaf tips visible | |
| | 7 | First leaf separated from shoot tip | Flowering |
| | 9 | 2 to 3 leaves separated; shoots 2-4 cm long | |
| 12 Shoots 10 cm Inflorescence clear, 5 leaves separated | 11 | 4 leaves separated | |
| | 12 | 5 leaves separated; shoots about 10 cm long; inflorescence clear | |
| | 13 | 6 leaves separated | |
| | 14 | 7 leaves separated | |
| | 15 | 8 leaves separated, shoot elongating rapidly; single flowers in compact groups | |
| | 16 | 10 leaves separated | |
| 19 Flowering begins | 17 | 12 leaves separated; inflorescence well developed, single flowers separated | |
| | 18 | 14 leaves separated; flower caps still in place, but cap colour fading from green | |
| | 19 | About 16 leaves separated; beginning of flowering (first flower caps loosening) | Berry formation |
| | 20 | 10% caps off | |
| 23 Flowering 50% caps off | 21 | 30% caps off | |
| | 23 | 17-20 leaves separated; 50% caps off (= flowering) | |
| | 25 | 80% caps off | Berry ripening |
| | 26 | Cap-fall complete | |
| 27 Setting Young berries growing Bunch at right angles to stem | 27 | Setting; young berries enlarging (>2 mm diam.), bunch at right angles to stem | |
| | 29 | Berries pepper-corn size (4 mm diam.); bunches tending downwards | |
| 31 Berries pea-size Bunches hanging down | 31 | Berries pea-size (7 mm diam.) | |
| | 32 | Beginning of bunch closure, berries touching (if bunches are tight) | Senescence |
| | 33 | Berries still hard and green | |
| | 34 | Berries begin to soften; Sugar starts increasing | |
| 35 Veraison Berry softening continues Berry colouring begins | 35 | Berries begin to colour and enlarge | |
| | 36 | Berries with intermediate sugar values | |
| | 37 | Berries not quite ripe | |
| 38 Harvest Berries ripe | 38 | Berries harvest-ripe | |
| | 39 | Berries over-ripe | |
| | 41 | After harvest; cane maturation complete | |
| | 43 | Beginning of leaf fall | |
| | 47 | End of leaf fall | |

"Grapevine growth stages" Viticulture 1 - Resources. 2nd edition 2004. Eds. Dry, P. and Coombe, B. (Winetitles)
13 AGROCHEMICALS REGISTERED FOR USE IN AUSTRALIAN VITICULTURE

Agrochemicals registered for use in Australian viticulture

The following products are registered by the Australian Pesticides and Veterinary Medicines Authority for use in wine-grape production in Australia. Always read the label on the chemical container as the products listed in the table might not necessarily be registered for use in your state.

To avoid the development of chemical resistance, it is necessary to know how the product works. Most chemicals have been allocated an 'activity group' based on their mode of action. The activity group appears on the product label as a number (or letter and number) for fungicides, a letter for herbicides and a number and letter or only a letter in the case of insecticides and miticides. Sometimes the resistance management strategy is also shown on the label. Management strategies to avoid the development of fungicide resistance have been published by CropLife Australia, and are described on page 23. More information regarding activity groups can be found on the CropLife Australia website: www.croplifeaustralia.org.au

In the past, the export restriction on use for many of the insecticides listed in the table below has not been provided. Due to international pressures, the use of agrochemicals belonging to chemical groups such as the organophosphates and carbamates is not encouraged. The recommended restriction on use for all 1A, 1B, 2B, 4A and 4C insecticides listed in this booklet is 'Use no later than 80% capfall'. In addition, it is recommended that any 3A insecticides that are not restricted to use during dormancy only (label withholding period), should not be used later than 80% capfall. However, it is essential that you contact your winery/grape purchaser prior to the application of any 1A, 1B, 2B, 3A, 4A or 4C insecticide.

The CropLife resistance management strategies on page 23 are a guide only and do not endorse particular products, groups of products or cultural methods in terms of their performance. Always follow the product label for specific use instructions. While all effort has been taken with the information supplied in this document, no responsibility, actual or implied, is taken for the day to day accuracy of product or active constituent specific information. Readers should check with the Australian regulator's (APVMA) product database for contemporary information on products and actives. The database can be sourced through www.apvma.gov.au. The information given in the resistance management strategies is provided in good faith and without any liability for loss or damage suffered as a result of its application and use.

