Clone forum

Richard Fennessy & Diana Fisher
Research Officer  Development Officer
Program

9.00am – Introduction and program outline
9.30am – Western Australian Vine Improvement Association (WAVIA)
9.45am – Chardonnay clones & panel discussion
10.15am – Tempranillo clones & panel discussion
10.45am – Morning tea
11.00am – Cabernet Sauvignon clones & panel discussion
11.30am – Shiraz clones & panel discussion
12.00pm – Merlot clones & panel discussion
12.30pm – Lunch
1.00pm – Wine tasting at the winery
2.50pm – Close
Clones

**Definition:** a population of vines derived vegetatively from a single (mother) vine; initially genetically identical.

**Clonal selection:** the comparison, selection, and propagation of one or more clones of a variety possessing particular characteristics.

- Vigour
- Growth habit
- Yield
- Bunch compaction
- Berry size
- Wine quality
A review of five wine grape variety clones in Western Australia

- Literature review conducted to produce ‘A review of five wine grape variety clones in Western Australia’
  - Over 70 clones of Cabernet Sauvignon, Chardonnay, Merlot, Shiraz and Tempranillo in WA
  - Another ~130 clones not found in WA but in other collections within Australia
    - Includes duplications and variations of clones through heat treatments, labelling etc.
  - Utilised 54 separate sources of information
  - Limited by available published information at the time of review
The Western Australian Vine Improvement Association

Jim Campbell-Clause
WAVIA

Role
- Facilitate the access, production and distribution of improved planting material to industry.
  - Imports new varieties and clones
  - Maintains protocols for the WA germplasm collection
  - Establishes source blocks in regions
  - Provides A class propagation material to industry
  - Promote R&D in clonal selection, rootstock research, and improved viticulture.
- Liaises with other VIA groups, AVIA and Industry organisations.

Structure
- Regional groups
- State committee.
- Represents wine grape, table grape, dried vine fruit producers and the nursery industry
- Run by volunteers

PO Box 941
Margaret River
Western Australia 6285
History

- Swan Research Station source of improve vine improvement material
- 1993 WAVIA formed and modelled on SAVIC and VIAMA
- 1994 first source blocks planted
- 1995 WAVIA incorporated
- 1996 WAVIA supplies material
- 1997 supplied class A, B and C class material
- 1998 hot water dipping
- 1999 Class A only
- 2000 variety collection moved to Manjimup
- Rationalised the collection in 2006
- Alternative variety trial results from Manjimup compiled in 2010
- Alternative variety trial results established in Harvey in 2011
- DNA testing of some varieties in 2012
- WAVIA supports ARC Cabernet Sauvignon Genome project.
- WA Germplasm collection recognized as the cleanest best managed variety collection in the country.
- WAVIA website established – thank you to Chris Harding
WAVIA now

- Active committee
- Financial
- Good procedures in place
- Variety collection in good condition and recognized nationally
- Source blocks
- Website wavia.org.au
- Active importation and disease testing procedure of variety collection
- Reports to industry
- Steady sales
Thoughts for today’s session

- Need input from industry on required new clones and varieties.
- Need more source blocks – on your vineyards.
- Need support on the committee level (to cover all regions).
- Understanding of use of improved clones
- Understanding of the use of clean true to type propagation material
- Only 2 commercial nurseries and WAVIA supplying material and increased demand may result in
- LRV
- Clones Chardonnay x 6, Cabernet x 8, Merlot x 4, Shiraz x 4, Tempranillo x 2.
Chardonnay clones

• 18 clones listed in WA
• Another 23 clones listed in Australia
• Information on performance available for 20 of the clones
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<thead>
<tr>
<th>Western Australia</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Publicly held (accession #, origin)</strong></td>
<td><strong>Privately held (accession #, origin)</strong></td>
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<tr>
<td>277 (W9195547, France)</td>
<td>277 (IC888547, France)</td>
</tr>
<tr>
<td>G9V7 (IN829330, UCD)</td>
<td>G9V7 (IN712306, UCD)</td>
</tr>
<tr>
<td>G9V7 (IN9091, IN279134, UCD)</td>
<td>Heat treated. Commonly referred as Clone 5 in WA.</td>
</tr>
<tr>
<td>20V1 (W728127, UCD)</td>
<td>20V1 (IC899127, UCD)</td>
</tr>
<tr>
<td>20V3 HT134-2 (IN728126, UCD)</td>
<td>20V3 (IC899129, UCD)</td>
</tr>
<tr>
<td>20V5 (W728126, UCD)</td>
<td>20V5 (IC898129, UCD)</td>
</tr>
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<td>76 (France)</td>
<td>76 (IC888454, France)</td>
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<td>84 (France)</td>
<td>84 (IC888545, France)</td>
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<tr>
<td>96 (France)</td>
<td>96 (IC888546, France)</td>
</tr>
<tr>
<td>ANT 84</td>
<td>84 (IN700190, France)</td>
</tr>
<tr>
<td>ENTAV-INRA® N° 548 (France)</td>
<td>ENTAV-INRA® N° 548 (France)</td>
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<tr>
<td>Merlot (IC858498)</td>
<td>Merlot (IC858498)</td>
</tr>
<tr>
<td>UC 3 (UCD)</td>
<td>UC 1 (UCD)</td>
</tr>
<tr>
<td>15 (18800180, France)</td>
<td>15 (18800180, France)</td>
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<td>277 (W9195547, France)</td>
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# Vasse Felix Chardonnay regional tasting

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<th>2015</th>
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<td><strong>Gingin</strong></td>
<td>75%</td>
<td>73%</td>
<td>76%</td>
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<tr>
<td>1 (I10V1)</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>3 (I10V3)</td>
<td>4%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>5 (I10V5)</td>
<td>2%</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
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<td>95</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>96</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>277</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td><strong>Mendoza</strong></td>
<td>6%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Blend</strong></td>
<td>7%</td>
<td>8%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Unknown</strong></td>
<td>2%</td>
<td>6%</td>
<td>2%</td>
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<tr>
<td><strong>Number of samples</strong></td>
<td>83</td>
<td>84</td>
<td>83</td>
</tr>
</tbody>
</table>
Gingin clone early distribution within WA

1957
24 cuttings of Pinot Chardonnay received from University of California, Davis.

1961
Cuttings planted at the Department of Agriculture’s Swan Research Station.

1965
15 cuttings of Pinot Chardonnay planted at Belhus Estate, Swan Valley.

1970
Cuttings taken from Belhus Estate planted at Valencia Wines (Moondah Brook Vineyard)

1976
Ashbrook Estate (Margaret River) supplied cuttings directly from Belhus Estate

1976
Department uses Moondah Brook Vineyard to supply Margaret River vineyards Leeuwin Estate, Moss Wood and Cullens. Rob Sippe in the Great Southern also received cuttings.

1978
Department uses Moondah Brook Vineyard to supply cuttings to Westfield vineyard (Frankland), Sippe (Great Southern), Yates (Wanneroo) and Jane Brook Estate (Swan Valley).

1993-94
Department of Agriculture relocates the Swan Research Station Germplasm collection to the Wokalup Research Station.
The following clones are known to be available in WA
G9V7

Origin
Sourced from the Martini owned Stanley Lane vineyard in Carneros, CA.

Performance
• Clonal evaluation conducted in Napa Valley, CA involving two sites summarised performance as **high yielding**, medium vigour, high number of bunches per vine, **large bunches**, high number of berries per bunch and moderate berry weight.

  • In a comparison trial of seven FPS Chardonnay clones (Harmony rootstock) in Salinas Valley, CA; both G9V7 and G9V5 showed **high yields**, moderate pruning weights and had the highest titratable acidity and lowest pH. Suggesting not ideally suited to cool climates.

• **High yields** with **large bunches**.

• Observed to have **large bunches** from a trial planted in the Adelaide Hills in 1990-1992.

• Shown in Victorian trials to be **high yielding** due to **heavy compact bunches** with large numbers of berries. Bunch rot issue for cool climates.
I10V1

Origin
Sourced from the Martini owned Stanley Lane vineyard in Carneros, CA. Commonly referred as Clone 1 in WA.

Performance
• Replicated trial in 1996 at a Healdsburg, CA vineyard on AXR-1 rootstock showed high vigour, **high yields**, small bunches and high wine quality. Recommended for low vigour sites\(^1\).

