

# Botryosphaeria dieback

## identification and management

### Background

Botryosphaeria dieback (formerly known as bot canker) is a grapevine trunk disease caused by fungal pathogens that grow primarily in mature wood. The pathogens can infect:

1. propagation material, affecting growth of newly planted grapevines; or
2. established grapevines, through pruning or other wounds.

Grapevine trunk diseases cause a loss of productivity as grapevines reach their elite stage of maturity when they should be at peak production.

The most prevalent grapevine trunk diseases known in Australia are botryosphaeria dieback and eutypa dieback.

Botryosphaeria dieback is caused by species of fungi within the family Botryosphaeriaceae. These fungi infect a wide range of hosts, however, they are most commonly associated with diseases of woody plants, such as acacia and eucalyptus. Species of Botryosphaeriaceae are found in most grape growing regions of Australia.

Economic costs associated with botryosphaeria dieback are due to a combination of factors, mainly yield loss and an increase in production cost (reworking/retraining of grapevines) when managing the disease. The overall loss caused by this combination of factors is difficult to quantify, however, from a study in California it is known that the annual cost associated with botryosphaeria dieback in that region was \$260 million.

### Symptoms

Botryosphaeria dieback is characterised by a range of symptoms affecting a number of vegetative structures of the grapevine (*Table 1*).

The symptoms outlined in *Table 1* are very similar to some of those of eutypa dieback often leading to confusion. Also, the symptoms do not always occur together. Do not use these symptoms alone to identify botryosphaeria dieback.

Table 1 Symptoms caused by botryosphaeria dieback. These symptoms should not be used alone for disease identification.

Structure	Symptom	
Trunk and cordon	Cankers initiating from wounds	
	Wedge-shaped lesions when cut in cross-section	
	Dieback described as 'dead arm' and loss of spur positions. This image shows a badly infected crown and trunk requiring intensive reworking.	
Shoots	Stunted appearance during spring	
Bud burst	Delayed or lack of growth in one or more spur positions	
Canes	Bleached	
Buds	Necrotic	

## Disease cycle

The basic cycle of botryosphaeria dieback is illustrated in Figure 1. The fungus over-winters as pycnidia (small dark 'pimple-like' structures) on the outside of diseased wood. Throughout the growing season pycnidia produce and release conidia (spores).

Following hydration, conidia are spread by wind and rain splash, disseminating the fungi from vine to

vine, and from one part of the vine to another.

Disease develops when conidia land on freshly cut or damaged wood from:

- fresh pruning wounds;
- fresh cuts from reworking vines (the removal of old cordons to re-establish the grapevine structure); or
- other mechanical damage.

The conidia germinate and invade the woody tissue via xylem vessels and

damage the vascular system. Cankers form around the initial infection point. Damage to the vascular system causes wood necrosis and dieback.

In some species, pseudothecia form on the outside of cankers and produce ascospores. Like conidia, ascospores are disseminated by wind and rain splash and enter the plant via fresh pruning wounds. New pycnidia are formed on the outside of diseased wood (Figure 2).

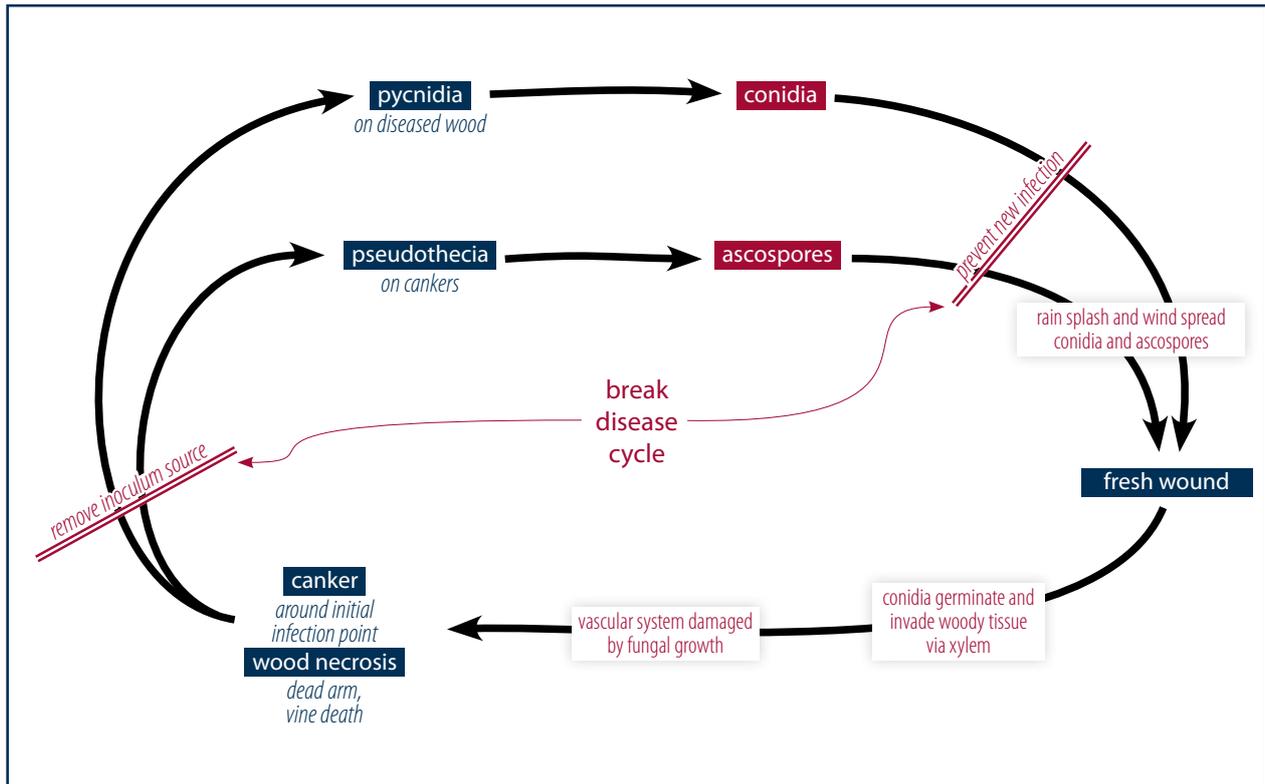


Figure 1 Life cycle of botryosphaeria dieback in grapevines showing the key points for management options to break the disease cycle.