How to use the following table

| Active constituent(s) | Some registered products | Re-entry period range | Activity group |
|---|--|---|-------------------------------|
| Grouped alphabetically for each chemical type | List of some chemical products available | Code for label mandated safe re-entry periods. See page 22 for details. | Australian agrochemical codes |

AGROCHEMICALS REGISTERED FOR USE IN AUSTRALIAN VITICULTURE 14

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|--------------------------------------|---|-----------------|----------------|
| FUNGICIDE | | | |
| ametoctradin + dimethomorph | Zampro | a | 45 + 40 |
| amisulbrom + tribasic copper sulfate | Amicus Blue | i | 21 + M1 |
| azoxystrobin | Affix 250SC, Amistar 250 SC, Avior 800 WG, Azaka, Azoxystrobin 250, Azoxystrobin 250 SC, Azoxystrobin 500 WG, Connect 800 WG, Kelpie Azoxy 250, Mirador 250 SC, Spartacus 250 SC, Spartacus 500WG, Stellar, Supernova 250SC | a, n | 11 |
| benalaxyl + mancozeb | Galben M | a | 4 + M3 |
| boscalid | Filan | a | 7 |
| captan | Captan, Captan 800 WG, Captan 900 WG, Captan WG | a, k | M4 |
| captan + metalaxyl | Duplex WG | e | M4 + 4 |
| chlorothalonil | Applonil 720, Barrack 720, Barrack Betterstick, Bond 720, Bravo 720, Bravo Weather Stik, Cavalry Weatherguard, Cheers 720, Cheers 720 Weathershield, Chlornil 720 SC, Chloro 720, Chloronil Pro, Chlorothalonil, Chlorothalonil 720, Chlorothalonil 900 WG, Chlortan 720, Conan 720, Conan Sticks 720SC, Echo 500SC, Echo 720, Echo 900 WDG, Elect 500, Fungo-nil 500, Unite 720, Whack 720, Whack 900 WG | a | M5 |
| copper ammonium acetate | Cop-IT | a | M1 |
| copper ammonium complex | Copperguard, Liquicop | a | M1 |
| copper cuprous oxide | Ag Copp 750, Nordox 750 WG, Red Copper WG | a | M1 |
| copper hydroxide | Blue Shield DF, Champ 500WG, Champ Dry Prill WG, Flo-Bordo, Hydrocop, Kocide Blue Xtra, Kocide Opti, Vitra 400 WG | a | M1 |
| copper octanoate | Tricop | a | M1 |
| copper oxychloride | Cobox 500 WP, Copper Oxychloride, Copper Oxychloride 500 WP, Copper Oxychloride WP, Coppox WG, Coppox WP, Neoram 375 WG, Oxydul DF, Uni-Guard 500 WP | a | M1 |
| copper sulfate tribasic | Bordeaux WG, Cuprofix Disperss, Tri-Base Blue, Tribasic Liquid | a | M1 |
| copper sulfate tribasic + mancozeb | Copman DF, Novofix Disperss | a, c | M1 + M3 |
| cyflufenamid | Flute 50 EW | a | U6 |
| cyproconazole + iodocarb | Garrison Rapid pruning wound dressing | a | 3 + 28 |
| cyprodinil | Solaris 300 EC | a | 9 |
| cyprodinil + fludioxonil | Cyprofludox WG, Missile, Switch | a | 9 + 12 |
| difenoconazole | Digger | a | 3 |
| dimethomorph | Acrobat SC, Downright, Sphinx | a | 40 |

