

# Delayed pruning: A tool to counteract warming effects

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## Background

The compression of harvest, where varieties ripen over a shorter period, the disruption of the balance between sugar, colour and flavour in ripening grapes, and the potential loss of wine's regional character are all partially related to recent warming.

Vineyards and wineries lack the harvesting and crushing capacity to deal with a narrowing harvest window, leading to fruit becoming overripe and a reduction in quality. The expansion of processing facilities places more strain on a capital intensive industry. Viticultural practices are needed to deal with these challenges.

Wine Australia and the Department of Agriculture and Water Resources have supported a project to test delayed pruning as a tool to counteract warming effects. Delayed pruning seeks to spread maturity, hence decompressing harvest, and shift berry development into more favourable conditions later in the season, hence preserving fruit balance and regional wine styles.

Two trials were established with Shiraz in the Barossa Valley. First, using open top heating chambers, we increased vineyard temperature and evaluated the interaction between delayed pruning and temperature in SARDI's experimental vineyard at Nuriootpa.

Second, using large scale trials, we explored the feasibility of delayed pruning in a commercial vineyard at Marananga.

This trial further tested the carry-over effect of repeated late pruning. Three pruning dates were tested in both trials: winter control (current practice), budburst, and once 2-3 leaves have emerged at the top of the unpruned canes. Earlier experiments showed that Shiraz vines do not recover and reduce yield when pruned later than 2-3 leaves.

## Impact and feasibility of late pruning

To be a viable option in commercial vineyards, delayed pruning has to meet four criteria:

1. shift phenology and delay maturity,
2. be positive or neutral for yield,
3. be positive or neutral for wine quality,
4. be neutral for cost and fit current vineyard practices.

### 1. Phenology and maturity

Late pruning shifted phenology and the magnitude of this shift depended on developmental stage, seasonal and vine conditions. Early events such as flowering were clearly separated in winter and late-pruned vines. Spread of maturity between winter and late pruning was up to two weeks. This large effect resulted from the combination of delayed onset of sugar accumulation and a reduction in the rate of sugar accumulation at late ripening (Figure 1).

A delay in sugar accumulation due to unseasonal rains could cancel the effect of pruning time. In balance, late pruning has potential to shift phenology and maturity of Barossa Shiraz, but the actual result depends on

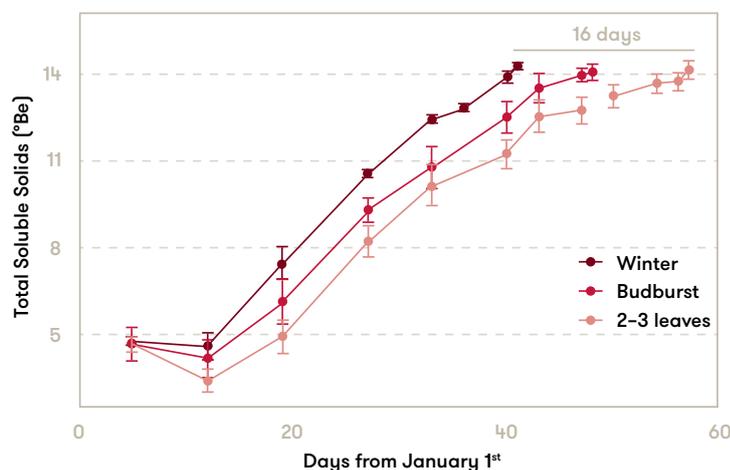


Figure 1: Dynamics of total soluble sugars in Shiraz berries in response to pruning time, Nuriootpa 2014-15, ambient temperature.

Site	Season	Yield response to pruning time
Nuriootpa	2013-14	no response
	2014-15	late > winter
	2015-16	winter > late
Marananga	2012-13	no response
	2013-14	no response
	2014-15	late > winter
	2015-16	no response

**Table 1:** Yield response to pruning time of Shiraz vines at two sites in the Barossa Valley. Pruning times were winter, and late at budburst or 2-3 leaves. Responses were assessed statistically in replicated trials with three possible outcomes: no difference between winter and late pruning (no response), higher yield in late-pruned vines (late > winter) or higher yield in winter pruned vines (winter > late).

seasonal conditions, and possibly other factors such as fruit/canopy ratio.

### 2. Yield

Yield ranged from 1.8 to 4.7 kg per vine across sites and seasons. Late pruning had no effect on yield in four out of seven cases, increased yield in two and reduced yield in one (Table 1). It is concluded that late pruning of Barossa Shiraz is likely to be neutral for yield as a result of no yield response, or yield reduction compensated by yield increase over a series of seasons. Results could differ outside the range of yield explored in this study, e.g. high-yielding machine pruned vines or low-vigour vines.