• Clonal evaluation conducted in Napa Valley, CA involving two sites summarised performance as **high yield** and vigour, similar high number of bunches per vine as G9V7 but with lighter bunches due to less number of berries per bunch\(^2\).

• When Olmo was evaluating the Stanley Lane selections he found this clone to be the **highest yielding** (4t/acre)\(^4\).

• Low vigour and early ripening\(^7\).

• In a comparison trial of seven FPS Chardonnay clones (Harmony rootstock) in Salinas Valley, CA, I10V1 showed moderate yields and high pruning weights\(^3\).

• Had the **lowest yield** when compared with I10V5, 84 ANTAV, G9V7 and 13 ANTAV from a Langhorne Creek trial in 1996\(^11\).

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\(^7\) Caldwell, J 2002, A guide for grapevine clones for professionals, John Caldwell Viticultural Service, Napa, California.
I10V5

Origin
Sourced from the same vines as I10V1 but underwent 114 days heat treatment. Commonly referred as Clone 5 in WA.

Performance
• Had the **highest yield** compared with I10V1, G9V7, C2V16 and F1V13 from a trial in Nuriootpa in 1983-1988\(^\text{11}\).

• With 84 ANTAV had the **highest yield** when compared with I10V1, G9V7 and 13 ANTAV from a Langhorne Creek trial in 1996\(^\text{11}\).

• At a trial in Drumborg, Vic was shown to **yield higher** than I10V1 and I10V3 due to more berries per bunch. Also noted to ripen later and have higher titratable acidity and lower pH than I10V1 and I10V3\(^\text{25}\).

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Origin
Saône-et-Loire, France. Commonly referred as a Bernard or Dijon clone.

Performance
- Described as early maturing and a high quality clone for all types of soils. Produces fine aromatic, elegant and complex wines\(^7\).
- From an evaluation by Meo-Camuzet, Vosne Romanée this clone is described as early ripening, low to average vigour and producing high wine quality\(^1\).
- Five year study in Burgundy found moderate yields, bunches per vine and bunch weight\(^3\).
- High quality wine, moderate yielding, superior sugars and produces aromatic fine wines\(^5\).
- In the selection of this clone it was observed to be good quality and a regular producer\(^6\).
Origin
Côte-d'Or, France. Commonly referred as a Bernard or Dijon clone.

Performance

• A trial in Healdsburg, CA in 1994 involved ENTAV_INRA clones grafted on established vines (variety unknown) found this clone as high yielding and high wine quality. Literature describes this clone as moderate yielding producing wines of good aroma and rich texture⁴.

• From an evaluation by Meo-Camuzet, Vosne Romanée this clone is described as early ripening, moderate yields producing rich and age worthy wines⁴.

• Five year study in Burgundy found moderate yields, bunches per vine and bunch weight³.

• High quality wine, moderate yielding, superior sugars and produces full rich wines⁵.

• In the selection of this clone it was observed to be very good in any situation⁶.

• Observed to have high yields and high quality wines. Produces rich, powerful and fat wines⁷.
Origin
Côte-d'Or, France. Commonly referred as a Bernard or Dijon clone.

Performance

• A trial in Healdsburg, CA in 1994 involved ENTAV_INRA clones grafted on established vines (variety unknown) found this clone as the least preferred based on wine quality. Literature suggests this clone is high yielding and producing lively aromatic wines with balance\(^1\).

• From an evaluation by Meo-Camuzet, Vosne Romanée this clone is described as moderate to high yields, large bunches, low acid and wine quality described as powerful and rich\(^1\).

• Five year study in Burgundy found high yield, moderate bunches per vine and high bunch weight\(^3\).

• Moderate quality wine, moderate yields, medium sugars and produces balanced aromatic wines\(^5\).

• In the selection of this clone it was observed to be regular and good producer\(^6\).

• Observed to be 20% more productive than 76 and 95. Produces fine aromatic, elegant and complex wines\(^7\).
Origin
Côte-d'Or, France. Commonly referred as a Bernard or Dijon clone.

Performance
• Five year study in Burgundy found **high yield**, high bunches per vine and moderate bunch weight\(^3\).
• Moderate wine quality, **high yielding**, medium sugars and produces balanced aromatic wines\(^5\).
• In the selection of this clone it was observed vigour and yields have to be controlled to achieve sufficient quality\(^6\).
• Observed producing 20% **higher yields** than average. A productive clone where wine quality is determined by yield control\(^7\).

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### Assessing clonal variability in Chardonnay and Shiraz for future climate change

**Margaret River Chardonnay (2014 – 2017)**

<table>
<thead>
<tr>
<th>Bunch compaction</th>
<th>Yield (kg/vine)</th>
<th>Nº bunches/vine</th>
<th>Bunch weight (g)</th>
<th>Berry weight (g)</th>
<th>Pruning weight (kg)</th>
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<tbody>
<tr>
<td>76</td>
<td>1.37</td>
<td>1.9</td>
<td>19.5</td>
<td>96.0</td>
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<td>95</td>
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<td>96</td>
<td>1.57</td>
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<td>20.0</td>
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<td>277</td>
<td>1.54</td>
<td>3.0</td>
<td>23.5</td>
<td>129.5</td>
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<tr>
<td>Gingin</td>
<td>1.23</td>
<td>3.7</td>
<td>30.0</td>
<td>124.1</td>
<td>1.5</td>
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**Mount Barker Chardonnay (2014 – 2017)**

<table>
<thead>
<tr>
<th>Bunch compaction</th>
<th>Yield (kg/vine)</th>
<th>Nº bunches/vine</th>
<th>Bunch weight (g)</th>
<th>Berry weight (g)</th>
<th>Pruning weight (kg)</th>
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<tr>
<td>76</td>
<td>1.08</td>
<td>2.26</td>
<td>27.8</td>
<td>80.8</td>
<td>1.2</td>
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<tr>
<td>95</td>
<td>1.08</td>
<td>2.5</td>
<td>29.6</td>
<td>87.7</td>
<td>1.2</td>
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<td>103.1</td>
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<td>277</td>
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<td>2.81</td>
<td>31.3</td>
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<td>Gingin</td>
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<td>42.2</td>
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<td>I10V1</td>
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<td>1.79</td>
<td>27.4</td>
<td>60.1</td>
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ANTAV 84

Origin
France

Performance
• With I10V5 had the highest yield when compared with I10V1, G9V7 and 13 ANTAV from a Langhorne Creek trial in 1996. 

ENTAV-INRA® 548

Origin
Saône-et-Loire, France

Performance
- Five year study in Burgundy found low yield, low bunches per vine and low bunch weight\(^3\).
- Nick Dry at Yalumba describes clone as early ripening, low yields, small loose bunches and balanced acidity\(^3\).
- Described with small bunches, early ripening and low yields. Produces rich, powerful and fat wines\(^7\).
- Small open bunches with small berries and high sugar. Early ripening and light cropping load. Rich complex wine, flavours show intensity and good acid\(^8\).


\(^7\) Caldwell, J 2002, A guide for grapevine clones for professionals, John Caldwell Viticultural Service, Napa, California.

C2V16 (Mendoza)

Origin
UC Davis

Performance
• In a trial in the Adelaide Hills in 1990-1992 this clone yielded significantly lower than I10V1, I10V5 and G9V7¹¹.

Same as Gingin?
• Separate importation into Australia in 1968 (11 years after Gingin was imported directly to WA).
• Awaiting information from CSIRO regarding the importation.