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|---------------------------------------|---|-----------------|----------------|
| FUNGICIDE (CONT.) | | | |
| dithianon | Delan 700 WG, Dinon 700 WG, Dragon 700 WG | a | M9 |
| fenhexamid | Teldor 500 SC | a | 17 |
| fenpyrazamine | Prolectus | a | 17 |
| fluazinam | Emblem, Gem | a, p | 29 |
| hexaconazole | Viva | a | 3 |
| hydrogen peroxide + peroxyacetic acid | Peracetic Acid, Peratec, Peratec PLUS, Peroxy Treat | a | M + M |
| iprodione | Aquaflow 500 SC, Chief 250 Liquid, Chief Aquaflow, Corvette Flowable, Corvette Liquid, Ippon 500 Aquaflow, Ipral 250, Iprine 250, Iprine 500, Iprodex 250, Iprodione 250, Iprodione Aquaflow 500, Iprodione Liquid 250, Rovral Aquaflow, Rovral Liquid, Shelby 250, Sindon 500 SC, Sinpro 500 SC, Subscribe, Transact | a | 2 |
| mancozeb | Dithane Rainshield Neo Tec, Fortuna Globe 750WG, Kencozeb 750DF, Mancoflo, Mancozeb 750 DF, Mancozeb 750 WG, Mancozeb DF, Manic WG, Manzate DF, Manzeb, Penncozeb 420 SC, Penncozeb 750DF, Sinozeb 750 WG, Sinozeb Xtend 750 DF, UniZeb 750 DF, Unizeb Disperss 750 DF | a | M3 |
| mandipropamid | Revus | a | 40 |
| metalaxyl - M + copper hydroxide | Ridomil Gold Plus | a | 4 + M1 |
| metalaxyl - M + mancozeb | Ridomil Gold MZ WG | a | 4 + M3 |
| metalaxyl + copper oxychloride | Axiom Plus, Copper Plus, Medley Plus, Metalaxyl + Copper Oxychloride WP, Zeemil Plus | a | 4 + M1 |
| metalaxyl + mancozeb | Axiom MZ 720, Max MZ, Maxyl, Medley MZ, Metal-man MZ 720, Zeemil 720 WG, Zeemil MZB 720 WP | a, o | 4 + M3 |
| metiram | Polyram DF | a | M3 |
| metrafenone | Vivando | a | U8 |
| myclobutanil | Mycloss Xtra | g | 3 |
| oxadixyl + propineb | Rebound WP | a | 4 + M3 |
| paraffinic oil | BioPest | a | unspecified |
| penconazole | Azotic, Delos, Pearl, Ruby 100EC, Topas 100 EC | a | 3 |
| phosphorous acid | Agri-Fos 600, Crop Doc 600, Dominator 600, Fungacid 600, Fungi-Fos 400, Fungi-Fos 400 pH 7.2, Grow-Phos 600, Phos Phyt 400, Phospot 400, Phospot 400 pH 7.2, Phospot 600, Sprayphos 400, Sprayphos 600, Sprayphos 620, Throw Down, Throw Down 600 | a | 33 |
| potassium bicarbonate | Ecocarb | a | M2 |
| potassium salts of fatty acids | Ecoprotector | a | U1 |

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|--|--|-----------------|----------------|
| FUNGICIDE (CONT.) | | | |
| procymidone | Fortress 500, Procymidone 500, Proflex 500, Sumisclex 500 | m | 2 |
| proquinazid | Talendo | a | 13 |
| pyraclostrobin | Cabrio, Cabrio WG | a | 11 |
| pyrimethanil | Predict 600 SC, Protector 400SC, Pyrus 400 SC, Scala 400 SC | a | 9 |
| pyriofenone | Kusabi 300 SC | a | U8 |
| quinoxifen | Legend, Quinfen 250 SC | a | 13 |
| spiroxamine | Prosper 500 EC | a | 5 |
| sulfur + copper oxychloride | Mildex WG | a | M2 + M1 |
| sulfur + tebuconazole | Unicorn 745WG | h | M2 + 3 |
| sulfur, present as elemental or crystalline sulfur | Cosamil, Cosavet WG, David Grays Sulphur Spray, Dusting Sulphur, Dusting Sulphur 900, Flosul 800, InnoSulph 800 WG, Kendon Sulphur, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Rutec Sulfur, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | a | M2 |
| tebuconazole | Buzz Ultra 750WG, Folicur 430 SC, Gelseal, Greenseal, Laguna Xtreme 800 WG, Launch, Orius 430 SC, Zolo 430 SC | a, i | 3 |
| tebuconazole + azoxystrobin | Custodia | a | 3 + 11 |
| tetraconazole | Domark 40ME, Mettle 40ME | a | 3 |
| thiram | Thiragranz, Thiram DG, Thiram 800 WG | a | M3 |
| triadimefon | Slingshot, Triadimefon 125 | a | 3 |
| triadimenol | Allitron, Bayfidan 250 EC, Citadel, Triadimenol 250 EC, Tridim 250 EC | a | 3 |
| <i>Trichoderma harzianum</i> | Vinevax Bio-Implants, Vinevax Wound Dressing | a | unspecified |
| trifloxystrobin | Flint 500 WG | a | 11 |
| zineb | Zineb | a | M3 |
| ziram | Ziragranz, Ziram DG, Ziram Granuflo | a | M3 |

