



Managing grapevines after hail damage



Background

This fact sheet provides growers that have experienced hail damage with guidance on how to assess and manage their vines.

Assessing hail damage

It is important to inspect damaged vines as soon as possible after a hail event, as the level of damage may be obscured by any new growth. It is also important for growers with hail damage insurance to contact their insurer and arrange for formal damage assessment processes to be initiated as soon as possible. For growers without hail damage insurance, it is still important to assess the crop loss and damage in a formal manner in case other relief measures are made available. It is also wise to collect photographic evidence of damaged vines throughout each affected vineyard.

The damage caused by hail events will vary depending on the stage of vine development. The following symptoms can be observed in affected vineyards:

- Vines can be completely stripped of leaves and fruit.
- Leaves can be bruised, torn, tattered, holed or completely knocked off the plant.
- Shoots and trunks can be broken or bruised and scarred.
- Compound/lateral buds located in the leaf axils of the current season's shoots, can be damaged, affecting the development of fruiting buds for the following season.
- Inflorescences/bunches can be knocked off or damaged. The full extent of the crop loss may not be obvious until after a few days when the damaged inflorescences or bunches start to shrivel.

Although the hail damage can appear to be extreme, vines have the ability to recover by reshooting from other buds on the vine. The degree of recovery depends on the severity of damage on each individual vine.



Physiological response of the vine to hail damage

The physiological response of the vine to a significant stress event such as hail or frost depends on the timing of the event. Damage soon after budburst will have less of an effect than damage that occurs around flowering or later in the season.

If hail occurs soon after budburst:

- Shoots are very susceptible to breakage at this time. Hail that causes the majority of shoots to break off will trigger the secondary buds at the base of the broken shoots (basal buds) to burst as well as other unburst primary and secondary buds on spurs, canes, cordons and the trunk.
- Depending on the variety, secondary shoots are less fruitful than primary shoots, so yields will likely be 50-70% of the full crop. Varieties such as Cabernet Sauvignon, Shiraz and Muscat Gordo Blanco have relatively fruitful secondary buds but varieties such as Sultana, Riesling and Chardonnay are typically less fruitful.
- The new crop will likely ripen slightly later than the original crop.

If hail occurs around the time of flowering:

- Hail at this time may break shoots off completely or it may break off the shoot tip and part of the shoot. The remaining shoot may be damaged (with wounds or lesions) and completely or partially stripped of leaves and bunches. The remaining leaves and bunches will likely have some damage.
- The extent of yield reduction will depend on the number of bunches broken off, the damage to the remaining bunches and the amount of leaf area lost. Significant leaf loss around flowering can cause a decrease in fruit set of the remaining bunches and significant leaf loss at fruit set can induce berry abortion, reducing berry number per bunch.
- Loss of the shoot tip triggers the latent buds in the leaf axils to burst and develop into lateral shoots. Mechanical shoot tipping after fruitset is a common practice and generally one of the most apical laterals along the shoot takes over from the main shoot. However, when shoot tipping is combined with a significant reduction in leaf area, laterals may shoot along the length of the main shoot. Lateral shoot growth helps compensate for the loss of leaf area but when lateral growth occurs in the fruit zone it may cause shading of the main crop and the developing compound buds. If unmanaged, the shading can reduce the quality of the remaining crop and may decrease the fruitfulness of the developing compound buds, reducing next year's crop.
- Depending on the variety, the lateral shoots may produce some bunches (termed 'second set') that may provide some yield compensation, but they will ripen several weeks later than the main crop. If the second set is not removed or managed at harvest it may affect fruit quality and make harvest decisions more difficult. Wineries may reject a load of fruit that



contains a mixture of ripe and unripe fruit, as the green/unripe fruit can impart negative sensory characters to the final wine.

- Depending on the extent of the damage, hail-affected shoots may break later in the season when the shoot is subjected to the weight of the developing bunches. Damaged canes may also be more likely to break when they are wrapped down at pruning.
- Significant leaf loss around flowering can increase the incidence of primary bud necrosis the following season, reducing next year's crop by around 25%.