**1969 CSIRO listing of Mendoza clone**

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<tr>
<th>Variety</th>
<th>Source</th>
<th>Released from quarantine</th>
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<td>Aligoté</td>
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<tr>
<td>Alvaranhao</td>
<td>Davis</td>
<td>no</td>
</tr>
<tr>
<td>Barlinka</td>
<td>Davis</td>
<td>no</td>
</tr>
<tr>
<td>Bastardo (Jackson)</td>
<td>Davis</td>
<td>10.10.68</td>
</tr>
<tr>
<td>Beauty seedless</td>
<td>Davis</td>
<td>10.10.68</td>
</tr>
<tr>
<td>Buffalo</td>
<td>Geneva N.Y.</td>
<td>no</td>
</tr>
<tr>
<td>Campbell's early</td>
<td>Davis</td>
<td>no</td>
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<tr>
<td>Captivator</td>
<td>Geneva, N.Y.</td>
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</tr>
<tr>
<td>Chardonno</td>
<td>Davis</td>
<td>10.10.68</td>
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<tr>
<td>Chardonnay (Mendoza)</td>
<td>Davis</td>
<td>10.10.68</td>
</tr>
<tr>
<td>Chardonnay (O.F.)</td>
<td>Davis</td>
<td>10.10.68</td>
</tr>
<tr>
<td>Chardonnay Musqué</td>
<td>Urbana, Ill.</td>
<td>no</td>
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</table>
Penfolds 58

Origin

Introduced from France into NSW by Penfolds Wines in 1958.

Performance

• Low yields due to fewer berries per bunch were observed at plantings in Drumborg and Nagambie, Vic\textsuperscript{25}.
The following clones are not known to be in WA
ANTAV 13

Origin
France

Performance

• From a trial planted in the Adelaide Hills in 1990-1992, found this clone to yield lower than ANTAV84, G9V7, I10V1 and 1959/Europe\(^\text{10}\).

• Had the lowest yield compared with I10V5 and 84 ANTAV from a trial in Nuriootpa in 1989-1992\(^\text{11}\).
Origin

Côte-d'Or, France

Performance

• A trial in Healdsburg, CA in 1994 involved ENTAV_INRA clones grafted on established vines (variety unknown) found this clone as high yielding with moderate wine quality\(^1\).

• From an evaluation by Meo-Camuzet, Vosne Romanée this clone is described as high vigour, high acid, best suited for sparkling production\(^1\).

• Similar yield to 277. A productive clone where wine quality is determined by yield control\(^7\).


Origin
Côte-d'Or, France

Performance
- Recommended for sparkling wine, average to high yields\textsuperscript{7}.  

\textsuperscript{7} – Caldwell, J 2002, A guide for grapevine clones for professionals, John Caldwell Viticultural Service, Napa, California.
Origin
Côte-d'Or, France

Performance

• Five year study in Burgundy found high yield, bunches per vine and bunch weight.\(^3\)

• Often ranked first in comparative tastings. Produces fine aromatic, elegant and complex wines.\(^7\).
ENTAV-INRA® 809

Origin
Saône-et-Loire, France

Performance
- Five year study in Burgundy found low yield, moderate bunches per vine and low bunch weight\(^3\).
- Nick Dry at Yalumba describes clone as early ripening, low yields, low acid and distinctly aromatic (\textit{musque clone}) \(^3\).
- Tighter bunches than 548 but similar to 95. Early ripening, Muscat flavours with citrus and floral notes – fragrant yet with a good acid finish\(^8\).
- Produces a \textit{Muscat character} wine\(^7\).
ENTAV-INRA® 1066

Origin

Côte-d'Or, France

Performance

• Nick Dry at Yalumba describes clone as early ripening, low yields and small loose bunches with *hen and chicken*³.

• Low cropping with small, loose berries and bunches. Prone to *hen and chicken*, early ripening with wines described as richly flavoured.⁸.
F1V3 (OF)

Origin
UC Davis

Performance
• In a trial in the Adelaide Hills in 1990-1992 this clone yielded lower than I10V1, I10V5 and G9V7\textsuperscript{11}.
• Had the lowest yield compared with I10V1, I10V5, G9V7 and C2V16 from a trial in Nuriootpa in 1983-1988\textsuperscript{11}.
• Known to produce very low yields\textsuperscript{25}.

\textsuperscript{25} – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
G9V5

Origin
UC Davis

Performance

• Shown in Victorian trials to be **high yielding** due to heavy compact bunches with large numbers of berries. Bunch rot issue for cool climates\(^2^5\).

• In a comparison trial of seven FPS Chardonnay clones (Harmony rootstock) in Salinas Valley, CA, G9V5 and G9V7 showed **high yields**, moderate pruning weights and had the highest titratable acidity and lowest pH. Suggesting not ideally suited to cool climates\(^3^5\).


Chardonnay clones panel discussion

- David Botting (Chief Viticulturist, Burch Family Wines)
- Rob Mann (Director, Doolette consultancy and Corymbia wine)
Tempranillo clones

• 11 clones listed in WA
• Another 12 clones listed in Australia
• Information on performance available for 11 of the clones
# Tempranillo Clones

Spanish origin

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<th>Comments</th>
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<td>Privately held (accession #, origin)</td>
<td>Public and privately held (accession #, origin)</td>
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<td>D8V12</td>
<td>D8V12 (IV712330, UCD)</td>
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<td>Requena</td>
<td>Requena (IC648007, Spain)</td>
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<tr>
<td>EN51</td>
<td>EN51 and PLANSEL 51 may be the same clone.</td>
<td></td>
</tr>
<tr>
<td>EN232</td>
<td>EN95 and PLANSEL 595 may be the same clone.</td>
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<td>ITACyL32</td>
<td>ITACyL32</td>
<td>Selection from Ribera del Duero (Tinta del País).</td>
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<td>Selection from Ribera del Duero (Tinta del País).</td>
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<td>ITACyL306</td>
<td>ITACyL306</td>
<td>Selection from Toro (Tinta de Toro).</td>
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<tr>
<td>ITACyL326</td>
<td>ITACyL326</td>
<td>Selection from Toro (Tinta de Toro).</td>
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<tr>
<td>M776 (France)</td>
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</table>
D8V12 & D8V13

**Origin**

- Spain. Sourced FPS. D8V12 (Valdepenas) 1971 D8V13 1966

**Performance**

- D8V12 and D8V13 similar
- Winemaking D8V12 more perfumed D8V13 more savoury
- D8V12 - preference for short pruning to spur
- D8V12 - Wine intense red colour, very alcoholic, well-balanced, often low acidity
- Wine develops well with ageing - tobacco, spice and leather flavours
- A black grape variety widely grown to make full-bodied red wines. Low acidity & sugar
Requena

Origin

• Requena Spain 1964

Performance

• Fruit - Fresh berry flavours. Chewy astringent skims

• Wine – Ripe cherry, raspberry & chocolate aromas. Medium bodied

• Rose Wine Style – Geographe Wine Show 2015 – 16.6 16.9 16.6

<table>
<thead>
<tr>
<th>Wine Analysis</th>
<th>Wine pH</th>
<th>Wine TA (g/L)</th>
<th>Wine Alc (%)</th>
<th>Wine RS (g/L)</th>
<th>Wine VA (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 t/ha</td>
<td>3.59</td>
<td>6.7</td>
<td>14.6</td>
<td>0.2</td>
<td>0.39</td>
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<tr>
<td>6 t/ha</td>
<td>3.48</td>
<td>6.3</td>
<td>15.5</td>
<td>0.2</td>
<td>0.28</td>
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<tr>
<td>10 t/ha</td>
<td>3.55</td>
<td>6.3</td>
<td>15.4</td>
<td>0.2</td>
<td>0.33</td>
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</tbody>
</table>

31 – Nicholas, P 2006, Grapevine clones used in Australia, South Australian Research and Development Institute, Adelaide.
201 – Kennison, K & Fennessy, & 2011, Evaluation of alternative wine grape varieties in Manjimup WA. Department of Agriculture and Food Western Australia, Bulletin 4824.
### ITACyL

