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Vine identification – knowing what you have

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Introduction

Variety identification is important to grape growers, winemakers, regulatory authorities, those who sell wine and those who consume it.

An estimated 5000 to 6000 varieties of the Vitis vinifera species exist around the world, although only a relatively small number of these are used commercially. Historically, Australian winemaking has been based on the classical varieties but in the last 20 years there has been an increase in interest in less well known, or alternative, varieties.

The need for correct identification

With the increasing interest in new planting options there is a need to ensure trueness to type and to avoid planting material. This applies at all stages of the wine production process including the nursery, the vineyard, and winery. Mistakes can potentially result in significant financial costs to those involved along the chain.

The Australian Wine and Brandy Corporation Act requires that statements made on wine labels be true and not misleading. The Label Integrity Program (LIP) supports that goal by requiring wine producers to maintain records throughout the winemaking process, which includes the grapes vintage, variety and regional provenance. It is an offence to make false or misleading claims on wine labels, and penalties may include fines and even a jail sentence of up to two years.

Recent research suggests that identification of the variety or varieties in the actual wine by DNA typing is now coming closer to a commercial reality (Sefc et al 2009), which adds to the importance of a good traceability system throughout the winemaking process, including variety provenance.

Mistaken identities

There have been varietal identification mistakes or confusion with grapevine material through history, both internationally and in the Australian wine industry.

In 1976, the French ampelographer, M. Paul Truel, visited Australia, and revealed misnamed varieties (e.g. Chenin Blanc known as Semillon, Albillo or Stein), mixed plantings known under a single name (e.g. a "Marsanne" vineyard made up of five different varieties, Semillon, Trebbiano, Chardonnay, Riesling and Sauvignonasse) and errors in the naming of some imported planting material, for example "Pinot Blanc" from California, was found to be Melon (Antcliff 1976).

More recent examples of either wrong identification, or logistical errors, include Cabernet Franc/ Merlot mixed plantings, a Viognier planting that was more than 60% Sauvignon Blanc, and a Pinot Gris planting that was entirely Trousseau Gris. Costs associated with replants and loss of production can be significant.

One of the latest errors identified concerned what was thought to be the Spanish variety Albariño, imported in 1989, before DNA analysis was available. In 2008, the visiting French ampelographer Jean–Michel Boursiquot suggested it was actually Savagnin Blanc, a member of the Traminer family and also known as White Traminer (not to be confused with Sauvignon Blanc). This was verified by DNA analysis in France, and investigated and confirmed at CSIRO. Wine wrongly labelled as Albariño had to be re–labelled, marketing plans needed to be changed, and some grower contracts were suspended. Savagnin Blanc has fortunately shown to be a versatile variety that has had good wine reviews, but it is not the Spanish variety people had anticipated and the mistake has been a significant cost to the industry and to individuals.

Together with the greater interest in alternative varieties, there has been a slight change in the general importation process of grapevine material, with the demise of a centralised system of importation that allowed a national register of varieties and clones held in Australia to be maintained. Private importations have increased, and due to privacy laws, there is no national register of all vine material now in Australia. There is no requirement for trueness to type testing, nor for traceability in the importation process.

Now that DNA testing can verify grapevine identity, it would be a useful tool to use either during the importation process, or prior to distribution, before large plantings and investments are undertaken.

Some nurseries now offer to have planting material of newer varieties DNA tested at the client's cost. Yalumba Nursery independently tests new acquisitions where deemed necessary, with most of their imported material coming from ENTAV, France, one of the most rigorously inspected germplasm collections.

Vine Identification methods

Ampelography

Traditional vine identification involving a visual inspection of the grapevine is known as ampelography, a word from the Greek "ampelos" meaning vine and "graphe" meaning description.

Several morphological vine parts are used to distinguish one variety from another, and are best inspected at specific times of the season. These include:

- the growing shoot tip and young leaf, during spring, when the colours are most pronounced;
- the mature leaf, from flowering onwards; and
- the bunch and berry from veraison onwards.

