Measuring for Quality: The National Vineyard Fruit Composition Survey

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Introduction
The wine industry's push for consistent quality product has led research and development teams across Australia to focus on answering several key questions:

• What is quality?
• How can we measure quality?
• How can we manage our vineyards to achieve quality?

The Cooperative Research Centre for Viticulture (CRCV) has been undertaking a major study under its Program 5 'Grape quality characterisation and objective measurements' which is designed to assist in answering some of these questions. The basis for much of this research work is the fact that in order to be able to effectively manage vineyard and winery operations for quality production we must first be able to measure quality.

Part of Program 5 includes the development of a laboratory technique called the glycosyl-glucose assay (G-G assay) which may provide a tool to assist industry in the objective measurement of quality attributes. The G-G assay is an indicator of important flavour precursors in grapes, grape juice and wine. The G-G assay provides an accurate measurement of the total quantity of a group of chemical compounds called glucosides in the grape. There are hundreds of these glucosides in grapes and this group has been shown to be important in determining wine aroma, i.e. they act as flavour precursors. The G-G assay technique has been used for research purposes over the past three seasons, and was developed using mainly Shiraz grapes and wine. We are now in a position to assess its usefulness over a broader range of varieties and situations with a view to defining its value in commercial practice.

The CRCV Program 5 involves researchers from the Australian Wine Research Institute, University of Adelaide and Charles Sturt University.

During the 1996 vintage the CRCV undertook the National Vineyard Fruit Composition Survey (NVFCS), which is the first comprehensive survey of grape and wine composition involving the use of the G-G assay.

What is the NVFCS?
The NVFCS is a survey of grape berries and wines from most viticultural regions in Australia focussing on four varieties: Semillon, Chardonnay, Cabernet Sauvignon and Shiraz.

The survey involved over 30 growers, 50 vineyards and 2500 individual samples. The samples will be tested using various measurements which will then be assessed on the basis of region, management practice and variety. Although the survey includes a wide range of vineyards it is by no means a random sample of Australian viticulture, but should be sufficiently comprehensive to give sound guidance for any future development of the assay.

Objectives of the NVFCS

• To explore the potential of the G-G assay as a quality indicator. This will be a key validation exercise for the G-G assay, to expand the current data set which is required to assess the assay’s applicability to the viticultural industries.
• To assess G-G range for four varieties, across Australia. This will provide the industry with a range of G-G values that can be obtained by the assay and show how these values differ according to variety, region and management.
• To relate grape G-G to wine G-G, and wine quality/style. The relationship of the grape G-G values and the end product characteristics will be a valuable part of the overall process.
• To assess the change in G-G values as grapes ripen.

Who is involved?
Staff and resources from many agencies and industry cooperators have been involved in the design and operation of the NVFCS; the major participants are listed below:

- CRCV - Australian Wine Research Institute: Patrick Williams, Leigh Francis, Mariola Kwiatkowska.
- CRCV - University of Adelaide: Patrick Iland, David Botting
- CRCV: Mike McCarthy
- CRCV: Hugh Armstrong
- Participating growers, wineries, State Departments of Agriculture.

Where have the grapes/wine come from?
Most viticulture regions in Australia are represented:

- State Region
  - Victoria: Sunraysia, King Valley, Dookie, Swan Hill, Yarra Valley, Mornington, North East
  - South Australia: Clare Valley, Barossa Valley, Padthaway, Riverland, McLaren Vale, Adelaide Hills, Langhorne Creek
  - New South Wales: M.I.A., Hunter Valley, Murrumbateman
  - Queensland: Stanthorpe
  - WA: Mt Barker
  - Tasmania: Launceston, Hobart

Which attributes are we measuring?
Participants in this survey have collected weekly samples of grapes from the period between veraison until after the commercial harvest date. Growers sectioned off a block of 20 vines for sampling. Each week for 8–10 weeks from veraison, 150 berries were collected at random from within the 20 vine plot. One hundred berries were placed into each of two plastic vials while the remaining 50 berry sample was measured for °Brix on site if possible. The samples were stored frozen until

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concentration in the juice at harvest.

There is no excuse for a winemaker having to contend with a stuck ferment in the winery due to low nitrogen concentrations in the juice. Vineyard applied nitrogen should provide sufficient nitrogen in the must to sustain fermentation. Analysis of juice for FAN and NH₄ prior to fermentation should also provide the winemaker with data to predict whether nitrogen supplements may be required in the winery to maintain fermentation.

Potassium is important in sugar production and colour but can have a detrimental effect on the acid balance of the finished wine if the rate of application is too high. It is important to maintain a balance between potassium and nitrogen in the must. This can be achieved by maintaining nitrogen nutrition in the vine marginally higher in the adequate range and potassium at the bottom of the adequate range (as determined from petiole analyses). Phosphorus does not appear to affect the winemaking process, however it is important in berry set and development, that is, in providing a sufficiently large and strong container (skin) for maintaining juice volume.

References


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they could be collected and sent to the laboratory for analysis. Participants submitting wine for the survey collected 25 grape bunches from across the vineyard; the berries were then plucked and mixed together. Five random samples of 50 berries were taken and these samples were used for analysis. The remaining grapes were processed and wine samples were taken at the end of fermentation.

Once collected the measurements carried out have included:

- G-G assay
- pH
- Titratable acidity
- Baume/Brix
- Colour—measurement of colour is emerging as a promising indicator of black grape quality

Progress to date

Several hundred samples have now been analysed and some regional differences are beginning to appear. We intend to release the complete results from the survey to participants prior to the 1997 vintage. We will be running a similar survey to further validate these emerging technologies during next vintage.

More information

Further information about the G-G assay can be found in the references listed, or by contacting Dr Patrick Williams or Dr Leigh Francis at the Australian Wine Research Institute. The CRCV has also produced an instructional laboratory video and manual to describe the G-G assay technique; this is available from the CRCV Secretariat. Information about the NVFCS should be directed to Hugh Armstrong at the CRCV Secretariat (phone 08 8303 9405).

Conclusion

The underlying principle remains: we need to be able to measure before we can manage! The G-G assay and NVFCS are tools to assist in being able to measure the parameters which drive the quality of our end product.

Further reading

