What can be done in the vineyard to manage risk in difficult seasons?

This paper was delivered by Mary Retallack, managing director, Retallack Viticulture, at Finlaysons Wine Roadshow XX, at nine different venues around Australia between 30 July and 31 August 2012. In last month's Grapegrower & Winemaker Mary Retallack discussed ways viticulturists could minimise risk in particularly wet and dry seasons. Retallack said it was important to take stock of what had happened in the past because past seasons provided a handy checklist for seasons to come.

Mary Retallack

Canopy and fruit quality (maturity, purity and condition) parameters

An assessment of vine performance and fruit quality may be carried out to:

- Benchmark vine condition and fruit quality from season to season; this is useful if you are coming out of contract,
- Compare with information received from a vineyard visit by a fruit purchaser,
- Have the condition of vines and/or fruit documented for later reference,
- Equip wine growers with the skills and terminology to talk confidently with winemakers, or
- To help settle a dispute at vintage.

Examples of common parameters assessed are presented in Table 1.

Assessing damaged fruit in the vineyard

When faced with a downgrade or rejection of fruit in the vineyard, there

Table 1: Details of common canopy assessment and fruit quality parameters[1].

Canopy assessment criteria	Fruit assessment	Fruit purity and condition parameters	Laboratory assessments
Average shoot length (cm)	Fruit condition	Powdery mildew	°Brix / °Baume
Average internode length	Berry shrivel (%)	Downy mildew	pH
Number of leaves on average shoot	Berry size (diameter –mm)	Berry splitting	TA (g/L^{-1})
% Growing tips visible	Berry weight	Sunburn	Anthocyanins (colour)
Shoot trimming	Bunch shape/ compactness	Botrytis and other bunch rots	Laccase activity
Extent of lateral shoot growth	Crop load	Sooty mould	Ochratoxin A
Shoot maturation (% lignified)	Berry Sensory Assessment (BSA) • pulp description • flavour intensity and description • sugar / acid balance • skin chewiness • tannin intensity and mouth feel description • berry skin colour • seed colour and maturity • identification of any undesirable flavours	Dry berries / shrivel	Yeast Assimilable Nitrogen (YAN)
Leaf condition		Bird / insect damage / animal damage	Salt (Na^+ and Cl^-)
Leaves remaining			
Leaf Layer Number (LLN) at bunch zone		Immature berries	Herbicide residue testing
Light description penetrating bunch zone		Uneven ripening	Smoke taint (Guaiacol and 4-methylguaiacol)
Bunch exposure			

Price penalties imposed by fruit purchasers vary significantly, as do the thresholds for downgrade or rejection of fruit in the vineyard.

are a number of steps involved in assessing and quantifying the level of damage present. Ideally if there is a problem this is identified early so remedies can be applied, such as the hand harvesting of fruit, dropping damaged bunches to the ground, and/or or machine harvesting selected sections.

It is much better to manage fruit quality issues in the vineyard rather than waiting until fruit is sitting at the weighbridge for appraisal. If there is a problem at this late stage, then there are few options available to the wine grower to find an alternative purchaser for their perishable product.

Assessment of fruit purity and condition is most commonly carried out in the vineyard by assessing the incidence and severity of damage on a representative sample size; commonly this comprises a 200 bunch sample. As with any sampling technique it is important that the sample is truly representative (randomly assess bunches) and the sample size is large enough to take into consideration the level of variation within the area sampled. This process can be time consuming (30 to 60 minutes per assessment depending on the size of the management unit).

If a management unit has 'hot spots' present, it may be necessary to assess these areas separately, so the entire crop is not downgraded or rejected, if the remaining fruit is sound.

While work has been done on developing procedures for assessing Botrytis and other bunch rots, and Powdery Mildew, there is still much work to be done to effectively quantify sunburn damage, dry berry/shrivel, bird peck damage, insect damage, sooty mould residue etc on different vine parts including leaves, the bunch and in some cases the rachis.

This issue is often further compounded by the lack of criteria presented in grape sale agreements for the assessment of incidence and severity.

Incidence and severity

It is important to have a clear understanding of the difference between incidence and severity when assessing disease or physical damage of wine grapes in the vineyard, as there seems to be a lot of confusion about these terms, especially at vintage time.