**Origin**

- Spain – 32 98 261 Ribera del Duero - 306 326 Toro

---

<table>
<thead>
<tr>
<th>Parameter/Clones</th>
<th>CL-32</th>
<th>CL-98</th>
<th>CL-261</th>
<th>CL-306</th>
<th>CL-326</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yield (t/ha)</strong></td>
<td>11.4&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>9.17&lt;sup&gt;cdef&lt;/sup&gt;</td>
<td>10.1&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>7.89&lt;sup&gt;f&lt;/sup&gt;</td>
<td>9.51&lt;sup&gt;cde&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>No. bunches/vine</strong></td>
<td>18&lt;sup&gt;b&lt;/sup&gt;</td>
<td>19&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>19.9&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>19.5&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>19.2&lt;sup&gt;abc&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>No. berries/bunch</strong></td>
<td>136&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>110&lt;sup&gt;cdef&lt;/sup&gt;</td>
<td>124&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>96&lt;sup&gt;f&lt;/sup&gt;</td>
<td>121&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Berry weight (g)</strong></td>
<td>2.19&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.01&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;de&lt;/sup&gt;</td>
<td>1.87&lt;sup&gt;da&lt;/sup&gt;</td>
<td>1.97&lt;sup&gt;cd&lt;/sup&gt;</td>
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<tr>
<td><strong>Bunch weight (g)</strong></td>
<td>247&lt;sup&gt;a&lt;/sup&gt;</td>
<td>191&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>199&lt;sup&gt;b&lt;/sup&gt;</td>
<td>154&lt;sup&gt;e&lt;/sup&gt;</td>
<td>201&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td><strong>Pruning weight (Kg/vine)</strong></td>
<td>1.09&lt;sup&gt;de&lt;/sup&gt;</td>
<td>1.14&lt;sup&gt;cde&lt;/sup&gt;</td>
<td>1.27&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>1.36&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>1.27&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Shoot weight (g)</strong></td>
<td>66.8&lt;sup&gt;def&lt;/sup&gt;</td>
<td>72.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>76&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>80.3&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>74.9&lt;sup&gt;abcd&lt;/sup&gt;</td>
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<td><strong>Sugar / Degree Brix (oBrix)</strong></td>
<td>21.5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>22.5&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>22.2&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>22.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>22&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>3.41&lt;sup&gt;de&lt;/sup&gt;</td>
<td>3.47&lt;sup&gt;abcd&lt;/sup&gt;</td>
<td>3.49&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>3.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.4&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td><strong>Total acidity (g/l tartaric acid)</strong></td>
<td>5.25</td>
<td>5.21</td>
<td>5.22</td>
<td>5.22</td>
<td>5.37</td>
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</table>

**Table 2. Performance of 5 ITACYL Tempranillo clones from a replicated trial planted in Valladolid. (Source: Rubio, J. et al., 2008).**

Values with different superscript means there is significant differences (p<0.05) according to the Fisher test.

**Wine sensory attributes**

- **ITACYL32**: Aromatic and light.
- **ITACYL98**: Well balanced and structured.
- **ITACYL261**: Well balanced and powerful.
- **ITACYL306**: Balanced and powerful.
- **ITACYL326**: Structured and good length.

---

## Aravina Estate

<table>
<thead>
<tr>
<th>Be</th>
<th>pH</th>
<th>TA</th>
<th>BWg</th>
<th>pH</th>
<th>TA</th>
<th>Comments</th>
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<tr>
<td>326</td>
<td>14.3</td>
<td>3.71</td>
<td>6.6</td>
<td>276</td>
<td>3.94</td>
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<td>32</td>
<td>14.0</td>
<td>3.71</td>
<td>6.2</td>
<td>312</td>
<td>3.98</td>
<td>5.47</td>
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<tr>
<td>98</td>
<td>13.9</td>
<td>3.82</td>
<td>5.7</td>
<td>308</td>
<td>3.95</td>
<td>5.77</td>
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<tr>
<td>261</td>
<td>13.5</td>
<td>3.66</td>
<td>5.5</td>
<td>251</td>
<td>3.95</td>
<td>5.92</td>
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<td>306</td>
<td>13.3</td>
<td>3.58</td>
<td>6.0</td>
<td>291</td>
<td>3.81</td>
<td>5.77</td>
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</table>
ENTAV-INRA

Origin
• Rioja Spain

Performance
• 770 - Fruit low in sugar compared with 771 & 776
• 770 - The most propagated certified clone of Tempranillo in France
• 770 - Good productivity, reliable flowering & fruit, large bunches, can overcrop
• 776 – Fruit high in sugar compared with 770
• 776 – Very productive, big loose bunches, vigorous vines. Better flavour than 770

<table>
<thead>
<tr>
<th>Clone/Parameter</th>
<th>Bunch Number/Vine</th>
<th>Yield/Vine (kg)</th>
<th>Bunch Weight (g)</th>
<th>Berry Weight (g)</th>
<th>% Alcohol</th>
<th>Acidity (g/L)</th>
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</thead>
<tbody>
<tr>
<td>ENTAV-INRA® Nº 770</td>
<td>11.00</td>
<td>3.72</td>
<td>339.50</td>
<td>2.65</td>
<td>10.60</td>
<td>3.48</td>
</tr>
<tr>
<td>ENTAV-INRA® Nº 776</td>
<td>8.50</td>
<td>3.15</td>
<td>328.00</td>
<td>2.67</td>
<td>11.80</td>
<td>4.00</td>
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</tbody>
</table>

Table 1. Performance of ENTAV-INRA® clones 770 and 776
(Source: Christophe Sereno, Institut Français de la Vigne et du Vin)

Tempranillo clones panel discussion

- Steve Partridge (Managing Director, ARM Nursery)
- Ryan Aggiss (Chief Winemaker, Aravina Estate)
- Mark Messenger (Chief Winemaker, Juniper Estate)
Morning tea
Cabernet Sauvignon clones

• 20 clones listed in WA
• Another 44 clones listed in Australia
• Information on performance available for 24 of the clones
<table>
<thead>
<tr>
<th>Western Australia</th>
<th>Australia</th>
<th>Publicly held (accession #, origin)</th>
<th>Privately held (accession #, origin)</th>
<th>Public and privately held (accession #, origin)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 13 (AV122259, Nurocota)</td>
<td>125 (AV122259, Nurocota)</td>
<td>129 (AV122259, Nurocota)</td>
<td>Believed to be the same as SA126. Introduced into WA in 1999.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich (AV122259, Nurocota)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GW44 (AS806400, Coonawarra)</td>
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</tr>
<tr>
<td>HW155 (AW99217, UCGB)</td>
<td>GeV3 (IW99217, UCD)</td>
<td></td>
<td>Believed to be the same as FRS-07. Released in 1999 and introduced into WA in 1999.</td>
<td></td>
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</tr>
<tr>
<td>LC9 (IW992123, Langhorne Creek)</td>
<td></td>
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<tr>
<td>LC10 (IW992122, Langhorne Creek)</td>
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<tr>
<td>LC11 (IW992123, Langhorne Creek)</td>
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<tr>
<td>LC14 (IW992123, Langhorne Creek)</td>
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<tr>
<td>LC14 (IW992123, Langhorne Creek)</td>
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<tr>
<td>LC84 (Langhorne Creek)</td>
<td>169</td>
<td>169</td>
<td>Believed to be the same as ENTAV-INRA No 169. Napa selection.</td>
<td></td>
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<tr>
<td>CH2 (UCO)</td>
<td></td>
<td></td>
<td>Napa selection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH4 (UCO)</td>
<td></td>
<td></td>
<td>Napa selection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houghton mass selection (Swan Valley)</td>
<td></td>
<td></td>
<td>Mass selection of Cabernet Sauvignon from a 6 acre block at Houghton Vineyard, Middle Swan planted in 1936.</td>
<td></td>
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</tr>
<tr>
<td>M335 (France)</td>
<td>M335 (IS906824, France)</td>
<td></td>
<td>Selected in Bordeaux and released in 1935. Believed to be the same as FRS-47, FRS-387 in 1989, underwent micro-shoot tip culture to remove virus.</td>
<td></td>
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</tr>
<tr>
<td>M351 (France)</td>
<td>M351 (IS906833, France)</td>
<td></td>
<td>Selected in Bordeaux and released in 1935. Believed to be the same as ENTAV-INRA No 121, EN91 and FRS-34 C34, FRS-387 in 1989, underwent micro-shoot tip culture to remove virus.</td>
<td></td>
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<tr>
<td>M412 (France)</td>
<td>M412 and ENTAV-INRA No. 412</td>
<td></td>
<td>M412 and ENTAV-INRA No. 412 are believed to be the same clone.</td>
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<tr>
<td>Rich (Great Southern)</td>
<td></td>
<td></td>
<td>Selected from the Westfield vineyard, Frankland River, originally sourced from Houghton vineyard, Swan Valley.</td>
<td></td>
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</table>