The main descriptors of those vine parts considered in identification are the amount and type of hair, the colour, shape and size, texture, appearance and, where relevant, taste.

It is useful to consider more than one vine part to distinguish between varieties. The shoot tip colour can be a very useful descriptor in the spring, with the white tip of Merlot, for instance, distinguishing it from the often confused Cabernet Franc or Cabernet Sauvignon, (see Figure 1). The mature leaf then provides a large number of descriptors that may be useful for distinguishing further between varieties (see also Figures 2, 3 & 4).

Figure 1. Shoot tips/young leaves in spring are a good discriminating characteristic for Merlot and Cabernet Franc. The white on the left is Merlot, bronze on the right is Cabernet Franc.
Source: Tassie (2008)

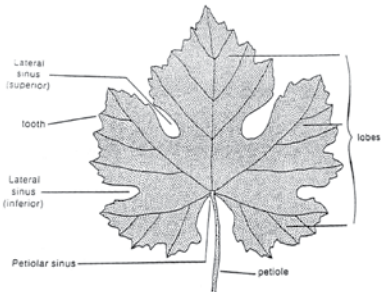

Figure 2. Diagram of mature leaf parts showing lobing delineated by the presence of sinuses, and the teeth at the leaf edges.
Source: Tassie (2008)

For the mature leaf, the following descriptors can be considered:

- Hair: · type – bristles or woolly;
  · amount – none to felty;
- Lobe number: · entire, or with 3, 5 or more lobes;
- Teeth–size and shape: · convex (arched), pointed, or concave
- Petiolar sinus: · shape – V, lyre or a U;
  · width – open,close or overlapping;
  · naked, ie delineated by the vein – e.g. Chardonnay;
- Leaf shape: · circular, reniform, wedge shaped (cuneiform) or pentagonal;
- Leaf colour: light, dark;
- Leaf surface: rough or "bullate", or smooth;
- Petiole and vein colour: green, red/green, red;
- Leaf contour: flat, lacy, cupped;
- Lateral sinuses: depth and shape, presence of tooth, e.g. Cabernet Sauvignon, Nebbiolo.

Fig 3. Petiolar sinus delineated by the veins, "naked", characteristic of Chardonnay. Source: Tassie (2008)

Figure 4. Teeth shape on the mature leaf – convex or round teeth on the left as found in Sauvignon blanc, and on the right, straight or pointed teeth typical of the Muscat family.
Source: Tassie (2008)

Ampelography is not an exact science, and some variability in descriptor definition may occur due to environmental, cultural and genetic variations.

In different environments the amount of colour or anthocyanin in shoot tips, petioles, shoots and leaves may vary, as can berry and bunch characteristics. Health status, including the viral, pest or disease load, can influence descriptors (e.g. viruses can distort leaf size and appearance). Within a variety there can be significant variability with descriptors such as leaf lobing for example, particularly in older varieties such as Pinot Noir and Nebbiolo, that also have significant clonal variability.

It is important to:

- inspect a good representative sample, looking at a number of vines and leaves (at least 20 leaves) due to the large variability within and between vines;
- avoid sick vines: and
- avoid suckers, water shoots and young plants as these can display juvenile characteristics of more colour, bristles and greater lobing in their leaves.

Ampelographic descriptions for a variety can therefore vary slightly from one area to another depending on environment and vigour, and the interpretation of the observer.

In trying to identify a vine, it is important to establish a relativity with the descriptors used particularly in trying to distinguish between similar varieties.

There are limited ampelographic texts in English. Pierre Galet, in the 1970s, developed a text including a dichotomous key to systematically work through French varieties in his translated text (Galet,1979). More recently, the Organisation Internationale de la Vigne et du Vin (OIV) has developed a comprehensive ampelographic descriptor list that looks at the green and woody shoot and the inflorescence, with a total of 89 different characters.