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|--------------------------------------|--|-----------------|----------------|
| HERBICIDE | | | |
| 2,2-DPA-sodium (dalapon-sodium) | Dalapon 740 SP | a | J |
| amitrole + ammonium thiocyanate | Amitrole 250, Amitrol T | a | Q |
| amitrole + paraquat | Alliance, Para-Trooper | a, j | Q + L |
| bromoxynil + diflufenican | Bentley, Colt, Cougar, Difluken B, Jaguar, Kelpie DFF + Brom MX | a | C + F |
| carfentrazone-ethyl | Artillery, Carfentrazone 240 EC, Carfentrazone-ethyl 240 EC, Elevate, Hammer 400 EC, Nail 240 EC, Nail 600 EC, Spotlight Plus | a | G |
| dichlobenil | Casaron 4G, Casaron G | a | O |
| diquat | Desiquat, Dia-Kill 200, Diquat 200, Reglone | a | L |
| diquat + paraquat | Blowout, Brown Out 250, Combik 250, Di-Par 250, EOS, Kwicknock 250, Paradat, Paradym 250, Paraquat + Diquat 250, Paraquat/Diquat, Pre-Seed 250, Revolver, Scorcher 250, Speedy 250, Spray & Sow, Spray Seed 250, Spraykill 250, Uni-Spray 250 | a | L + L |
| fluazifop-P | Fusilade Forte, Fuzilier, Resilience, Rootout 212 | a | A |
| flumioxazin | Chateau | a | G |
| glufosinate-ammonium | Basta, Biffo, Cease, Commando 200, Exile, Exonerate, Exonerate200 SL, Fascinate 200 SL, Faster-TG 200, Fiestar, Gamma, Glufonium 200 SL, Glufosinate 200, Glufosinate-Ammonium 200, Kelpie G-FOS 200, Sky-7th 200 | a | N |
| glyphosate-ipa | AllOut 450, BioChoice 360, ClearUp Glyphosate 450, Eradicator 540, Eraze 360 Bi-aquatic, Eraze 510 Bi-aquatic, Gladiator, Glister 360, Glister 450, Glymount 450, Glyphosate 360, Glyphosate 360 SL, Glyphosate 450, Glyphosate 450 CT, Glyphosate 450 SL, Glyphosate 510, Glyphosate 510SL, Glyphosate CT, Kelpie Rico 450 GLY, Ken-Up 450 CT, Ken-Up Aquatic 360, Knockout 450, Pestmaster Aqua-Tech 360, Pestmaster Glyphosate CT, Raze, Roundup, Roundup Biactive, RoundupCT, Sanos 360, Sanos 450, Sickie 540, SquareDown 360, Wipe-Out 450, Wipe-Out Bio | a | M |
| glyphosate-ipa + carfentrazone ethyl | Broadway | a | M + G |
| glyphosate-ipa + mas | Credit, Weedmaster Duo | a | M + M |
| glyphosate-mas | Bazooka Dry 800 SG, ClearUp 700 Bio-Dri, ClearUp 700 Dri Broadacre, ClearUp 840 Dry-Flo, Gladiator Dry 680 WG, Glister 680 SG, Glyphosate 680, Glyphosate 700, Glyphosate 700SG, Glyphosate 875, Ken-Up Dry 680 WG, Roundup Ready Plantshield | a | M |
| glyphosate-mea | Clear Up 450 SL, Glyphosate 450 SL | a | M |

AGROCHEMICALS REGISTERED FOR USE

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|---------------------------------|---|-----------------|----------------|
| HERBICIDE (CONT.) | | | |
| glyphosate-potassium salt | Cotton Glyphosate 495, Firebolt, Gladiator Optimax, Glyphosate 540K, Glyphosate K-Tech 500SL, Kelpie GLY 540 SL, Max Out 540, Roundup Dura, Roundup Ready PL, Roundup Ultra MAX, Touchdown Hitech, Warlord 540 Hi-Load, Wipe-Out Accelerate | a | M |
| glyphosate-potassium salt + ipa | Weedmaster Argo | a | M + M |
| glyphosate-potassium salt + mas | Weedmaster Dual Salt Technology | a | M + M |
| haloxyfop-R methyl ester | Convict, Exert 520, Firepower, Haloxyfop 520, Haloxyfop 520 EC, Haloxyfop 900EC, Haloxyken 520, Hermes 520, Jasper 520, Recon 520, Verdict 520 | a | A |
| isoxaben | Gallery 750 DF | a | O |
| napropamide | Devrinol WG | a | K |
| nonanoic acid | Slasher | a | unspecified |
| norflurazon | Zoliar DF | a | F |
| oryzalin | Cameo 500, Oryzalin 500, Prolan 500, Stonewall, Surflan 500 | a | D |
| oxyfluorfen | Cavalier, Convert 240 EC, Crossbar 240, GoalTender, Gowel 240 EC, Ox 240, Oxen 240EC, Oxyfan 240 EC, Oxyfluorfen 240 EC, Point, Striker | a | G |
| paraquat | Explode250, Gramoxone250, Nuquat 250, Paradox 250, Para-Ken250, Para-Ken334, Paraquat 250, Paraquat 250 SL, Powerquat 300 SL, Shirquat250, Sinmosa 250, Sprayquat250, Spraytop250SL, Uniquat 250 | a | L |
| pendimethalin | Cronos 440EC, Fist 330, Panda 435, Panida Grande, Pendimethalin 330, Pendimethalin 330EC, Pendimethalin 440 EC, Rifle 440, Romper 440 EC | a, c | D |
| pine oil | BioWeed | a | unspecified |
| quizalofop-P-ethyl | Atomic Selective Herbicide, Elantra, Elantra Xtreme, Leopard, Leopard 200 EC, Quinella 100 EC, Quinella Upgrade, Quiz, Quizalofop-P-ethyl 200 EC, Sextant, Tiger Gold 250 | a, l | A |
| simazine | Gesatop 600 SC, Gesatop Granules 900 WG, Kelpie S-Zine 900, Kelpie S-Zine 900WG, Simagranz, Simanex 900 WG, SimaPhos 900 WG, Simaquest 900 WG, Simazine 500 Flowable, Simazine 900 DF, Simazine 900 WDG, Simazine 900 WG | a | C |
| trifluralin | Trampoline 480, Tricon Flexi 480, Triflur X, Trifluralin 480, Trifluralin 480 EC, Triflurasip 480, Trilogy, Trilogy 600, Uni-Try | a | D |

