



barossa viticulture technical group

VITICULTURE FACT SHEET

April 2010

POST HARVEST CARE OF GRAPEVINES

Introduction

In most Australian grape growing regions temperatures are sufficiently warm for vines to retain a functional canopy for one to four months after harvest. Providing the leaves remain in reasonable condition and the supply of water and nutrients is adequate continued photosynthesis and root nutrient uptake during this period allows vines to store carbohydrate and nutrient reserves in the perennial parts of the vine for use in the next season. Within the viticultural industry it is generally recognised that this post-harvest recovery is important for replenishing reserves used earlier in the season, and that if prevented for whatever reason by an early loss of leaf function, then productivity will be reduced in the following season. Consequently, the normal management approach for this period has been to ensure that the water and nutrient supply to the vines remains adequate so that carbohydrate storage and nutrient uptake is maximised.

However, with many regions now facing reduced irrigation allowances, lower rainfall, and declines in groundwater output and water quality, maintaining favourable conditions for the duration of post-harvest period is not always possible. The question is then raised as to the best way to manage irrigation and fertiliser applications after harvest with limited water supply, and what measures can be taken to reduce the impact of saline irrigation water on vine productivity.

An important point to understand about the post-harvest period is that the need for any recovery in carbohydrate and nutrient reserve levels is very much dependant on crop load, and the extent to which photosynthesis and nutrient uptake were maintained during berry development and ripening. For example, under high crop loads the post-harvest period is essential for sustaining productivity, as the demand for carbohydrates from the fruit limits the amount that can be stored as reserves before harvest. However, with low crop loads, sufficient carbohydrate reserves can accumulate prior to harvest, so little or no post-harvest recovery may be required. As water scenarios and cropping levels will vary considerably between vineyards and regions, growers need to assess the importance of the

post-harvest period for their specific situation, and seek professional advice if unsure on how best to assess the vineyard.

1 Carbohydrate reserves

Grapevines, like other perennial plants, require a supply of carbohydrates from stored reserves to support new root and shoot growth in spring. In warm climates a significant amount of carbohydrate can be stored after harvest due to continued photosynthesis. For high yielding vines where high crop loads prevent the recovery of reserves prior to harvest, this period is particularly critical for sustaining productivity. Reserve replenishment can start before harvest if crop loads are lower, so the importance of the post-harvest recovery will vary according to yield and conditions during the ripening period.

Key points regarding carbohydrate reserve accumulation are:

- Carbohydrate reserve dynamics, and in particular root starch concentrations, are very responsive to crop load and whole vine photosynthesis.
- The post-harvest period is important for the replenishment of high yielding vines, but may be less important where reserves are already high, or where adequate replenishment occurs during the ripening period.
- The amount of carbohydrate reserves stored over winter can influence yield and shoot growth in the following season.

2 Root growth

Grapevines appear to have only one main peak of root activity around flowering. A second flush of root growth may occur after harvest in some vineyards, but not to the same extent as earlier in the season. Nutrient uptake during the post-harvest period may therefore be more reliant on existing roots. In warmer climates, new roots can appear around bud break, suggesting that nutrient uptake may commence from the beginning of the season. Water stress at these times may reduce fine root growth.



3 Pest & Disease

It is always prudent to develop a disease control strategy as early as possible for the following season. Most diseases survive during the winter months in various forms. The following practices could be adopted, providing they are cost effective:

- While pruning (mechanical, cane or spur pruning), remove all raisined berries and rachii (the skeleton of the grape bunch), and diseased canes.
- Powdery mildew infected canes appear reddish in colour. These canes need to be removed as they can provide a source of inoculum.
- Disease infected pruned material could also be mulched, but the incorporation into the soil should be reasonably deep.
- The fungal disease *Phomopsis* tends to produce bleached canes near the nodes with black pinhead-type structures called pycnidia. If these are found on canes, they need to be pruned.
- If older wood is cut in the vine, the cut region needs to be painted with pruning paint or an equivalent treatment to prevent *Eutypa* infection.