For example, if one berry in each bunch of a 200 bunch sample has a particular disease or physical damage present, this would equate to 100% incidence per bunch. If however only one berry per bunch is affected, obviously the severity is low (as per the bunch right).

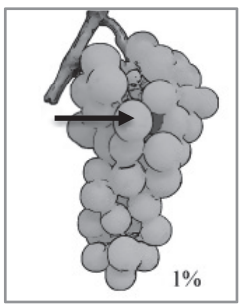


Photo: www.bunchrot.co.nz

It is important to make this differentiation. I still see 'incidence' written into grape sale agreements, or

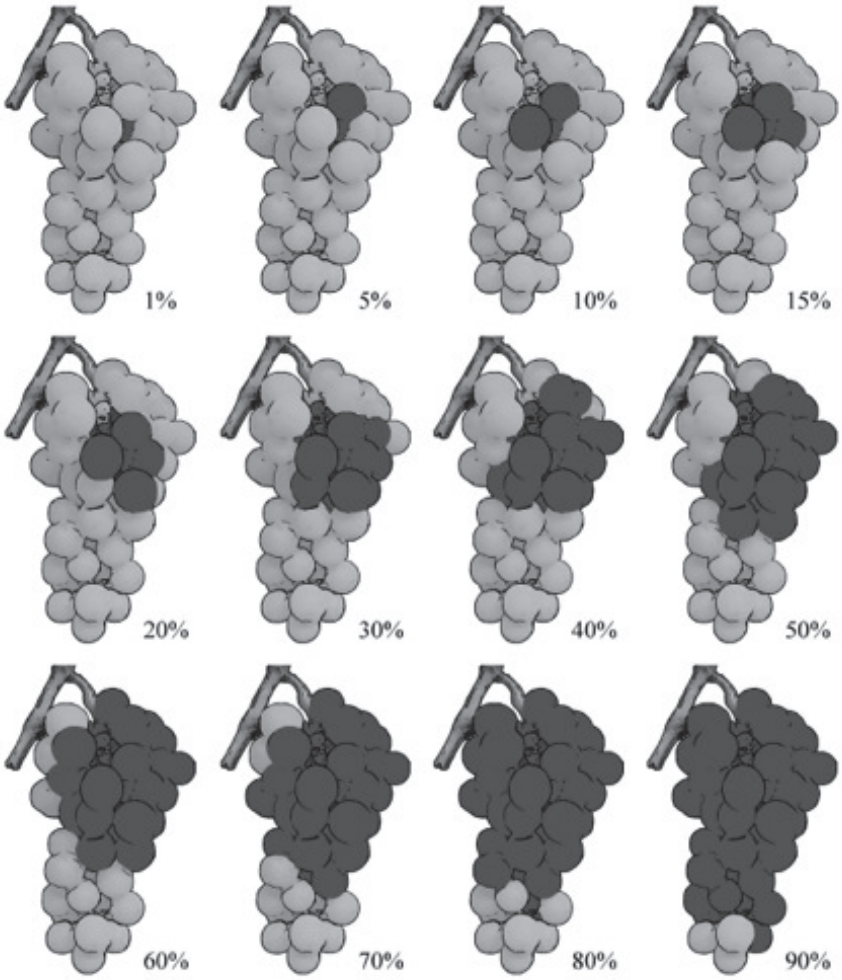


Figure 1: Botrytis bunch rot severity assessment key. Lighter areas represent healthy berries and darker areas represent disease-affected berries. Numbers indicate the percentage of the visible side of the bunch occupied by diseased berries.[2]

both terms used interchangeably, or not at all. This is problematic when parties are trying to navigate their way through schedules that outline the percentage thresholds for the downgrade or rejection of fruit.

To look more closely at the assessment of severity, if there are 100 berries on each bunch and one berry is damaged, then this equates to 1% severity. The way the severity is calculated will depend on the sample size, the severity of the disease or physical damage present on each bunch, and how this is visually assessed into particular severity categories.

For example, if the following severity categories were used (0%, >0 to 3%, 3 to 25%, 25 to 50% and >50% damage), the severity for the example above would be 1.5%. This is the category median of 0% and 3%. When assessing the % damage for a 200 bunch sample (each bunch falls into a different severity category), the severity calculation is more complex and is best calculated using a spread sheet or specially designed program.