### 3. Wine

Late-pruned vines produced consistently distinct wines in comparison to winter-pruned vines. We found an increase in anthocyanins, total polyphenols and colour in wines from late-pruned vines in comparison to their winter-pruned counterparts (Figure 2). This is important, as one of the main effects of warming is to reduce berry pigmentation and wine colour. Owing to the strong impact of site and seasonal conditions, further tests are needed for a more complete picture of wine responses to the multiple interactions between pruning time, variety, site and vintage. Collectively, two vintages in two sites showed the wine’s chemical and sensory attributes from late-pruned vines were generally better or similar than those from winter-pruned vines.

### 4. Cost and vineyard practices

Late pruning was tested in a replicated trial on a commercial vineyard over five seasons. As it involves only a change in the timing of pruning, it is likely to be cost neutral. A commercial vineyard in Barossa established late pruning in 8 ha, and maintained this practice during four vintages as part of this trial; in 2015-16, an additional 4.8 ha were late-pruned.

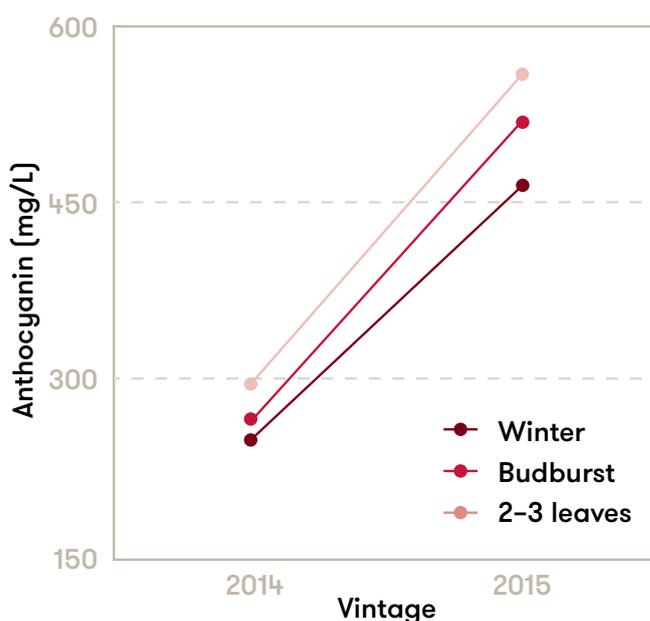
In addition late pruning has been trialled in other commercial vineyards in the Barossa Valley (20 ha), Langhorne Creek (20 ha), NE Victoria (10 ha) and the Fleurieu Peninsula (8 ha).

Logistically, late pruning fits well with standard vineyard practices. Some minor adjustments might be needed. For example, it may be required to fine tune early fungicide sprays and irrigation at the start and end of the season.

### Conclusion

Pruning at budburst or up to the point where 2-3 leaves have developed is a practice with potential for Shiraz in the Barossa Valley. In relation to winter-pruned vines, late pruning delayed harvest maturity primarily by delaying the onset of sugar accumulation in berries, with further delay associated with slower sugar accumulation. The actual spread of harvest that can be achieved in relation to winter-pruned vines depends on seasonal conditions; some factors such as untimely rainfall could negate the delay in maturity between late and winter pruned vines.

For vines yielding between 2 and 5 kg of fruit, late-pruning is likely to have little effect on yield when it is averaged over several seasons. Wine chemical and sensory tests over two sites and two vintages suggest overall positive or neutral effects of late pruning. Enhanced wine colour seemed a consistent response to late pruning in our trials. However, further tests



**Figure 2:** Late pruning increased anthocyanin concentration in Shiraz wines from Marananga in two vintages.

are needed to explore a wider range of varieties and environments and how they interact with the wine from late-pruned vines.

To achieve its goal of spreading maturity, late pruning has to be used on a rotational basis. This means combining conventional winter pruning and delayed pruning in proportions that have to be defined for the goals and conditions of particular vineyards. Whereas repeated late pruning over 2–4 seasons had no apparent carry over effect on vigorous vines, we suggest it is safer to avoid late pruning the same vines over successive vintages. Late pruning can be feasible beyond Barossa Shiraz, but direct experimental tests are recommended for other regions and varieties.

## Acknowledgements

Denis Taylor, Sue Bastian, Trent Johnson, Mariola Kwiatkowski, Joanna Gambetta, students from the sensory panel of Adelaide University and AWRI provided input in wine chemical and sensory analyses. Tim Malone and Jana Shepherd kindly supported our trial in Treasury Wine Estates vineyard at Marananga. SARDI's Nuriootpa staff maintained the experimental vineyard. Jacquie Selles, Gaston Sepulveda, Sandra Olarte-Mantilla and Marcos Bonada helped with field and laboratory work.

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