**Australia**

<table>
<thead>
<tr>
<th>Publicly held (accession #, origin)</th>
<th>Privately held (accession #, origin)</th>
<th>Public and privately held (accession #, origin)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Focche 9-7 (Great Southern)</td>
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<td>Selected from the Westfield vineyard, Frankland River, originally sourced from Houghton vineyard, Swan Valley.</td>
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<tr>
<td>Focche 9-16 (Great Southern)</td>
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<td>Selected from the Westfield vineyard, Frankland River, originally sourced from Houghton vineyard, Swan Valley.</td>
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<td>Focche 20-4 (Great Southern)</td>
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<td>Selected from the Westfield vineyard, Frankland River, originally sourced from Houghton vineyard, Swan Valley.</td>
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<td>16</td>
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<td>Possibly the same as ENTAV-INRA No 16.</td>
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<tr>
<td>36 (Nurocota)</td>
<td>C22-4 (AC722157, Mackay)</td>
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<td>Selected by CSIRO.</td>
</tr>
<tr>
<td>67 (IC709157, France)</td>
<td>INA Pont de la Maye (SN 5186/CP/P. de la M.),</td>
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<td>68 (IC709156, France)</td>
<td>INA Pont de la Maye (SN 5185/CP/P. de la M.),</td>
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<td>69 (IC709158, France)</td>
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<td>74 (Nurocota)</td>
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<td>A selection made in 1968 at SARCI trial at BVRC.</td>
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<tr>
<td>64 (Nurocota)</td>
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<td>A selection made in 1968 at SARCI trial at BVRC.</td>
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<td>90 (Nurocota)</td>
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<td>A selection made in 1968 at SARCI trial at BVRC.</td>
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<td>110 (Nurocota)</td>
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<td>A selection made in 1968 at SARCI trial at BVRC.</td>
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<tr>
<td>126 H8-3 (Nurocota)</td>
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<td>Heat treated.</td>
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<td>126 H8-2 (Nurocota)</td>
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<td>Heat treated.</td>
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<tr>
<td>126 H8-3 (Nurocota)</td>
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<tr>
<td>126 H8-4 (Nurocota)</td>
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<td>126 H8-5 (Nurocota)</td>
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<td>126 H8-6 (Nurocota)</td>
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<td>126 H8-7 (Nurocota)</td>
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<td>Heat treated.</td>
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<tr>
<td>126 H8-8 (Nurocota)</td>
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<td>Heat treated.</td>
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<td>Bord (Bordeaux)</td>
<td></td>
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<td>Held in CSIRO collection which may not be accessible. Believed to be the same as 1080/NX/Bordeaux ex Griffith.</td>
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<td>Western Australia</td>
<td>Australia</td>
<td>Comments</td>
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<td></td>
<td>C7V5 (IV20092, UCD)</td>
<td>Held in CSIRO collection which may not be accessible. Believed to be the same as FPS 00. FPS 02 was sourced from Oakville, CA, and originally selected by Olmo from the Kunde Estate vineyards in Sonoma County before 1940. This material is believed to have been sourced from Chateaux Margaux and Lafite Rothschild in Bordeaux in the 1880's.</td>
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<tr>
<td></td>
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<td>CW15 (Coonawarra)</td>
<td>Selected from SARDI trial at Coonawarra in 1973 with local selection.</td>
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<tr>
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<td>CW51 (Coonawarra)</td>
<td>Selected from SARDI trial at Coonawarra in 1973 with local selection.</td>
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<tr>
<td></td>
<td></td>
<td>ENTAV-INRA® N° 338</td>
<td>Selected in Bordeaux and released in 1985. Believed to be the same as clone 338.</td>
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<tr>
<td></td>
<td></td>
<td>FPS 10 (US9191111, UCD)</td>
<td>Originally sourced from Germany in 1969 and has undergone 140 days heat treatment. This material was not derived from a clonal development program.</td>
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<tr>
<td></td>
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<td>FPS 12 (US9191632, UCD)</td>
<td>Originally sourced from Chile in 1973 and underwent 100 days heat treatment. Selected from the single vine from Cachapoal Valley vineyard (Conche y Toro Vina) linked to an importation from Bordeaux in 1899. Believed to be the same clone as 12R.</td>
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<td>Griffith (Griffith)</td>
<td>Selected by CSIRO.</td>
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<td>GW (Great Western)</td>
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<td>ISV FS</td>
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<td>LC6 (Langhorne Creek)</td>
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<td>MD10-13/15</td>
<td>Held in CSIRO collection which may not be accessible. Originated from McWilliam's.</td>
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<td>Reeds (France)</td>
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<td>Q390-05 (Sidney)</td>
<td>Imported from Centre for Plant Health, Sydney, British Columbia. Originally from France.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RSV19E (Coonawarra)</td>
<td>Selection from Coonawarra. Believed to be the same as RSV19E FSAC (propagated by D79 Victoria by fragmented shoot apex culture).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reynolds selection</td>
<td>Mass selection from McLaren Vale.</td>
</tr>
<tr>
<td></td>
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<td>SAVII01</td>
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<tr>
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<td></td>
<td>SAVII02</td>
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<td>Verla 1 (Coonawarra)</td>
<td>Local selection from a Barossa nurseryman.</td>
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<td></td>
<td>Verla 2 (Coonawarra)</td>
<td>Local selection from a Barossa nurseryman.</td>
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<tr>
<td></td>
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<td>WA Cape Selection</td>
<td>Houghton mass selection.</td>
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### Vasse Felix Cabernet regional tasting

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<th></th>
<th>2017</th>
<th>2016</th>
<th>2015</th>
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<tr>
<td>Houghton</td>
<td>80%</td>
<td>65%</td>
<td>80%</td>
</tr>
<tr>
<td>126</td>
<td>13%</td>
<td>15%</td>
<td>13%</td>
</tr>
<tr>
<td>125</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>191 &amp; 337</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Unknown</td>
<td>4%</td>
<td>17%</td>
<td>5%</td>
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<tr>
<td><strong>Number of samples</strong></td>
<td><strong>92</strong></td>
<td><strong>84</strong></td>
<td><strong>75</strong></td>
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</table>
Origin

Nuriootpa

Performance

• In Victorian trials this clone had reasonable yields and has a wine character similar to G9V3 (fruit)$^{25}$. 

• Comment from Margaret River producer that it is high yielding and more herbaceous characters and lighter in weight$^{21}$.  

---

$^{25}$ Whiting, J 2003, *Selection of grapevine rootstocks and clones for Greater Victoria*, Department of Primary Industries Victoria, East Melbourne.

Origin

Nuriootpa

Performance

• In Victorian trials this clone showed reasonable yields but more herbaceous character than others. Contains a strain of leafroll virus but alone seems to have little impact on vine performance\(^{25}\).

• Trialled in Coonawarra in 2007, found to be early ripening and producing wines of good intensity and ripe tannins\(^{21}\).

• Known to have mild-leaf roll virus. Did not perform well at a Langhorne Creek trial, having the lowest yield of 30 selections (1977-1980)\(^{12}\).

• In a trial in Nuriootpa (1973-1976) had the highest yield of 8 clones\(^{12}\).

• From a trial at Wynns, Coonawarra (2009-2012) was found to produce high quality wines\(^{17}\).

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25 – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
CW44

Origin
Coonawarra

Performance
• Described as producing moderate yields and good fruit flavours\textsuperscript{21}.
• From a trial at Wynns, Coonawarra (2009-2012) was found to produce high quality wines\textsuperscript{17}. 


G9V3

Origin
Concannon, California

Performance
• In a trial in Nuriootpa (1973-1976) had the lowest yield of 8 clones.\textsuperscript{12}
• In a trial in McLaren Vale (1987-1987) had a higher yield compared to clone 125.\textsuperscript{11}
• Produced consistently high yields in a trial in Sunraysia (1975-1979).\textsuperscript{14}
• Several trials in Victoria showed this clone to be more fruit driven and less herbaceous than some other clones.\textsuperscript{25}

\textsuperscript{12} Nicholas, P 1997, South Australian vine improvement scheme 1996 – 1997 annual report, Primary Industries South Australia, Adelaide.
\textsuperscript{25} Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
LC9

Origin
Langhorne Creek

Performance

• Second highest yielding clone from a trial in Langhorne Creek (1977-1980)\textsuperscript{12}.
LC10

Origin
Langhorne Creek

Performance

• **Highest yielding** clone from a trial in Langhorne Creek (1977-1980)\(^{12}\).