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|---|---|-----------------|----------------|
| INSECTICIDE | | | |
| alpha-cypermethrin | Alpha Duo 100, Alpha Duop 100, Alpha Forte 250 SC, Alpha-Cyper 100 EC, Alpha-Cypermethrin 100 EC, Alpha-Cypermethrin 250 SC, Alpha-Scud Elite, Astound Duo, Buzzard, Chieftain Duo 100EC, Dictate Duo 100, Dominex Duo, Ken-Tac 100, Mascot Duo, UniChoice 100 EC | a, c | 3A |
| <i>Bacillus thuringiensis</i> subspecies: | aizawai: Bacchus WG kurstaki: Delfin, DiPel DF | a | 11 |
| bifenthrin | Arrow 100 EC, Astral 250 EC, Bifenthrin 100, Bifenthrin 100 EC, Bifenthrin Ultra 300 EC, Bifentin 100EC, Bi-Thrin 100EC, BiFendoff 100, Cropro Zeus, Disect 100 EC, Out of Bounds, Tal-Ken 100, Talstar 250 EC, Venom 100 EC, | a | 3A |
| buprofezin | Applaud, Scale & Bug Insecticide, Strident | a | 16 |
| carbaryl | Bugmaster Flowable, Carbaryl 500 Flowable, Carbaryl 500 SC, Cricket and Grasshopper Killer Bait | d | 1A |
| chlorantraniliprole | Altacor, Altacor Hort | a | 28 |
| chlorpyrifos | Chlorban 500EC, Chlorpos 500EC, Chlorpyrifos 500, Chlorpyrifos 500 EC, Cyren 500 EC, Cyren 500 WP, Fortune 500, Generifos 500 EC, Kensban 500, Lorsban 500 EC, Lorsban 750 WG, Strike-Out 500 EC, Strike-Out 500 WP, suSCon Green | a | 1B |
| clothianidin | Samurai (bare soil application only) | a | 4A |
| copper complex | Escar-Go, Socusil | a | unspecified |
| diazinon | Diazinon | a | 1B |
| dicofol | Miti-Fol EC | a | UN |
| dimethoate | Danadim, Dimethoate, Dimethoate 400, Dimethoate 400EC, Saboteur, Stalk | a | 1B |
| emamectin | Proclaim, Warlock | b | 6 |
| esfenvalerate | Sumi-Alpha Flex | a | 3A |
| etoxazole | ParaMite | a | 10B |
| fenitrothion | Fenitrothion 1000, Fenitrothion 1000 EC | a | 1B |
| fipronil | Albatross 200 SC, Amulet Cue-Lure, Cannonball 200SC, Fipronil 200SC, Regal 800 WG, Regent 200SC, Vista 200SC | a | 2B |
| indoxacarb | Avatar | a | 22A |
| iron EDTA complex | Multiguard Snail and Slug Killer | a | unspecified |
| maldison (malathion) | Fyfanon 440 EW, Hy-Mal | a | 1B |
| metaldehyde | Meta (pellets), Metarex Snail + Slug bait, Pestmaster Snail + Slug pellets, Slug Out (bait), Slugger Slug + Snail pellets | | unspecified |
| <i>Metarhizium anisopliae</i> var. <i>acridum</i> | Green Guard SC, Green Guard SC Premium | d | unspecified |