DNA testing

In the early 1990s, initial research with DNA fingerprinting technology by CSIRO showed its potential as an objective technique to identify grapevine cultivars (Thomas 1993). This technology has now been developed for identification of grapevines using various molecular markers both in Australia and internationally, and can also determine relationships in grapevines, e.g. Cabernet Sauvignon was found to be a cross between Sauvignon Blanc and Cabernet Franc. Current techniques do not readily discriminate between clones, nor between varieties with differences due to mutations such as berry colour, e.g. between Gewurztraminer and Savagnin Blanc (White Traminer), or between Pinot Noir, Pinot Blanc and Pinot Gris.

The DNA test can be undertaken on a minute sample of any grapevine tissue, with younger, actively growing material preferred. Correct grapevine identification with DNA profiling is reliant on validation of trueness to type of the reference vine. That is, the grapevine used to establish the initial genetic fingerprint needs to be verified to be true to type itself.

A significant European project has included varietal DNA profiles in the second edition of the OIV "Descriptor List for Grape Varieties and Vitis Species", in addition to the ampelographic, ampelometric (leaf measurements), isoenzyme characteristics and phytopathological traits.

Identification of a single vine by DNA profiling has an advantage over the subjective nature of ampelography. It overcomes the problems of morphological variability and, given a sufficient and verified data base, can identify unknown vines. DNA tests can however only verify one specific, individual vine, so to determine trueness to type of a source block or vineyard, all vines need to be verified or inspected.

There are now some commercial services available to verify identification of a grapevine variety. In Australia, grapevine samples can be sent to a commercial testing facility based on the data base initially established by CSIRO, and France and the US also provide a commercial service; see end of fact sheet for contact details.

Nomenclature issues, synonyms & clonal authenticity

Nomenclature issues and synonyms

Grapevine varieties used for winemaking in Australia originate from Europe, where the same variety may be grown in a number of countries or regions under different names, (synonyms), and different varieties may be known under the same name (homonyms). The variety of Mataro, for example, has a number of synonyms, known as Monastrell in Spain and Mourvèdre in France, (see Table 1). Garnacha Tinta – or Grenache – has 108 synonyms listed in the Vitis International Variety Catalogue.

Table1. Examples of some synonyms in other countries and regions

COMMON NAMES IN AUSTRALIA	SOME SYNONYMS USED ELSEWHERE
Mataro, Mourvedre	Monastrell (Spain), Mourvèdre (France)
Sangiovese	Nielluccio (Corsica, France), Sangioveto (Italy)
Grenache	Garnacha Tinta, Lladoner, Tinto Aragones, Alicante (Spain), Cannonau (Sardinia,Italy), Granaccia (Sicily, Calabria, Italy)
Tempranillo	Tinta Roriz, Aragonez (Portugal), Tinto Fino, Tinto del Pais, Cencibel (Spain)
Zinfandel, Primitivo	Zinfandel (America), Primitivo (Italy), Crljenak Kastelanski (Croatia)

Extensive studies in Europe at the regional level are working on the synonyms and homonyms to unravel varietal complexity. Recent work in the region of Calabria, Italy, studied over 250 varieties from old vineyards, and identified a complexity of synonyms and homonyms, including Sangiovese under four different names, and Grenache under the name of Nero (Schneider et al, 2009). The red variety Calabrese, from Calabria, is also widely grown in Sicily as Nero d'Avola and becoming popular internationally under the latter name.

As all our vine material is imported, it is pertinent to keep in mind the complexities of the grape resource in Europe.

Use of the correct grapevine varietal name is required in todays global wine market. Australian wines that are exported to Europe must comply with the Australian section of the OIV International List of Vine Varieties and Synonyms, where Australia, for example, lists Traminer and Savagnin Blanc as acceptable synonyms for Savagnin.