When faced with a downgrade or rejection, it is important to assess this as severity (not just incidence), as this better reflects the impact of a particular issue on fruit quality

Definitions[3]

Incidence is the number of plant parts (in this case bunches) affected by disease or physical damage within a population (representative sample). i.e. either a bunch is or is not affected.

$$\text{Incidence (\%)} = \frac{\text{The number of infected or damaged units}}{\text{Total number of units assessed}} \times 100$$

Severity is the measure of the extent of the damage per sampling unit i.e. the percentage area of damaged fruit within a bunch (an estimate of the number of damaged berries per bunch, expressed as a percentage).

$$\text{Severity (\%)} = \frac{\text{Area of unit affected by disease or physical damage}}{\text{Total area of unit}} \times 100$$

Particular attention needs to be given to accurately assessing the extent of a particular disease or physical damage (getting the basics right). The estimation of visual signs of disease severity can be difficult to estimate without prior training and the use of assessment keys such as standard area diagrams. Training tools such as the Bunch Rot Assessment Trainer (BRAT), www.bunchrot.co.nz can significantly increase the accuracy of assessments made in the vineyard.

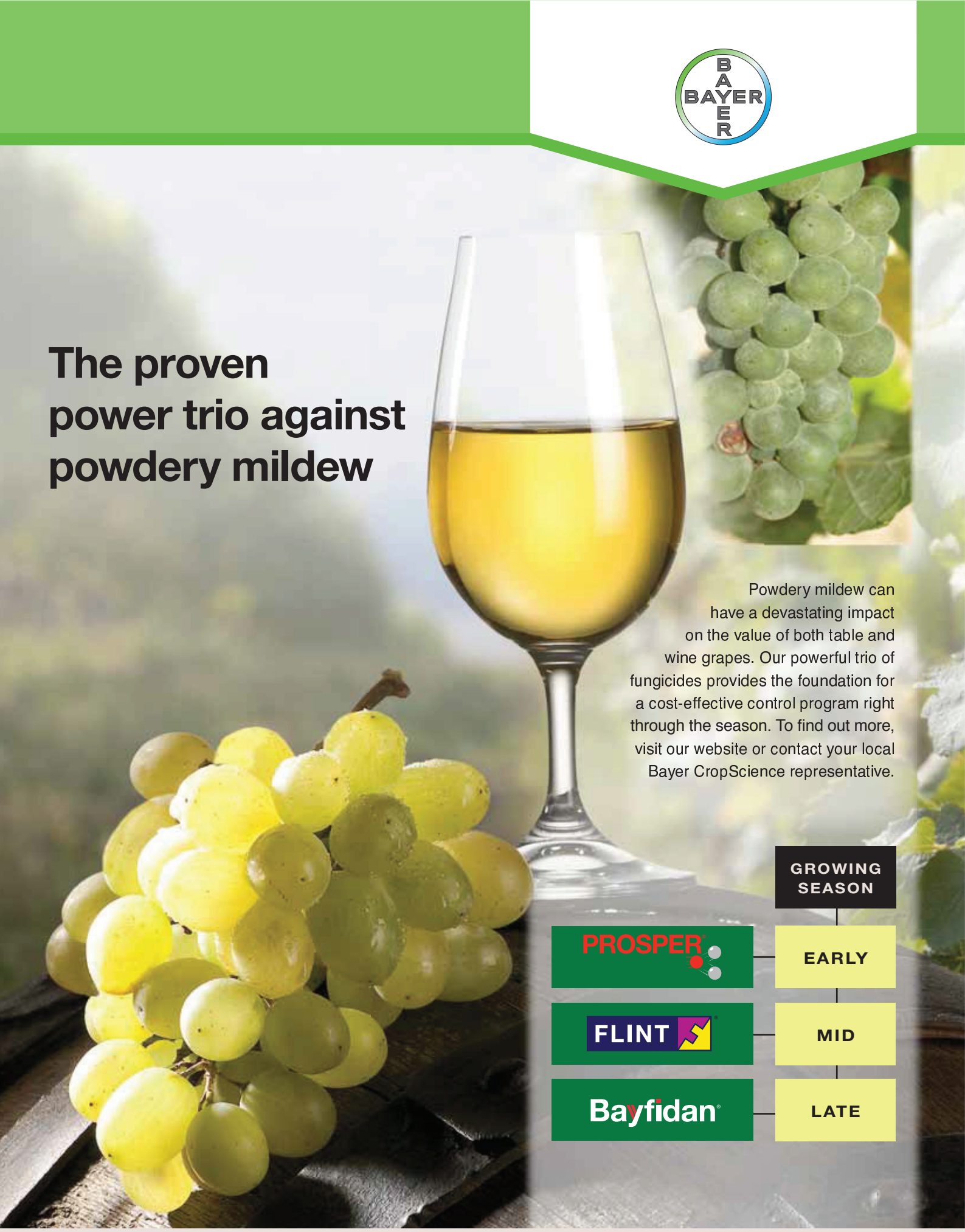
Lighter areas represent healthy berries and darker areas represent disease-affected berries. Numbers indicate the percentage of the visible side of the bunch occupied by diseased berries.