| Active constituent(s) | Some registered products | Re-entry period | Activity group |
|--|--|-----------------|----------------|
| INSECTICIDE (CONT.) | | | |
| methidathion | Suprathion 400 EC | a | 1B |
| methiocarb | Mesurol Snail and Slug Bait | | 1A |
| methomyl | Electra 225, KDpc Metho, Landrin 225, Lannate L, Marlin, Methomyl 225, Nudrin 225, Seneca, Sinmas 225 | a, d | 1A |
| methoxyfenozide | Prodigy | a | 18 |
| paraffinic oil | Bioclear, BioPest, Heavy Paraffinic Dormant Spray Oil, Trump Spray Oil | a | unspecified |
| petroleum oil | All Seasons White Oil, D-C-Tron Plus Spray Oil, Sacoa Summer Spray Oil, Stifle, Vicol Summer Oil, Vicol Winter Oil | a | unspecified |
| pyrethrins + piperonyl butoxide | Py-Bo Natural Pyrethrum | a | 3A |
| spinetoram | Delegate | a | 5 |
| spinosad | Naturalure Fruit Fly Bait Concentrate | a | 5 |
| spirotetramat | Movento 240 SC | a | 23 |
| sulfoxaflor | Transform | a | 4C |
| sulfur, present as elemental or crystalline sulfur | Cosamil, Cosavet WG, David Grays Sulphur Spray, Flosul 800, InnoSulph 800 WG, Kendon Sulphur, Kumulus DF, Microsul WG Elite, Microthiol Disperss, Notion, Rutec Sulfur, Solo 800WG, Sulfostar DF, Sulfur 800 WG, Sulgran WG, Sulphur 800 WG, Sulphur WG, Thiovit Jet, Top Wettable Sulphur, Uni-Shield, Wettable Sulphur | a | M2 |
| sulfur, present as polysulfide | Lime Sulphur | a | M2 |
| tetradecenyl acetate + tetradecadienyl acetate | Isomate LBAM Plus Pheromone, MD LBAM Corto, MD LBAM Flex Pheromone, MD LBAM Pheromone | | unspecified |
| trichlorfon | Dipterex 500 SL, Lepidex 500, Tyranex 500 SL | a | 1B |
| <i>Trichogrammanza carverae</i> | Trichogramma parasitic wasp | | unspecified |
| PLANT GROWTH REGULATORS | | | |
| Contact your winery or grape purchaser prior to the application of any plant growth regulator. | | | |
| chlormequat ⁹ | CC-77, Getset | a | unspecified |
| cyanamide | Cyan, Dormex, Duomax HC520 | a | unspecified |
| ethephon ⁹ | E-Phon, Ethephon 480, Ethephon 720, Ethephon 720 SL, Ethrel 720, K-Ethephon, Promote 720, Promote Plus 900 | f | unspecified |
| gibberellic acid | Gala, GBR Acid, GBR Acid 200SG, Gibb 100, Gibb 200, Gibber, N-Large, ProGibb SG | a | unspecified |
| methyl esters of fatty acids | Waiken | c | unspecified |

9. For grapes destined for export wine, the use of chlormequat or ethephon is not recommended.

Re-entry period

The re-entry period is the minimum amount of time that must pass between when a pesticide is applied to an area and when that area can be entered without protective clothing and equipment.

Re-entry periods are set to protect people from exposure to agrochemicals that can occur by inhalation or skin contact if they enter an area without proper protective equipment.

The agrochemical label provides information about the re-entry period and any protective clothing or equipment that must be used if the re-entry period is not met.

Different products from the same activity group may have different re-entry requirements. The advice provided in these tables lists the various re-entry periods for the active constituent.

Where the re-entry period specifies a range of days, the shorter period relates to low exposure activities and the longer period to higher exposure activities. Check the label for details.

This advice is intended as a guide.

Consult each product label for re-entry period directions.

| | |
|---|--|
| a | Do not enter until the spray has dried |
| b | 8 hours |
| c | 12 hours |
| d | 1 day |
| e | 1 to 16 days depending on vineyard activity being performed |
| f | 2 days |
| g | 4 days depending on vineyard activity being performed |
| h | 4 to 23 days depending on vineyard activity being performed |
| i | 5 days |
| j | 5 to 23 days depending on vineyard activity being performed |
| k | 7 days |
| l | 8 days |
| m | 9 to 24 days depending on vineyard activity being performed |
| n | 9 to 27 days depending on vineyard activity being performed |
| o | 15 to 33 days depending on vineyard activity being performed |
| p | 12 to 32 days depending on the vineyard activity being performed |

What is 'chemical resistance'?

Chemical resistance is the inherited ability of an organism, be it a disease, weed or insect, to survive doses of an agrochemical that would normally control it. Resistance may develop after frequent use of one chemical or chemicals from the same activity group. Incorrect chemical use, such as under- or over-dosing or application at the wrong time in the life cycle of the target, can also promote resistance.

How does resistance develop?

Any population might contain a very small number of individuals that are naturally able to survive the application of a particular chemical. If the same chemical or chemicals from the same activity group are used repeatedly and exclusively, the susceptible individuals continue to be removed, and those with natural resistance survive and multiply to essentially dominate the population. The chemistry then 'fails' in the field.