Given the interest in the lesser known varieties, and the new technology of DNA profiling for identification from grapevine material and possibly, wine, it is important to get the varietal identification right.

Clonal authenticity

Clonal identity has become more significant in todays wine industry, with new vineyards often planted with a preferred clone or mix of clones The selection of a clone is based on a difference in some attribute such as phenology, productivity, flavour, aroma, morphology, or disease resistance or other performance characteristic. Some clonal differences may be due to virus load, and current virus detection and sanitary clean up can now ensure that clonal differences are most likely due to genetic differences.

Initial clonal selection programmes in Australia in the late 1950s looked primarily at yield, and wine quality attributes were included in later trials. Rigorous clonal selection programs in European research institutes such as ENTAV in France require new clones to be registered via a certification process, with the process possibly taking up to 14 years (Anon. 1995). Nursery clonal selection programs may not be so stringent. Importations of clones are made for their reported superior performances and to increase our genetic resources and options in Australia, although further evaluation is required to gain site specific information in our environments.

The clonal name can trace the origins and any known performance of a clone. The Pinot Noir clone FVD5V12/VX/UCD, for example, indicates it is from University of California, Davis, (UCD) and from the Foundation Vineyard (the original block) ie FV, block D row 5 vine 12. In some instances, information is included to indicate the clone has been heat treated to eliminate viruses, eg Pinot Noir FVG8V7/VX/UCD HT69. Other clonal names indicate the selection organisation, and an identifiable number. For example Arneis CVT CN 15, is from the Piedmont research group " Centro di Studio per il Miglioramento Genetico e la Biologica della Vite" (CVT), selected in the region of Cuneo (CN), Italy.

Some clones have distinctive flavour characteristics that may play a significant part in the final wine composition. Field experience with Nebbiolo for example, has found that while clone CVT CN 230 makes up the main backbone of the wine, a small component of clone CN 111 imparts a distinctive and important perfume to the wine (Henschke, P., Henschke S., and Ringland, C. pers comm. 2010).

To optimise potential wine quality, it is to the industry's advantage to know and maintain the original clonal names particularly while there are few clonal or varietal trials being undertaken in Australia.

Distinction between clones is usually very difficult using traditional ampelography, and not readily achievable with DNA profiling. A good traceability system for the clonal identity is thus absolutely critical.

Sourcing vine material from accredited suppliers (trueness to type and disease load issues)

When establishing a vineyard, high quality planting material is an essential component for the long term success of the vineyard. The planting material should be true to type for both variety and clone, and it should be of high and known health status, free from as many disease(s), including identifiable viruses, as possible.

A grower needs to feel confident that the supplier of the planting material has a robust audit system in place and can provide documentation to demonstrate traceability.

Questions need to be asked about whether the supplier can prove that the material is true to type with regard to both clonal and varietal identity and can give an assurance on health status. There should be an accreditation system in place to give some quality assurance of procedures and traceability.

Three recognised accredited schemes operate in Australia. There are those conducted by vine improvement organisations, (the National Vine Accreditation Scheme), the nursery industry accreditation scheme coordinated by the Vine Industry Nursery Association (VINA), and the general ISO (International Organisation for Standardisation) accreditation scheme.

The National Vine Accreditation Scheme was set up in the late 1990s to oversee germplasm collections, source block plantings and facilitate the supply of planting material to the industry. AVIA (Australian Vine Improvement Association) continues to administer this to an extent throughout Australia, with state or regional vine improvement groups. Vine improvement coordinated source block plantings can be traced back to original mother vines of known varietal and clonal origin. The source blocks should be virus tested annually, to reduce the risk of virus in the propogation material supplied, and have an inspection for trueness to type in the first few years of planting. Cutting collection, storage and distribution should be undertaken under quality control guidelines.

The nursery industry scheme coordinated by VINA ensures accredited nurseries are audited according to established best practice standards. Certified material that must meet certain standards is only distributed to industry by these accredited nurseries, who can also distribute non–certified, or common stock.