Managing hail-affected vines

The priority when managing vines that are affected by hail is to ensure that they have adequate water and nutrients to support fruit and shoot growth and are protected from pests and diseases.

Vines may require additional fertiliser inputs after they re-shoot due to the loss of significant reserves used to push secondary shoot growth. Good soil moisture levels should be maintained to support the new shoot growth.

Protection of damaged tissue from *Botrytis* should be a priority, particularly in wet or humid conditions. Botryticides should be applied immediately after hail damage and before any further wet weather. Where the trunk or cordon has been damaged, a spray aimed at reducing the risk of *Eutypa* and *Botryosphaeria* should be considered. The active ingredient tebuconazole is registered for use against both *Eutypa* and powdery mildew and can be used up to growth stage E-L 29. To be effective against *Eutypa*, the spray must be applied within a week of the damage occurring.

Even if the crop is not being harvested, a basic preventative spray program should still be applied to control powdery mildew and *Botrytis*. In blocks that are not being harvested, growers can follow the label withholding periods rather than the [AWRI 'Dog book'](#) recommendations.

When hail damage is experienced later in the season, from pre-flower onwards, additional actions may be warranted to help vines recover. The best actions to take depends on many factors including:

- The extent of the damage
- The pruning method
- The ability of vines to ripen crops later than normal (depends on the region and the season)
- Whether the crop is insured for hail damage
- Whether the priority is to salvage as much crop as possible this year or maximise the crop for next year.

In young grapevines, hail can cause significant wounding on the shoot that is to become the future trunk of the vine. If the shoots extending up to the trellis wire are badly scarred, cutting them back and retraining a new shoot should be considered. Scarring on the trunk can interfere with sap flow and may also provide sites for the entry of trunk diseases. If the damage is not extensive, the vine will often recover quickly.



Management options

Leave the fruit and wait for the canopy to regrow

- If, after assessing the hail damage, a grower decides that an economically viable amount of fruit to justify harvest remains, then an appropriate management strategy may be to simply leave the fruit and wait for the canopy to reshoot and grow.
- Managing the second set is key to maintaining fruit quality. Hand or selective harvesting of hail-affected blocks can help to remove unripe fruit at harvest but it is often quicker and easier to remove the second set earlier in the season, soon after the inflorescence become visible. By harvest the second set may have already gone through veraison and may be difficult to differentiate from the primary crop.
- Depending on the extent of shoot damage, the pruning strategy for the following season may need to be adjusted. Cane-pruned vines with severely damaged canes may need to be spur pruned for a season.
- Bud dissections conducted before pruning provide an indication of the level of primary bud necrosis. Growers can use this information to adjust their pruning method to compensate for reduced bud fruitfulness.

Cut the shoots back to the basal buds

- If the majority of shoots have been significantly damaged and the majority of the crop has been lost, the best vineyard management strategy may be to cut the shoots back to the secondary buds at the base of the broken shoots (basal buds) and allow the vines to re-shoot. While this is a radical management decision, it will promote the development of new healthy shoots and will make pruning easier the following season, particularly in cane-pruned blocks.
- The key to cutting shoots back to assist with hail recovery is to cut them back shortly after the hail event. If vines are cut back after they have already started to push lateral shoots, the vines may not have adequate carbohydrate reserves to push more buds and support the new shoot growth.
- Depending on the variety and season, the secondary shoots may not fully lignify by the end of the season. The unligified ends of the canes should be removed when cane pruning.



Summary

Growers need to assess vine damage as soon as possible after a hail event and choose an appropriate vineyard management strategy that aligns with the symptoms observed in each vineyard. Growers should aim to regrow and retain a healthy canopy to drive good carbohydrate storages for the following season and maintain an appropriate pest and disease management strategy.

Further reading

Dry, P. 1986. The effects of hail damage may carry over to next season. *Aust. Grapegrower Winemaker* 275: 22, 24.

Gourieroux, A. 2020. [Hail and severe storms](#) (NSW DPI grapevine management guide 2019–20)

Whiting, J. 2012. [Recovery from hail damage – Grapevines](#) (Horticulture Industry Networks).

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