It has been observed in vineyards that despite several herbicides being used over a season, they are often applied at the same time each season. As such, the weed species peculiar to that time are treated with the same herbicide each year, therefore promoting resistance.

Resistance countering measures

Manage unwanted pathogens, weeds and insects using non-chemical means when possible.

When using chemicals, get the most out of them by:

- timing them to when the target is most susceptible
- using the correct dose
- adding suitable adjuvants
- applying when the conditions are right.

Minimise chemical selection pressure by not overusing chemicals from the same activity group. CropLife Australia maintains Resistance Management Strategies for fungicides, insecticides and herbicides. These are available at www.croplife.org.au.

Fungicide resistance status

Resistance to fungicides is a serious problem worldwide and Australia has not been spared. Resistance to many of the commonly used fungicides now exists.

CropLife Australia incorporates two initiatives in fungicide resistance management which ensure the best control with least risk of developing resistance. These are:

1. All fungicides have been classified by activity group, which appears as a number or letter and number code on the fungicide product label
2. Strategies have been developed for the use of fungicides in crops where resistance by a particular organism is already evident or considered a risk. See pages 25 - 27.

The advice given in the CropLife strategies is valid at the time of going to print. Current versions of the strategies are available from the CropLife Australia website: www.croplife.org.au. CropLife can be contacted on 02 6273 2733 or info@croplife.org.au.

CropLife disclaimer

The strategies on pages 25 - 27 are guide only and do not endorse particular products, groups of products or cultural methods in terms of their performance. Always follow the product label for specific use instructions. While all effort has been taken with the information supplied in this document, no responsibility, actual or implied, is taken for the day to day accuracy of product or active constituent specific information.

Readers should check with the Australian regulator's (APVMA) product database for up-to-date information on products and actives. The database can be sourced through www.apvma.gov.au. The information given in this strategy is provided in good faith and without any liability for loss or damage suffered as a result of its application and use. Advice given in this strategy is valid as at 7 June 2017.

Downy mildew

Resistance management strategy for:

Group 4 Phenylamide

Group 11 Quinone outside inhibitor

Group 21 Quinone inside inhibitor

Group 40 Carboxylic acid amide

Group 45 Quinone outside inhibitor, stigmatellin binding type fungicides

1. Apply **all** these fungicides preventatively, **Group 4** fungicides should be applied before the first sign of oilspots or as soon as possible after an infection period.
2. Mixtures are co-formulations or tank mixes with an alternative mode of action at the label rate.
3. Apply a maximum of two consecutive applications of any one group.
4. Start preventative disease control sprays using **non-Group 4** protectant fungicides, typically when shoots are 10-20 cm long. Continue spraying at intervals of 7-21 days depending on disease pressure, label directions and rate of vine growth.
5. Limit the use of **Group 4** fungicides to periods when conditions favour disease development. Always apply **Group 4** fungicides in mixture.

| | Group | | | | |
|--|-------|------|-------------|----------------|-------------|
| | 4 | 11 | 21 (+M1) | 40 | 45 (+40) |
| Max. number of consecutive applications | 2 | none | 2 | 2 | 2 |
| Max. number of solo sprays | none | 2 | 3 | 2 (50%) | none |
| Max. number of sprays per season | 4-mix | 2 | 3 | 4-mix (50%) | 4-mix |
| Areas of higher agronomic risk | mix | mix | n/a | mix | n/a |

6. **Group 40** - do not apply as the last spray of the season.
Group 40 - apply a maximum of 50% of the total number of downy sprays.
7. **Group 11** - if applied alone, do not make consecutive applications.
8. **Group 11** - apply a maximum of 2 sprays per season, including in mixtures.

Powdery mildew

Resistance management strategy for:

Group 3 Dimethylation inhibitors (DMI)

Group 5 Amines (morpholines)

Group 7 Succinate dehydrogenase inhibitors (SDHI)

Group 11 Quinone outside inhibitors (QoI) and combinations of **Group 3**

Group 13 Aza-naphthalenes

Group U6 Phenyl-acetamide

Group U8 Actin disruptors (aryl-phenyl-ketone) fungicides

1. Apply **all** these fungicides preventatively.
2. Consecutive applications include from the end of one season to the start of the next.
3. Mixtures are co-formulations or tank mixes with an alternative mode of action at the label rate.

| | Group | | | | | | |
|--|-------|---|------|-----------|----|----|----|
| | 3 | 5 | 7 | 11 (3) | 13 | U6 | U8 |
| Max. number of consecutive sprays | 2 | 2 | none | see below | 2 | 2 | 2 |
| Max. number of sprays per season | 3 | 3 | 3 | 2 | 3 | 2 | 4 |

4. **Group 11** - where these fungicides have been routinely used for many seasons, field research indicates there is an increased risk of powdery mildew resistance. To ensure effective powdery mildew control in these circumstances, either use alternative modes of action or apply in mixtures.
Group 11 - if applied alone, do not make consecutive applications.
Group 11 - apply a maximum of two sprays per season, including mixtures.