It is important that customers can be confident that a good audit trail is in place to ensure that they are receiving the best planting material of known identity and health status.

References and contacts for vine identification

There are not a lot of current references for ampelography written in English.

Historically, large tomes of lengthy descriptions were undertaken in Europe, with the first international work of 7 volumes by Vialla and Vermorel in French, in 1909.

Some of the most useful, but specific, references are publications from individual regions in the European countries, and from some of the large European nurseries.

Publications

English language references

Anon. (1995) Catalogue of selected wine grape varieties and certified clones cultivated in France. ENTAV, INRA, ENSAM, ONIVINS, Ministry of Agriculture, Fisheries and Food, CTPS, France.
This has ampelographic descriptions of 227 varieties, mainly French, with good photos of bunches and leaves, as well as phenological, agronomic and clonal information.

Bettiga, Larry, J., et al.(2003) Wine grape varieties in California. University of California, Agriculture and Natural Resources
Looks at 36 main varieties of California, and, in less detail at 19 minor varieties, with morphological characteristics, viticultural, cultural and clonal information. Good photos.
Available at UCD bookshop:
http://ucdavisbookstore.com/home.aspx

Boehm E.W., & Tulloch, H.W. (1967) Grape Varieties of South Australia (S.A. Dept of Agric; Adelaide)
Descriptions, photos and some cultural notes on the varieties most common in SA at that time, with comments on some of the early misnamings.

Galet, P. (1979) A Practical Ampelography. Translated by L. T. Morton. (Comstock Publishing.: Ithaca, NY).

A good description and explanation of the traditional method of vine identification, but only French varieties. Out of print, may be available via web.

Kerridge, G. and Antcliff, A.J. (1999) Wine Grape Varieties (CSIRO Publishing, Melbourne)
This book is a revised edition of the 1996 version (see below) and combines the information from that and the previous 3 Antcliff books, with some more varieties from the CSIRO collection. Information for varietal recognition is given, with some cultural information and statistics. Good photos.

Kerridge, G. and Antcliff, A.J. (1996) Wine Grape Varieties of Australia, (CSIRO Publishing, Melbourne)

Antcliff, A.J. (1976b) Some Wine Grape Varieties for Australia (CSIRO: Adelaide)

Antcliff, A.J. (1979) Major Wine Grape Varieties of Australia (CSIRO: Adelaide)

Antcliff, A.J. (1983) Minor Wine Grape Varieties of Australia (CSIRO; Adelaide)

Orffer, C. Ed (1979) Wine Grape Cultivars in South Africa (Human and Rousseau, Cape Town).
Looks at varieties from South Africa, not many common in Australia; descriptions, some phenological and agronomic data.

French language references

Anon. (2006) Catalogue des variétiés et clones de vigne cultivés en France. 2nd edition Institut Francais de la Vigne et du Vin (ENTAV– ITV France) INRA – Montpelier.
A more recent and expanded version of the 1997 edition, good photos of bunches and leaves, with phenological, agronomic & clonal information.

Galet, P. (1990.) Cepages et vignobles de France. Tome II. L'ampelographie francaise. 2nd edition, Dehan, Montpelier.

Viala, P. and Vermorel, V. (1909) Ampelographie. 7 volumes. Masson, Paris .

Italian language references

Anon. Catalogo Generale Vitis Rauscedo : VCR Vivai Cooperative Rauscedo.
The Rauscedo Nursery produces a catalogue of their available material, with ampelographic,clonal and cultural information that is updated periodically.

Schneider, A. and Mannini, F. (2006) Vitigni del Piemonte; Varieta e Cloni. Regione Piemonte – Assessorato Agricoltura. Torino.
This covers 19 main varieties of Piedmont, and 47 minor varieties with ampelographic, clonal, phenological, cultural and some oenological information.