Post-harvest fungicide sprays (e.g. for Powdery Mildew) are generally considered of little value, unless to control severe leaf infection that might cause early loss of leaf function.

4 Nutrient reserves

Grapevines require a supply of nutrients from stored reserves to support growth in early spring. Nitrogen (N) is stored in the roots and wood, and follows a similar pattern to carbohydrate reserves over the season. Significant N uptake and reserve storage can occur after harvest. Approximately 30% of vines nitrogen requirements are from reserves. Uptake of other minerals may be equally important during the post-harvest period, but how they act as reserves is less understood. The ability to store and re-mobilise nutrients in spring depends on their mobility within the plant. This is high for all the macronutrients, except calcium, which has low mobility. With the exception of manganese, which is also low, all the other micro-nutrients have intermediate mobility. **In general, the post-harvest period is most important for N and phosphorus uptake.**

5 Irrigating with saline water

All irrigation water contains dissolved salts at some concentration and as water is transpired by

the vine, these salts are left behind in the soil. The effects of these salts on the vine are twofold. The first is osmotic, where the concentration of salt in the soil solution makes it difficult for roots to take up water (effectively the same as if the soil was drying out). The second is ion toxicity from chloride and sodium, which among other effects, inhibits photosynthesis when they build up to high concentrations in the leaves. Grapevines are classed as moderately sensitive to salinity, but a number of rootstocks have considerably higher tolerance to salinity than *Vitis Vinifera* (own roots).

The salinity of irrigation water is usually measured by conductivity and expressed in dS/m (1 dS/m \approx 550mg/L \approx 38grains/gallon). Below 1 dS/m there should be minimal problems. Between 1 and 2.7 dS/m salinity will become an increasing problem, and above 2.7 dS/m can be expected to severely impact on productivity. To avoid a build up of salts in the soil to the point where it impacts on vine productivity, these salts need to be leached from the root-zone. To understand when and how much of a leaching requirement is needed, the salt concentration of the irrigation water, and the plant's water requirements, must be known. These calculations are explained in publications such as the Soil, Irrigation and Nutrition book from Winetitles in Adelaide. Grapevines are more sensitive to salinity at the start of the season than the end, so it is important that accumulated salt from the season is removed before bud-break. Pre-budburst irrigation, which also takes advantage of winter rainfall, is a more effective way of leaching accumulated salt than post-harvest irrigation. Consideration should also be given to application of gypsum when addressing salinity and sodicity issues in vineyards.

6 Determining the importance of the Post-harvest period for your vineyard

The main factors that determine the need for a post-harvest recovery are yield and photosynthesis during the ripening period. However, without actually testing nutrient and carbohydrate reserve concentrations it is difficult to predict how important the post-harvest period is likely to be for a particular vineyard. Given the range of situations that may be faced by growers after harvest, a set of generally applicable recommendations is provided below.

7 Recommendations for post-harvest management with variable water supply

Manage water during the season to prevent a large post harvest irrigation which may result in a



flush of new growth. I.e. lighter irrigations during the season if restricted water availability.

For vineyards where a post-harvest recovery is thought to be necessary and some water is still available, try to manage remaining irrigations so as to maintain a functional canopy for three to four weeks after harvest. This should be sufficient to replenish adequate reserves for the following season. An earlier loss of canopy (e.g. from water-stress or frost) may result in renewed shoot growth if rainfall occurs later in the season, but next year's buds won't burst in this situation, and the extra growth does not appear to be detrimental for the following season's growth. Post-harvest fertiliser applications are still possible, but these need to be timed with irrigation. If not taken up prior to leaf-fall, mobile forms of nitrogen fertiliser may be lost with winter rainfall. If a lack of water is anticipated, it may be more effective to apply nutrients earlier in the season when root growth is at a maximum. A final consideration is the risk that leaving a dry soil profile over winter may lead to problems with restricted spring growth in the following season. Although the cause of this disorder is not well understood, young vines maybe more vulnerable in this situation.

