Bunch stem necrosis

LAST SEASON saw a spike in queries to the AWRI helpdesk about bunch stem necrosis (BSN), with incidence across most Australian regions. While the causes of BSN are not fully understood, this column summarises current knowledge about this disorder.

Figure 1: Shrivelled bunches (at bottom) affected by bunch stem necrosis.

WHAT ARE THE SYMPTOMS OF BUNCH STEM NECROSIS?

BSN is a physiological disorder of bunches that usually becomes obvious post-veraison. Early symptoms are areas of brown dead tissue on the rachis and/or pedicels which grow and girdle the rachis. In some cases the bunch ends and shoulders can be affected, while the rest of the bunch develops normally. Berries on affected bunches (or parts of bunches) are typically dull and opaque in appearance with a soft texture (Figure 1), and juice analysis suggests they are low in sugar and high in acid. Bunches with BSN break easily from the vine and the affected part of the bunch can dry out or drop off ahead of the harvester. The ease of removal of the affected bunches is a clear symptom of BSN and helps distinguish it from other causes of berry shrivel such as heat damage or a botrytis infection that has 'dried up'.

WHAT CAUSES BSN SYMPTOMS?

In BSN-susceptible cultivars the xylem development is restricted just past each node or branch from in the peduncle (bunch stem). These restrictions create a bottleneck and prevent the flow of nutrients through to the developing berries; symptoms then become apparent post-veraison. The xylem is also less developed towards the tip of the bunch which is also the area most likely to be affected by BSN. Restrictions in the xylem are greater in varieties such as Cabernet Sauvignon, Riesling and Chardonnay that are most susceptible to BSN.

DO ENVIRONMENTAL CONDITIONS CONTRIBUTE TO BSN?

Bunch stem necrosis occurs at low levels in most seasons, especially in susceptible varieties. However, in some seasons, like the most recent one, it is much more prevalent. This suggests that environmental conditions may influence the development of this disorder. The weather around flowering is thought to be important for xylem development. In some studies in Europe rain events around flowering or veraison have been correlated with BSN, but this was not consistent between reports. In Australia (at Langhorne Creek) low temperatures in the 20 days prior to flowering were related to BSN incidence, with a similar relationship seen for flowering temperatures in Europe in some cases. In the spring of 2014 the Bureau of Meteorology recorded above average temperatures in October and November, so low spring temperatures are not necessarily related to BSN. Other trials in Europe have also failed to find a correlation between low flowering temperatures and BSN. At this stage there have been no consistent links between specific weather events and BSN and no relationship has been observed between high temperatures or dry conditions and the incidence of BSN.

DO NUTRITIONAL FACTORS CONTRIBUTE TO BSN?

Vine and berry nutrition may also be involved with BSN. BSN is potentially a deficiency in calcium and/or magnesium, which can occur as a similar disorder in other fruit (bitter pit in apples and blossom end rot in tomatoes and peppers). Potassium can displace the uptake of calcium and magnesium in plants and an imbalance between these metals has been reported as a potential cause of BSN. Low magnesium concentrations in the rachis have been related to higher incidences of BSN in the majority of studies. Nitrogen nutrition may also impact on BSN, with higher concentrations of ammonium (the main compound used by plants to transport nitrogen) being recorded in the rachis of BSN-affected vines in some studies. However it is not clear if the BSN is caused by the higher ammonium levels or if the high ammonium concentrations are a symptom of the BSN.

Many trials have reported that BSN is more prevalent in vigorous vines. The high vigour in these studies was due to a range of factors including excessive irrigation, fertiliser application (nitrogen and potassium) and severe pruning which resulted in relatively few, but very rapidly growing shoots. Trials where lighter pruning resulted in more, smaller shoots and smaller bunches or where vine vigour was reduced by root pruning showed decreased incidence of BSN.

CAN BSN BE MANAGED?

As it is not possible to control environmental conditions, most management for BSN centres on mineral nutrition. The application of calcium as a foliar fertiliser has occasionally been effective at reducing BSN; however magnesium has given far more consistent results. Normally multiple applications of magnesium sulfate (Epsom salt) are used in the flowering and fruit set period. Note that the application of magnesium sulfate does not guarantee that BSN will be controlled. Excessive application of potassium or nitrogen (when it results in vigorous shoot growth) can increase symptoms of BSN. If you are concerned about BSN it is worth completing petiole analysis at flowering to confirm the nutritional status of your vineyard.

The AWRI would like to acknowledge the support of Bruno Holzapfel, Senior Research Viticulturist at the National Wine and Grape Industry Centre and the NSW Department of Primary Industries in preparing this column.

For more information about BSN or other viticultural issues, please contact the AWRI helpdesk on 08 8313 6600 or helpdesk@awri.com.au. GW