Web references

English

Vitis *International Variety Catalogue*
http://www.vivc.bafz.de/index.php
An extensive data base maintained by the Julius Kühn Institut, Geilweilerhof.

European Vitis *database*
http://www.eu–vitis.de/index.php
Both these sites are works in progress, and the catalogue on the eu– vitis site deals essentially with autochtonous, or local, varieties generally not known outside their region.

http://www.chalmersnurseries.com
Considers some Italian varieties, with descriptions, agronomic and some clonal information.

The catalogue of the Italian Nursery, Rauscedo
http://www.vitisrauscedo.it/pdf/catalogue–en.pdf

Italian

www.enoteca–italiana.it
www.lavinium.com
www.vinoe.com
These sites have descriptions and some cultural information in Italian

Consulting ampelographers

A list of internationally recognised ampelographers.

France: Jean Michel Boursiquot – Montpellier SupAgro, 34060 Montpellier, Cedex 01, France.
Thierry Lacombe– 2, place Pierre Viala, 34060 Montpellier, Cedex 01, France.

Italy: Anna Schneider – Istituto di Virologia Vegetale, CNR, Unità Viticoltura, Via L. da Vinci 44 –10095 Grugliasco, Torino, Italy.

Germany: Dr. Erika Maul – Julius Kühn Institut – Bundesforschungsinstitut für Kulturpflanzen, Institut für Rebenzüchtung Geilweilerhof, 76833 Siebeldingen, Germany.

USA: Dr. Andy Walker – mainly rootstocks. Department of Viticulture & Enology, University of California,Davis, CA 95616–8749, USA.

Portugal: Dr. José Eiras Dias – Instituto Nacional de Investigação Agrária. Quinta de Almoínha, P–2565–191 Dois Portos, Portugal.

Spain: Dr. Gregorio Munoz & Dr. Félix Cabello – Instituto Madrileño de Investigación y Desarrollo Rural Agrario y Alimentario (IMIDRA). Finca El Encín. Ctra. A–2, km 38200. 28800 Alcalá de Henares (Madrid). Spain.
Carmen Martinez – Misión Biológica de Galicia (CSIC), Apartado de correos 28, 36080 Pontevedra, Spain.

Australia: CSIRO resources are about to be further reduced, and only a limited inspection service will be available on a private basis. Libby Tassie; Tassie Viticultural Services.

DNA typing commercial services.

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Email: gsdangl@ucdavis.edu
Web: http://fpms.ucdavis.edu/IDTesting.html

References

Antcliff, A.J. (1976). Variety Identification in Australia. A French Expert Looks at Our Vines. The Australian Grapegrower & Winemaker.153:10–11

Audeguin, L. and Boursiquot, J–M. (2008) Ampelography Workshop. ENTAV – INRA. Nov 18 – 20, Yalumba Nursery, Barossa Valley

O.I.V. Office International du Vigne et du Vin (2007) Descriptor list for Grapevine varieties and Vitis species. Second Edition.

Sefc, K.M., Pejić, I., Maletić, E., Thomas, M. R . & Lefort, F. (2009) Microsatellite markers for grapevine: Tools for cultivar identification & pedigree reconstruction. *IN*; K.A. Roubelakis–Angelakis (ed.), *Grapevine Molecular Physiology & Biotechnology*, 2nd edn.,© Springer Science+Business Media B.V. 2009 pp 565–596

Schneider, A. et al. (2009) "Contributo all'identificazione dei principali vitigni Calabrese" Frutticoltura no. 1/2

Tassie, E. (2008) Vine Identification Short Course Notes

Thomas, M.R, and Scott, N.S.(1993) Microsatellite repeats in grapevine reveal DNA polymorphisms when analysed as sequence–tagged sites (STSs). Theor Appl Genet 86:985–990

Thomas, M.R. and Walker,R. 'Evolution of Grapevine variety collections in Australia" The Aust. and NZ Grapegrower & Winemaker No.545. 78–80.

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