• **Yielded higher** than CW46, CW51, BVRC17 and LRC84 at trial planted at Wynns, Coonawarra (1984-1988)\(^{11}\).

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LC7

Origin
Langhorne Creek

Performance
• 10th highest yielding clone from a selection of 30 at a trial in Langhorne Creek (1977-1980)\textsuperscript{12}.

\textsuperscript{12} Nicholas, P 1997, South Australian vine improvement scheme 1996 – 1997 annual report, Primary Industries South Australia, Adelaide.
Origin
Bordeaux

Performance

• Described as a superior clone which produces well balanced wines with good aging abilities."

• Early ripening, good colour intensity and tannins.

• Moderate to high popularity in France, good tannins well balanced and with length.

• Ancedotal comments of the clone being reliable, reasonable yields of smallish berries and has fruit forward flavours and lush profile. Negative comments are that it lacks varietal typicity and makes a fruit-driven style that the media favours.
Origin
Bordeaux

Performance

• Washington winemakers comments on this clone are that it has a good fruit set with small berries and small bunches. The wine is characterised as a fruit-forward style\textsuperscript{20}.

• Moderate to low popularity in France, good colour and structured wines\textsuperscript{22}.


\textsuperscript{22} – Ward, G & Cameron, I 2013, Cabernet Sauvignon in Western Australia, Department of Agriculture and Food Western Australia, Bulletin 4844.
M412

Origin
Bordeaux

Performance
• Low to medium vigour producing balanced and structured wines with good aging potential\textsuperscript{88}. 

\textsuperscript{88} – Pl@ntGrape, Catelogue of vines grown in France, \textsuperscript{\textregistered}UMT Géno-Vigne\textsuperscript{\textregistered}, INRA – IFV – Montpellier
Roche 5-2

Origin
Selected from a Frankland River vineyard.

Performance
• Shares the same parent vine as Roche 5-7 but has been shown to colour earlier and is slightly more vigorous.
• General observations of Roche 5-2 and 5-7 are low vigour, highly fruitful, small berries and moderate yields. Early ripening and suited to cane pruning.\textsuperscript{23}
• Full-body, intense aromas of dark fruits, blackberry and chocolate. Good complexity, low herbal characters, fine and powdery tannins.\textsuperscript{23}
• Scored highly in a sensory panel and consistently outscored 126.\textsuperscript{23}

\textsuperscript{23} Ward, G, Cameron, I & Fennessy R 2013, Selections of the Houghton clones of Cabernet Sauvignon, Department of Agriculture and Food Western Australia, Bulletin 4843.
Roche 5-7

Origin
Selected from a Frankland River vineyard

Performance
• Shares the same parent vine as Roche 5-2\textsuperscript{23}.
• Low vigour, highly fruitful, small berries and moderate yields. Early ripening and suited to cane pruning\textsuperscript{23}.
• Full-bodied, intense aromas of dark fruits, blackberry and chocolate dominant with the palate showing bright fruit flavours of cassis, blackberry and chocolate\textsuperscript{23}.
• Complex, persistent, low herbal characters, fine and powdery tannins\textsuperscript{23}.
• Scored highly in a sensory panel and consistently outscored 126\textsuperscript{23}.

\textsuperscript{23} – Ward, G, Cameron, I & Fennessy R 2013, Selections of the Houghton clones of Cabernet Sauvignon, Department of Agriculture and Food Western Australia, Bulletin 4843.
Roche 9-7

Origin

Selected from a Frankland River vineyard

Performance

• Medium vigour, highly fruitful, large berries, large bunches and high yield. Late ripening and suited to cane pruning.

• Wine aromas featuring currant, blackberry and cherry. Full-bodied, concentrated delicate fruit flavours with blackberry, cassis, and plum dominant.

• Low herbal characters, fine powdery, slightly drying tannins and long persistent palate.

• Scored highly by a sensory panel and consistently higher than 126.
Roche 20-4

Origin
Selected from a Frankland River vineyard

Performance

• May be most suited to high vigour sites. Low vigour, moderately fruitful, small berries, small bunches and average yield. Early ripening and suited to cane pruning only\(^2\).  

• Full-bodied and persistent, aromas of ripe fresh berries and dark fruits. Generous and long palate with dark berry and fruit flavours\(^2\).  

• Low herbal characters, fine powdery tannins\(^2\).
The following clones are not known to be in WA
Origin

France

Performance

• Showed low yields in a trial in Sunraysia (1975-1979)\textsuperscript{14}.

Origin
France

Performance

• Characterised by a high pH and low yields in a trial in Sunraysia (1975-1979).
Origin
France
Performance
• Showed low yields in a trial in Sunraysia (1975-1979)\textsuperscript{14}.

Origin
UC Davis, selected in Germany

Performance
• Rated medium to high due to inconsistent wine quality\(^7\).
• Found to have low pruning weights (yield) and early ripening at a trial in San Joaquin Valley, CA (1990-1992)\(^{15}\).

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Origin
UC Davis, selected in Chile

Performance
• Rated medium to high due to inconsistent wine quality\(^7\).
LC6

Origin
Langhorne Creek

Performance
• Third highest yielding clone from a trial in Langhorne Creek (1977-1980)\textsuperscript{12}.

\textsuperscript{12} Nicholas, P 1997, South Australian vine improvement scheme 1996 – 1997 annual report, Primary Industries South Australia, Adelaide.
LC30

Origin
Langhorne Creek

Performance
• 8\textsuperscript{th} highest yielding clone from a selection of 30 at a trial in Langhorne Creek (1977-1980)\textsuperscript{12}.

\textsuperscript{12} Nicholas, P 1997, South Australian vine improvement scheme 1996 – 1997 annual report, Primary Industries South Australia, Adelaide.
Origin
Canada

Performance

- Trialled in Coonawarra in 2007, found to have low vigour, small bunches, good tannin and flavour ripeness, and good maturity of flavour and tannins considering sugar ripeness\(^{21}\).

Origin
Coonawarra

Performance
• Produced consistently high yields in a trial in Sunraysia (1975-1979)\textsuperscript{14}.
Reynella selection

Origin
McLaren Vale

Performance
• Trialled in Coonawarra in 2007, can be inconsistent yielding but seems to prefer warmer years\(^{21}\).
WA Cape selection

Origin
Swan Valley

Performance

• Trialled in Coonawarra in 2007, shown to have more acid than tannin, good growth habit and low vigour\(^2\)\(^1\).

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Cabernet clones panel discussion

• Steve Partridge (Managing Director, ARM Nursery)
• Rob Mann (Director, Doolette consultancy and Corymbia wine)
• David Botting (Chief Viticulturist, Burch Family Wines)
Shiraz clones