Assessment criteria

A number of criteria may need to be satisfied in addition to physical appearance, to establish the presence of damaged berries that may lead to a reduction or rejection of the fruit. Criteria such as the presence of 'off' flavours and/or laboratory assessment of specific compounds may need to be satisfied.

For example:

- Laccase activity (an enzyme produced by Botrytis cinerea) can cause oxidative damage to wines and can



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be assessed in the laboratory or by using a hand held test, although there have been problems associated with false negatives and false positives. The Australian Wine Research Institute (AWRI) recently undertook a thorough review of laccase analysis and has developed a new assay.

- Ochratoxin A (a toxin produced by Aspergillis sp and Penicillium sp) fruit can be assessed if sooty mould is present in the vineyard. Sooty mould is often associated with mealybug activity, when it colonises the sugary exudates left behind by these sap-sucking insects. Ochratoxin A is considered carcinogenic and its presence is limited to 2 µg/L in wine in the EU.

In recent years there has been a greater emphasis on emerging issues such as smoke taint, herbicide residues (from drift or off target spraying), agricultural residues, restrictions on the use of Phosphorous acid, rising salinity issues in dry seasons etc.

There is still much work to be done to determine a representative sampling size when assessing the physical damage of fruit in the vineyard. This will depend on the level of variability of the sample and the desired level of confidence in the assessment result.

More work is required to train assessors in the way they visually assess each bunch for the level of severity, correct assessment of the issue presented, and quantitative links to wine quality (ie what % severity of damage will cause taint in the finished wine), as these links are generally not agreed.

We need industry agreement on an objective, quantifiable, transparent, repeatable system for assessing incidence and severity in a standardised way. It is important that wine growers and purchasers are aware of these assessments, as an understanding of how to accurately assess damaged fruit in the vineyard empowers both parties and provides transparency. This is important, as often the quantum at stake is considerable.

RESOURCES – Publications, practical tools and latest technologies

Bunch Rot Assessment Trainer (BRAT)

The Bunch Rot Assessment Trainer is a training program that can be used to fine tune your approach to determining the level of different severity percentages of each bunch. For more information, see www.bunchrot.co.nz.

On-board harvester linear de-stemmer

The Pellenc Selectiv' process on-board sorting system can be used to remove petioles and other matter from the harvested grapes during the machine harvesting process. This is an effective way to reduce the material other than grapes (MOG) load in parcels of fruit delivered to the fruit processor.

For more information, see http://www.pellenc.com.au/Products/Viticulture/Harvester/SelectivProcess/tabid/570/Default.aspx

The following publication may be useful when assessing fruit in the vineyard or at the weighbridge.

- Winegrape Assessment in the Vineyard and at the winery, see www.wfa.org.au/files/resources/Winegrape_Assessment.pdf
- Email Mary Retallack at mary@viti.com.au or see www.viti.com.au for more information.

References

[1]Modified from Retallack, M and Drew, C (2009) 'Managing Dispute Risk.' Wine Business Magazine, Dec 2008 / Jan 2009.

[2]Reproduced from Hill G.N., Beresford R.M., Evans, K.J. (2010) Tools for accurate assessment of botrytis bunch rot (Botrytis cinerea) on wine grapes. New Zealand Plant Protection 63:174– 181. Available online from http://www.nzpps.org/journal/contents.php?vol=63

[3]Modified from Retallack, M in Barwick, J (2012) Team effort needed for happy resolutions, Australian and New Zealand Grapegrower and Winemaker, April, Issue 579, p 47-48. http://issuu.com/provincialpressgroup/docs/gw_apr_12/47

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