



Ask the AWRI: Extended post-fermentation maceration

This article continues a series examining treatments used in the AWRI's winemaking treatment trials, which have been the subject of tastings staged around Australia since 2016.



What is extended post-fermentation maceration?

Post-fermentation maceration involves leaving the grape skins, seeds, and any stalks in contact with the wine for a length of time after the primary fermentation has ended to optimise the colour, flavour and tannin structure of the wine. The length of maceration is probably the most critical factor in determining the degree and nature of the phenolic extraction from skins and seeds during winemaking, and one of the simplest ways to influence it.

How common is the use of extended post-fermentation maceration in Australia?

A survey of Australian winemakers conducted by Joscelyne (2009) revealed that extended maceration is used extensively in Australia, almost exclusively with red wines. However, winemakers had poor understanding of its chemical and sensory impacts, and more winemakers said they would use the technique if it were not for the costs and logistical pressures related to the need for greater fermentation capacity.

With which varieties is the technique most commonly used?

The technique can be applied to many varieties and is traditional in European wine regions, including Burgundy with Pinot Noir, Bordeaux with Cabernet varieties, Piedmont with Nebbiolo, and to a lesser extent the Rhone Valley with Shiraz and associated varieties. The 2009 survey revealed that in Australia the technique is most commonly used with Cabernet Sauvignon, followed by Shiraz, Merlot and Pinot Noir, and to a much lesser extent with other varieties.

For how long should the maceration continue?

Various studies have demonstrated that the ideal length of maceration depends on the variety and the season, with the initial concentration of grape phenolic compounds and their extractability being two key variables. However, there is no clear formula for determining the ideal length of the maceration, which might vary from a few days to two months or more. Previous winemaker experience with the variety and region as well as recognition of seasonal differences in fruit composition are important factors. A common theme is expressed by La Follette (1996): "If you talk to the pros who have put extended maceration on the map, it is better to press at dryness than go halfway on a maceration: tough tannins and awkward tactile elements grip the wine before it smooths out at

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the end on the extended contact". However, there appear to be few sensory studies to support this assertion, possibly because it can be difficult to obtain a representative sample of wines undergoing extended maceration.

In which ways is wine composition changed by extended post-fermentation maceration?

The greatest changes in wine composition as a result of extended maceration are an increase in total phenolics and a decrease in anthocyanins as they are incorporated into non-bleachable pigments including pigmented tannins. Decreases in anthocyanins have also been partially attributed to oxidative degeneration, and adsorption onto 'fermentation solids'. While this may mean the wine colour appears more advanced in young wines, the non-bleachable pigments are a more stable form of colour than anthocyanins, and their increased concentration may therefore be considered positive. One study found minimal differences in colour between extended maceration and control wines after 400 days.

Steadily increasing pH and decreasing ethanol with increasing maceration length have also been reported, and in one study of Duras, the concentration of the black pepper compound rotundone was reduced by 23% when the length of maceration was increased from eight to 14 days (Geffroy *et al.* 2017). The decrease in ethanol is not reported in all studies, and in some cases ethanol is seen to increase. It is possible that when a decrease does occur, aerobic consumption by microorganisms might be an explanation. One study examined both chemical and microbial variables during extended maceration and found that 'total yeast concentration' increased until day 40 of a 90-day maceration, with neither *Brettanomyces* nor acetic acid bacteria being detected at any stage. Populations of lactic acid bacteria remained active until day 90, with consequent decreases in malic acid and increases in lactic acid, with slight increases in ethanol and glycerol being attributed to the microflora (Francesca *et al.* 2013). While an increase in polysaccharide concentration has also been reported, differing trends are seen depending on variety and harvest date.

What sensory changes should I expect from using extended post-fermentation maceration?

In many studies, extended maceration wines were rated higher for bitterness during formal sensory evaluation, and while this does not appear to be widely reported in commercial wines, it is clearly a potential risk. The bitterness is often attributed to the presence of seed tannins, or flavan-3-ol monomers such as catechin, and the extraction of these compounds continues throughout the extended maceration. Three studies carried out by the Harbertson research group at Washington State University with 30-day macerations of Cabernet Sauvignon and Merlot demonstrated that between 73% and 79% of the tannins in the resulting wines were derived from the seeds. Increased astringency has also been reported in many studies, and while the contribution of seed tannin to wine astringency is not well understood, greater astringency would be expected with increasing overall tannin concentration.

Are there risks associated with extended post-fermentation maceration?

There are several risks associated with extended post fermentation maceration. These include the potential development of bitterness and overly astringent tannins, and the possibility of spoilage by undesirable yeast or bacteria. This means it is advisable to take a cautious approach when trialling the technique by starting with a small batch and assessing the results over time. Blending trials can also be conducted to ascertain the proportion of extended-maceration wine required to achieve the desired sensory effects.

For further information about extended maceration or other technical questions, contact the AWRI helpdesk on (08)8313 6600 or helpdesk@awri.com.au

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