• 12 clones listed in WA
• Another 44 clones listed in Australia
• Information on performance available for 22 of the clones
<table>
<thead>
<tr>
<th>Western Australia</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Publicly held (accession #, origin)</strong></td>
<td><strong>Privately held (accession #, origin)</strong></td>
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<tr>
<td>12 (IW346196, Nuriotop)</td>
<td>ENR72</td>
</tr>
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<td>1127 (AS702274, Nuriotop)</td>
<td>ENR127</td>
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<tr>
<td>115 (W323271, Nuriotop)</td>
<td>PT15</td>
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<td>PT15 (AN610012, Griffith)</td>
<td>PT15</td>
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<td>RWV26 (W2626134, Griffith)</td>
<td>RWV26</td>
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<tr>
<td>1125</td>
<td>1125</td>
</tr>
<tr>
<td>Rests old block</td>
<td>Rests Selection</td>
</tr>
<tr>
<td>PT23 (Griffith)</td>
<td>PT23 (AN610020, Griffith)</td>
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<td>WA Selection</td>
<td>WA Selection</td>
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<tr>
<td>12 (Nuriotop)</td>
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<td>373</td>
<td>373</td>
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<td>712 (AS702272, Nuriotop)</td>
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<td>2412 (AS702273, Nuriotop)</td>
<td>2412 (AS702273, Nuriotop)</td>
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<td>2926 (AS702276, Nuriotop)</td>
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<td>617 (AC702169, Merbein)</td>
<td>617 (AC702169, Merbein)</td>
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<td>CW 73-3 (Coonawarra)</td>
<td>CW 73-3 (Coonawarra)</td>
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<td>CW 73-16 (Coonawarra)</td>
<td>CW 73-16 (Coonawarra)</td>
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<td>EW90S</td>
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<td>EW90S1</td>
<td>EW90S1</td>
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<td>Cacosca (Lutherhope)</td>
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<td>EV07H3</td>
<td>EV07H3</td>
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<tr>
<td>EV07H12</td>
<td>EV07H12</td>
</tr>
<tr>
<td>Grippat 8</td>
<td>Grippat 8</td>
</tr>
<tr>
<td>RBP (sympyle)</td>
<td>RBP (sympyle)</td>
</tr>
<tr>
<td>Murray (Merbein)</td>
<td>Murray (Merbein)</td>
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<td>PT10 (AN610018, Griffith)</td>
<td>PT10 (AN610018, Griffith)</td>
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<td>PDFS</td>
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<td>R1E (Tahbik)</td>
<td>R1E (Tahbik)</td>
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<td>R5W (Tahbik)</td>
<td>R5W (Tahbik)</td>
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<td>R1E (Tahbik)</td>
<td>R1E (Tahbik)</td>
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<td>SARDI 2</td>
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<td>Western Australia</td>
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<td><strong>Privately held (accession #, origin)</strong></td>
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<td>SARDI 7</td>
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<td>SARDI 9</td>
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<td>SARDI 10</td>
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<td>SAVII 97</td>
<td></td>
</tr>
<tr>
<td>SAVII 98</td>
<td></td>
</tr>
<tr>
<td>Yalumba 1</td>
<td></td>
</tr>
<tr>
<td>Yalumba 2</td>
<td></td>
</tr>
</tbody>
</table>
Origin
Nuriootpa

Performance

• From an evaluation at Loxton primarily focused on yield potential, this clone **yielded higher** than the mean of the 22 clones within the trial\textsuperscript{13}.

• At a trial in Nuriootpa which was harvested 1978-1986 found clone 12 **yielded significantly higher** than 1654\textsuperscript{11}.

• Two separate trials in Victoria found no significant differences between 12 and 30\textsuperscript{25}.

• High yielding\textsuperscript{26}.

\textsuperscript{13} – McCarthy, M 1986, Vine clonal selection trials 1958 – 1985 Nuriootpa Research and Advisory Centre, Department of Agriculture South Australia, Nuriootpa, South Australia.


\textsuperscript{25} – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.

1127

Origin
Nuriootpa

Performance

• Prominent winemakers have commented that 1127 performs better in Canberra compared to clone 30.30

Origin
Nuriootpa

Performance

• At a trial in Nuriootpa, harvested 1978-1986 found 1654 yielded significantly lower than 1211.

• At a trial in Ararat, Vic this clone yielded higher than PT10 and R7V3E. It also had significantly heavier berries than CW73-16, PT23, PT10 and R7V3E25.

• Moderate yields, sensory comments from Yalumba evaluation - Chocolate, fruit cake aromas with medium bodyed but complete palate26.

• Stephen Pannell comments that this clone is typified by unevenness across the bunch which can lead to “green berry syndrome”. Consequently the fruit is left to hang resulting in super ripeness29.
Origin
Griffith

Performance

• In a trial in Nuriootpa 1987-90 this clone yielded significantly higher than 9 other clones included in the trial\textsuperscript{11}.

• Trials in multiple regions in Victoria did not find consistent differences between PT10, PT15 and PT23\textsuperscript{25}.

• High yielding\textsuperscript{26}.


\textsuperscript{25} – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.

R6WV28

Origin
Tahbilk, Vic

Performance
• In a trial in Nuriootpa 1987-90 this clone yielded significantly less than the other 11 clones included\(^\text{11}\).
• Widely planted and appreciated due to low yields, earlier ripening and loose bunches\(^\text{26}\).
• Sensory comments from Yalumba evaluation - lively palate, soft plush tannins. A touch of peppermint and cedar (elegant)\(^\text{26}\).

Origin
France

Performance
• Highly rated clone\(^7\).
• Medium vigour, slightly compact bunches, upright growth producing aromatic, balanced wines of length\(^8\).
Origin
France

Performance

• Highly rated clone, less productive than 174 with loose bunches, has higher sugar content and higher acidity suited for fertile sites\(^7\).

• Low yielding and **loose bunches**\(^{26}\).

• Vigorous and productive clone, medium sized and **loose bunches**. Fragile skins which can influence disease issues in challenging seasons. The fruit has intense black pepper, plummy and slightly herbal flavours with much spicier skins than other clones\(^{27}\).

• Drooping growth habit, produces aromatic, concentrated wines with good tannic structure\(^{38}\).

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\(^7\) Caldwell, J 2002, A guide for grapevine clones for professionals, John Caldwell Viticultural Service, Napa, California.


Origin
Griffith

Performance
• Trials in multiple regions in Victoria did not find consistent differences between PT10, PT15 and PT23\(^{25}\).
### Assessing clonal variability in Chardonnay and Shiraz for future climate change

**Margaret River Shiraz (2014 – 2016)**

<table>
<thead>
<tr>
<th></th>
<th>Bunch compaction</th>
<th>Yield (kg/vine)</th>
<th>Nº bunches/vine</th>
<th>Bunch weight (g)</th>
<th>Berry weight (g)</th>
<th>Pruning weight (kg)</th>
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<tbody>
<tr>
<td>1654</td>
<td>1.04</td>
<td>3.67</td>
<td>20</td>
<td>185.4</td>
<td>2.0</td>
<td>1.57</td>
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<tr>
<td>12</td>
<td>1.08</td>
<td>4.26</td>
<td>22.3</td>
<td>203.9</td>
<td>2.0</td>
<td>1.60</td>
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<tr>
<td>PT15</td>
<td>1.01</td>
<td>4.10</td>
<td>28.7</td>
<td>170.1</td>
<td>1.8</td>
<td>1.93</td>
</tr>
<tr>
<td>WA Selection</td>
<td>0.97</td>
<td>4.05</td>
<td>27</td>
<td>175.0</td>
<td>1.8</td>
<td>2.03</td>
</tr>
</tbody>
</table>
The following clones are not known to be in WA
Origin
Nurioopta

Performance

• Two separate trials in Victoria found no significant differences between BVRC12 and BVRC30\(^2\)\(^5\).
CW73-16

Origin

Coonawarra

Performance

• Yielded as well as most clones at a trial in Ararat but had smaller berries than most\textsuperscript{25}.  

\textsuperscript{25} – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
BVOVS5

Origin
Yalumba selection

Performance

• Sensory comments from Yalumba evaluation - Spicy, eucalyptus aromas, powerful tannins. Cooler climate palate\(^{26}\).

Origin
Yalumba selection

Performance
• Sensory comments from Yalumba evaluation - Tannin defines style of this wine. Confectionary aromas. Suited as a blender to increase tannin\(^\text{26}\).
Caracosa

Origin
Rutherglen

Performance
• Shows moderate to high yields but not as high as R7V1 and ESA3021\(^25\).

\(^25\) – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
Origin

Hunter Valley

Performance

• Yielded more than several clones at Ararat\textsuperscript{25}.
EVOVS3

Origin
Yalumba selection

Performance
• Sensory comments from Yalumba evaluation - Dry spice, fresh, perfumed aroma, tighter, fresh, more defined and linear palate\textsuperscript{26}.
EVOVS12

Origin
Yalumba selection

Performance

• Sensory comments from Yalumba evaluation - Very perfumed aromas. Succulent full and juicy palate (similar to a Shiraz Viognier blend)$^{26}$. 

Grippat B

Origin

Northern Rhone

Performance

• Very big bunches, better flavour than Grippat A and more acidity\(^27\).
PT10

Origin
Griffith

Performance

• Trials in multiple regions in Victoria did not find consistent differences between PT10, PT15 and PT23\textsuperscript{25}.
• Low yields\textsuperscript{26}.

\textsuperscript{25} - Whiting, J 2003, \textit{Selection of grapevine rootstocks and clones for Greater Victoria}, Department of Primary Industries Victoria, East Melbourne.

Origin
Tahbilk, Vic

Performance

• At a site in Ararat, Tahbilk heritage clones were compared. R7E found to have the lowest yields due to fewer bunches, small berries and lower bunch weights.\textsuperscript{25}.  

