Effects of hot and dry conditions

Hot and dry conditions have been experienced across many Australian wine regions in recent years, resulting in a number of questions to the AWRI helpdesk.

I'm concerned a dry soil profile has limited grapevine shoot development and forecast hot and dry weather will lead to sunburn in grapes. Is there anything I can do?

All grape varieties are susceptible to sunburn to some degree. Exposure to high temperature events after veraison may cause the most damage (due to development of skin pigmentation) but pre-veraison damage can lead to berries drying up to form hard 'pebbles'. The outermost berries on a bunch are most susceptible. The period of exposure required for sunburn is relatively short. In the vineyard, a temperature of 40 to 43°C at the berry surface for just five minutes can cause sunburn of Chardonnay berries at full maturity and the maximal level of damage will be reached after four days. Inappropriate canopy management or water stress that leads to reduced shoot vigour and leaf wilting can result in excessive bunch exposure and berry damage.

Using irrigation and nutrition to establish and maintain a leaf layer around bunches is the best strategy to prevent sunburn. If it is too late for this, work in the Hunter Valley and Riverland with vineyard sunscreen products has shown some promising results. It is important to contact your winery or fruit purchaser before using a sunscreen.

Sunburn causes varying degrees of damage to grapevines, ranging from brown lesions on berries to shrivel/drying of whole bunches. Skin damage caused by sunburn may lead to invasion by secondary fungi responsible for bunch rots.

The impact of sunburn on grape composition will depend on the extent of browning and off-flavour development and the degree of invasion by secondary bunch rots. It will also depend on the variety. Though all varieties are susceptible, some are more susceptible than others, e.g. Chardonnay, Semillon, Cabernet Sauvignon and Merlot.

Steps that can be taken to avoid or minimise sunburn include:

- Good bunch exposure management through choice of appropriate trellis, row orientation, and canopy management;
- Irrigation to fill soil the profile before the onset of heatwaves; and
- Planting of varieties with lower susceptibility to sunburn.

What other impacts on grapes are there from hot and dry conditions?

For a variety such as Shiraz, that is susceptible to shrivel, elevated temperatures are likely to result in increased levels of shrivel. Warmer conditions during the latter stages of ripening advance the onset of cell death in the berry pulp and increase the rate of shrivel.

Shiraz grapevines respond to warmer conditions by increasing the size of their stomata. This provides a mechanism to protect the plant from heat damage. The maintenance of high stomatal conductance and evaporative cooling are important mechanisms that protect, within limits, Shiraz canopies from heat damage. However, this cooling mechanism will only work if water is available to the vine.

Higher temperatures have also been found to delay the onset of anthocyanin accumulation in Shiraz and Cabernet Franc cultivars which could have consequences for colour/alcohol balance. Adaptation strategies to promote the onset or rate of colour accumulation such as water deficit established shortly before veraison could partially restore the balance.

BURNT: Grapes affected by varying degrees of sunburn.

What is causing my grapes to ripen earlier – climate or vineyard management?

Increased temperatures and reduced soil moisture both contribute to earlier ripening. Warming has been found to advance grape development through the earlier onset of budburst and flowering while the periods from flowering-to-veraison and veraison-to-harvest have been found to remain largely constant.

A decline in soil moisture content can affect ripening through at least two different mechanisms. Firstly, drier soils are associated with the production of the plant hormone abscisic acid (ABA) in vine roots. The movement of ABA from roots to shoots signals the shoots to stop growing and the ripening processes to begin. Secondly, dry soils are likely to warm more rapidly, advancing budburst in spring and subsequent growth stages.

For more information about hot and dry conditions, contact the AWRI helpdesk team.
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FURHTER READING

Bonada, M. Sadras, V.O. Fuentes, S. Effect of elevated temperature on the onset and rate of mesocarp cell death in berries of Shiraz and Chardonnay and its relationship with berry shrivel. Aust. J. Grape Wine Res. 19 (1): 87-94; 2013.

Crothers, N. and Downey, M. Effect of sun exposure on Chardonnay grapes and wines. Aust. Vitic. Jan/Feb, 19-20; 2006.

Greer, D. and La Borde, D. Sunburn of grapes affects wine quality. Aust. N.Z. Grapegrower Winemaker (506): 21-23; 2006.

GWRDC Managing Grapevines During Heatwaves factsheet available from http://www.gwrdc.com.au/tools-resources/factsheets-other-resources/

Nuzzo, V., Genovese, M., Shackel, K. and Matthews, M. Preliminary investigation on sunburn in Chardonnay. Proceedings of the 16th International. GiESCO Symposium: July 12-15, 2009: 183-187; 2009.

Petrie, P.R., Sadras, V. Advancement of grapevine maturity in Australia between 1993 and 2006: putative causes, magnitude of trends and viticultural consequences. Aust. J. Grape Wine Res. 14: 33-45; 2008.

Sadras, V. Montoro, A. Moran, M. Aphalo, P. Warming enlarges stomata in Shiraz. Aust. N.Z. Grapegrower Winemaker (584): 41-41; 2012.

Sadras, V. Moran, M. High temperature disrupts anthocyanin: sugar balance in reds. Aust. N.Z. Grapegrower Winemaker (578): 30-31; 2012.

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