Grey mould (Botrytis bunch rot)

Resistance management strategy for:

Group 2 Dicarboximide

Group 7 SDHI (Succinate dehydrogenase inhibitors)

Group 9 Anilinopyrimidine and combinations of **Group 9** and **Group 12** Phenylpyrroles

Group 11 Quinone outside Inhibitor and combinations of **Group 11** and **Group 3** (DMIs)

Group 17 Hydroxyanilide fungicides

1. Apply all these fungicides as protectants before the first sign of disease.
2. Consecutive applications include from the end of one season to the start of the next.
3. Varying the number of fungicides applied targeting Botrytis changes the relative resistance risk to any one fungicide group. When three or fewer fungicide sprays are applied, it is recommended that three different groups of fungicides are used (see table below). When four sprays are applied, try to use 3 or 4 different groups of fungicide.

| | | Maximum recommended number of sprays which can contain group | | | | |
|---|----|--|---|---------------|----------------|----|
| | | 2 | 7 | 9 (inc. 9+12) | 11 (inc. 3+11) | 17 |
| Total number of botrytis targeting sprays | 1 | 1 | 1 | 1 | 1 | 1 |
| | 2 | 1 | 1 | 1 | 1 | 1 |
| | 3 | 1 | 1 | 1 | 1 | 1 |
| | 4 | 2 | 2 | 2 | 2 | 2 |
| | 5+ | 2 | 2 | 2 | 2 | 2 |

4. If a **Group 11 or 7** fungicide is used solo, it should only be used in strict alternation with fungicides from a different mode of action group.
5. **DO NOT** apply more than two consecutive sprays from the same fungicide group, for any **Group 2, 7, 9** (including combinations with **Group 12**) **11+3** or **17** fungicide including from the end of one season to the start of the following season.
6. If two consecutive applications of **Group 11 + 3** fungicides are used, then they must be followed by at least the same number of applications of fungicide(s) from a different group(s) before a **Group 11** (including combinations with **Group 3**) fungicide is used again, either in the current or following season.
7. If resistance to a fungicide group has been detected, only use that fungicide group in mixtures or in strict alternation with fungicides with a different cross-resistance group. A fungicide group that has been applied as the final application of the season should not be the first fungicide in the following season.

Exotic Vineyard Pests

Australia's vineyards are kept free from the world's most severe pests and diseases by national biosecurity systems which prevent, respond to and recover from incursions. You have an important role to play in protecting your property and the entire viticulture industry from biosecurity threats.

1. Be aware of biosecurity threats

Make sure you and your vineyard workers are familiar with the most important exotic pest threats of grapevines.

2. Use pest-free propagation material

Ensure all propagation material is from trusted sources and vineyard inputs are fully tested, pest-free and preferably certified. Keep good records of planting material.

3. Keep it clean

Practising good sanitation and hygiene will help prevent the entry and movement of pests onto your vineyard. Workers, visitors, vehicles and equipment can spread pests, so make sure they are clean before entering and leaving your vineyard. Limit entry points to the property, have a designated visitor's area and provide vehicle and personnel wash-down facilities.

4. Check your vineyard

Monitor your grapevines frequently. Knowing the usual appearance of your vineyard and grapevines will help you recognise new or unusual plant symptoms or pests. Keep written and photographic records of all unusual observations. Constant vigilance is vital for early detection of any exotic plant pest.

5. Abide by the law

Be aware of and respect laws and regulations established to protect the viticulture industry, Australian agriculture and your region.

6. Report anything unusual

If you suspect a new pest, call the exotic plant pest hotline

1800 084 881

More information on biosecurity for viticulture can be found in the *Biosecurity Manual for the Viticulture Industry* available from the Farm Biosecurity website: <http://www.farmbiosecurity.com.au/industry/viticulture/>

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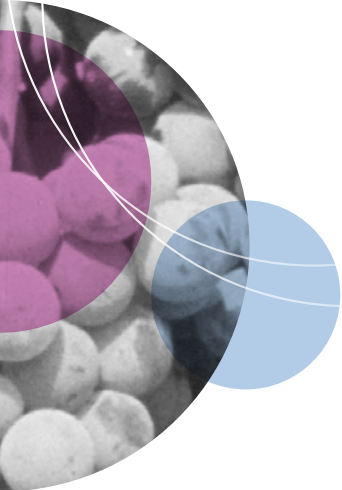
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