Water stress during the post-harvest period for one season appears to have little impact on yield in the following year. Reserve accumulation may be reduced, but providing the vines have had reasonable irrigation or rainfall prior to harvest, the amount of reserves stored should still be adequate. However, with successive seasons of poor post-harvest conditions, it would be expected that yield and vine health would start to decline. If comparable water shortages are expected in the medium-term, this essentially means that yields need to be reduced so that the vineyard is not in a situation where water is running out before harvest every year. In the longer term, options such as alternative varieties or more water use efficient rootstocks need to be considered.

8 Post-harvest Nutrition

Stay with standard industry recommended practice of annual petiole testing combined with visual assessments, and build up a longer-term picture of vineyard nutrient status. Determine application rates based on petiole results, removal of nutrients from the vineyard with fruit, and on past experience. For the major nutrients, avoid any significant changes unless clearly justified as the soil and reserves will provide some buffering capacity. Continue with post-harvest applications

in higher yielding vineyards, but if water is limited, keep in mind when roots are most active and time fertiliser with irrigation events. Nitrogen can be included post harvest but remember to tailor according to your vineyards requirements. For example, it may not be recommended to apply post-harvest nitrogen where there is high or excessive vine vigour. When the supply of available nitrogen is sufficient between harvest and leaf fall, grapevines store nitrogen over winter in the woody tissues for use the following spring. Generally, post harvest applications are only beneficial as a supplement to nitrogen applications made earlier in the season (especially if vine nitrogen status is low). Also, the viability of leaves should be considered at this time, as this will impact on the vine's ability to uptake and store nitrogen for the following season. If close to leaf fall, the uptake of nitrogen will be low and most will be lost to leaching through the soil profile, which is potentially damaging to the environment and can cause soil acidification. **If there is no water for post harvest irrigation then the nutritional status of the vines can be maintained with soil and foliar fertiliser applications earlier in the following growing season.**

9 Post-harvest Salinity Management

Within regions, greater problems may arise if vineyards become dependent on poor quality groundwater. In these situations it may be essential to leach salt from the soil to avoid excessive build-up. Approximate leaching fractions can be calculated using the conductivity of the irrigation water and the amount of irrigation applied during the season. **Typical leaching fractions may be in the range of 10 to 20%, and are best applied prior to bud-break if soil testing shows salinity levels were not reduced sufficiently by winter rainfall.**



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10 Summary

The importance of the post-harvest period is largely determined by climate, yield and management prior to harvest. If there is one situation to avoid, it is running out of water in the middle of ripening a heavy crop, as this will stress the vine exactly when the demand for carbohydrates is at a maximum. Vines will tolerate a season or two of poor post-harvest conditions, but productivity will eventually be reduced. While beyond the scope of this paper, it highlights the importance of long term planning and understanding that yield and nutrition together with effective salinity management, is a key factor in determining the sustainability of vines with reduced water supply.

Acknowledgments

The authors would like to thank GWRDC 'Water & Vine Module 01 - Post Harvest care of grapevines: irrigation, nutrition and salinity' CRCV: Viti Notes 2006 'Nitrogen fertilisation'

Disclaimer

The information supplied in this fact sheet is offered in good faith and was the best available at the time of publication. However, the specific application of information to individual circumstances will vary from one situation to another, and the understanding of viticultural science is constantly evolving. The reader should always consider all other relevant information, and seek professional advice prior to making their own diligent and informed judgement regarding management strategies and practices for their vineyards. All responsibility for vineyard management rests with the reader to conduct its business in a manner consistent with the best appropriate viticultural practices, and to deliver grapes in compliance with their grape purchaser's requirements, all State and Federal regulatory requirements, and those set out on product labels.