\textsuperscript{25} – Whiting, J 2003, Selection of grapevine rootstocks and clones for Greater Victoria, Department of Primary Industries Victoria, East Melbourne.
SAVII 97

Origin

McLaren Vale

Performance

• From a selection of SA heritage vines, this clone was identified by its wine quality. Sensory analysis agreed the wine to have good weight and length with a mixture of different descriptors\textsuperscript{24}.
SAVII 98

Origin
McLaren Vale

Performance
• From a selection of SA heritage vines, this clone was identified by its wine quality. Sensory analysis agreed the wine to be rich with a mixture of different descriptors\(^\text{(24)}\).
Shiraz clones panel discussion

• Lee Haselgrove (Viticulturist, Wilsons Pool Vineyard)
• Rob Mann (Director, Doolette consultancy and Corymbia wine)
Merlot clones

• 11 clones listed in WA
• Another 12 clones listed in Australia
• Information on performance available for 15 of the clones
# Merlot Clones

**French Origin**

<table>
<thead>
<tr>
<th>Western Australia</th>
<th>Australia</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>D3V7 (IW892408, UCD)</td>
<td>D3V7 (IS762408, UCD)</td>
<td>Believed to be the same clone as FPS 03. This clone was selected in Inglenook, CA.</td>
</tr>
<tr>
<td>D3V14 (IW672093, UCD)</td>
<td>D3V14 (IC658013 &amp; IS672093, UCD)</td>
<td>Believed to be the same clone as FPS 01.</td>
</tr>
<tr>
<td>8R (UCD)</td>
<td>8R (IS915615, UCD)</td>
<td>8R and FPS 08 are believed to be the same.</td>
</tr>
<tr>
<td>181</td>
<td>181, BDX 181, EN181 and ENTAV-INRA® N° 181 may be the same clone.</td>
<td></td>
</tr>
<tr>
<td>EN181</td>
<td>181, BDX 181, EN181 and ENTAV-INRA® N° 181 may be the same clone.</td>
<td></td>
</tr>
<tr>
<td>M 343</td>
<td>M343 and ENTAV-INRA® N° 343 may be the same clone.</td>
<td></td>
</tr>
<tr>
<td>PDFS</td>
<td>Q45-14 (IS905613, UCD)</td>
<td>Sourced from Italy via UCD.</td>
</tr>
<tr>
<td>Q45-14 (IS905613, UCD)</td>
<td>RVC 13 (Rutherglen)</td>
<td>Selected from an old variety block at DPI Rutherglen.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Western Australia</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>347</td>
<td>347</td>
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<tr>
<td>D3V5 (IV712315, UCD)</td>
<td>D3V5 HT</td>
</tr>
<tr>
<td>D3V7 HT</td>
<td>D3V7 HT</td>
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<td>ENTAV-INRA® N° 181</td>
<td>ENTAV-INRA® N° 181</td>
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<tr>
<td>ENTAV-INRA® N° 343</td>
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<tr>
<td>FPS 06 (IS915614, UCD)</td>
<td>FPS 06</td>
</tr>
<tr>
<td>SAVII 01</td>
<td>SAVII 02</td>
</tr>
<tr>
<td>Rauscedo (Italy)</td>
<td>Rauscedo selection from Vivali Cooperativi Rauscedo (VRC), released in 1969.</td>
</tr>
<tr>
<td>Rauscedo 12 (Italy)</td>
<td>Rauscedo selection from Vivali Cooperativi Rauscedo (VRC).</td>
</tr>
<tr>
<td>VCR 1 (Italy)</td>
<td>Vivali Cooperativi Rauscedo (VRC) selection.</td>
</tr>
</tbody>
</table>
D3V5 D3V7 D3V14

- D3V14 (FPS 01) D3V5 (FPS 02) D3V7 (FPS 03)
- No significant differences in yield & juice. Differences in canopy parameters in this trial

Table 1: Merlot clone yield components measured at harvest in 2003 and 2005.
(Note means followed by the same letter are not significantly different at $P \leq 0.05$.)

<table>
<thead>
<tr>
<th>Clone</th>
<th>Yield per vine 2003</th>
<th>Bunch Number 2003</th>
<th>Berries per bunch 2003</th>
<th>Berry Weight (g) 2003</th>
<th>114 Bunch Weight (g)</th>
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</thead>
<tbody>
<tr>
<td>D3V14</td>
<td>2.71^a</td>
<td>25.3^a</td>
<td>65.7^b</td>
<td>1.61^a</td>
<td>107.8^a</td>
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<tr>
<td>D3V5</td>
<td>2.82^a</td>
<td>25.7^a</td>
<td>69.7^ab</td>
<td>1.62^a</td>
<td>111.9^a</td>
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<tr>
<td>D3V7</td>
<td>3.22^a</td>
<td>26.2^a</td>
<td>79.5^a</td>
<td>1.56^a</td>
<td>123.3^a</td>
</tr>
<tr>
<td>D3V14</td>
<td>3.79^a</td>
<td>29.7^ab</td>
<td>97.2^a</td>
<td>1.38^a</td>
<td>133.6^a</td>
</tr>
<tr>
<td>D3V5</td>
<td>4.25^a</td>
<td>32.9^a</td>
<td>91.8^a</td>
<td>1.39^a</td>
<td>127.4^a</td>
</tr>
<tr>
<td>D3V7</td>
<td>3.16^a</td>
<td>24.5^b</td>
<td>89.6^a</td>
<td>1.43^a</td>
<td>126.7^a</td>
</tr>
</tbody>
</table>

• *ENTAV-INRA® N°181 - BDX 181 (BDX 481) – EN 181
• *ENTAV-INRA® N°343 - M343

  • 181 343 347 = 70% of merlot clones in French nurseries since 1993\(^7\)
  • 181 343 - Highly regarded clones in France\(^{102,108}\) California\(^{102}\)
  • 181 343 - Lower yielding clones. 181 Many small 343 Moderate sized … bunches\(^{102,108}\)
  • 181 Even distribution of fruit in fruiting zone. Intense plum flavours\(^{111}\)
  • 181 Most stable yield compared with 184, 346 & 348\(^{112}\)
  • 181 343 - Suitable for long aging\(^{102,7}\)

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\(^7\) – Caldwell, J 2002, A guide for grapevine clones for professionals, John Caldwell Viticultural Service, Napa, California.


\(^{111}\) – Dimovska, V, Ivanova, V, Serafinovska, A, Vojnoski, B & Ilieva, F 2011, Comparison of four Merlot clonal selections from Skopje’s vineyard region, R. Macedonia, Food science, engineering and technologies, 58, pp. 43-49.
• **Q45-14** Rated as a high quality clone in Eastern Australia\(^{101}\), produces smaller bunches and yield. Complex, structured and tannic wines\(^{102}\).

• **6R (**FPS 06**)** FPS 01, FPS 03, FPS 06, FPS 08, Bear Flats (BF) and Oak Knoll (OK) were evaluated. Juice and wine analyses showed BF and KO to have lower pH and malic acid but higher tartaric acid, colour and total phenols than any of the FPS clones\(^{110}\).

• **8R (**FPS 08**)** Confectionary characters\(^{101}\), moderate yields\(^{102} & 108\), aromatic soft wines\(^{102}\) produced 40% less yield than FPS 03 (*D3V7*)\(^7\) lower yield and fruit-to-pruning weight ratio due to poorer fruit set, especially cooler weather compared with 01, 03, 06 & 09\(^{109}\).
• **Rauscedo 12** Medium-large bunches, medium density of berries; vigorous \(^{103}\)

• **VCR 1** Italian Selection - Vivai Cooperative Rauscedo. Small medium bunches, semi-compact. Excellent resistance to Botrytis \(^{103}\). **VCR 181 343** Compared for differences in colour and sensory preference. Spectroscopy indicated no colour difference between clones. Preference 181 based on taste (Fig 2) \(^{107}\)

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Merlot clones panel discussion

• Steve Partridge (Managing Director, ARM Nursery)
• Rob Mann (Director, Doolette consultancy and Corymbia wine)
Acknowledgements

- Funding: Wine Australia
- Panel members
- Industry members who have supplied fruit and wine for the tasting