Figure 2 Outside bark of diseased wood showing pimple-like black pseudothecia.  
Photograph: Wayne Pitt

## Strategies to manage and prevent botryosphaeria dieback

There are a number of strategies that can be implemented to manage botryosphaeria dieback (Table 2, Figures 3 to 7), although there are no fungicides registered specifically for control. The aim is either:

1. prevention, by breaking the disease cycle, removing inoculum source, and reducing the risk of further infection; or
2. recovery, reducing the impact on the vineyard by bringing diseased grapevines back into full production.

It is important to practise good hygiene around the vineyard to remove infection sources and avoid cross contamination, similar to managing other fungal diseases. It is also essential to time operations, such as pruning, to minimise the risk of disease spread by avoiding high risk infection periods.



Figure 3 Infected trunks are cut off and removed from the vineyard.  
Photograph: Mark Sosnowski, SARDI

Table 2 Strategies to reduce the impact of grapevine trunk diseases in vineyards

Aim	Strategy	Method
Prevention	Cultural practices	<ul style="list-style-type: none"> <li>■ Avoid pruning during wet weather (spores of Botryosphaeriaceae fungi are released up to 2 hours after rain)</li> <li>■ Minimise number and size of pruning wounds</li> <li>■ Cuts should be made at an angle to allow water to drain from the wood surfaces</li> <li>■ Prune early in the season when spore production is low or late in the season when wounds are less susceptible and heal more rapidly</li> </ul>
	Chemical practices Protection of pruning wounds is the most efficient and cost effective way to prevent grapevine trunk diseases.	<ul style="list-style-type: none"> <li>■ Pruning wound protection: apply fungicides, paints, pastes or biological control agents directly onto large cuts as soon as possible after pruning (Figure 1 and 7). (See page 5 for further information)</li> <li>■ Vinevax™ (biological control agent) and Greenseal™ are the only two products registered in Australia for pruning wound protection (both products are registered for the control of eutypa dieback)</li> </ul>
Management	Removal of infected wood	<ul style="list-style-type: none"> <li>■ Remove dead wood of cordons and 10 cm of healthy tissue</li> <li>■ Extensively rework infected crown or trunk (Figure 3)</li> <li>■ Remove all infected wood from the vineyard (Figure 4)</li> <li>■ Retrain new cordons (Figure 5)</li> <li>■ Replace trunk with water shoots (Figure 6)</li> </ul>



Figure 4 Remove infected wood from the vineyard to avoid the risk of re-infection with botryosphaeria dieback and other grapevine trunk diseases.

Photograph: Cathy Gairn



Figure 5 Infected cordons have been removed and new ones trained.

Photograph: Cathy Gairn



Figure 7 Pruning wound protectant paint applied to large cuts.

Photograph: Cathy Gairn



Figure 6 Infected trunks and cordons have been removed and new water shoots trained up.

Photograph: Sandra Savocchia

# Botryosphaeria dieback



research undertaken by the National Wine and Grape Industry Centre

Project	Evaluation of fungicides for the management of botryosphaeria dieback of grapevines
Where	Wagga Wagga, NSW, Hunter Valley, NSW and Barossa Valley, SA.
When	2007–2010
Collaborators	Wayne Pitt, NWGIC, Sandra Savocchia, NWGIC, Chris Steel, NWGIC, Tony Somers, NSW DPI and Mark Sosnowski, SARDI
Funding	Grape and Wine Research and Development Corporation-funded Wine Growing Futures program of the National Wine and Grape Industry Centre

## Aims

1. Identify fungicides with the potential to inhibit the growth of Botryosphaeriaceae species.
2. Evaluate promising fungicides in the field.
3. Provide recommendations for the management of botryosphaeria dieback.

## Method

Twenty fungicides currently registered in Australia for other grapevine diseases were tested in-vitro for efficacy of reducing mycelial growth of four Botryosphaeriaceae species. The most effective fungicides were further evaluated under field conditions. This evaluation was conducted by applying the fungicides to freshly cut pruning wounds, and comparing their ability to reduce infection to three registered pruning wound protectants and one biological control agent.

## Summary of results

Bavistin® (carbendazim), Shirlan® (fluazinam) and Folicur® (tebuconazole) were the most effective pruning wound protectants, reducing infection by 41–65%. The two pruning wound protectants, Garrison® and ATCS tree wound dressing, also fell within this range. Garrison is a commercial tree wound paste formulated with the fungicides cyproconazole + iodocarb.

## Outcomes for industry

The research identified three fungicides, Folicur®, Shirlan® and the fungicide based paste, Garrison®, with potential to control botryosphaeria dieback. Protectants should be applied immediately after pruning or when large cuts are made. The product Bavistin®, which was tested, is no longer registered for use in Australia. Currently there are only two products registered in Australia

for pruning wound protection (Vinevax and Green Seal). Both of these products are registered for the control of eutypa dieback, however, not for botryosphaeria dieback.

## Future research

Recommended rates for fungicides currently registered for use on grapevines are based on rates used for the control of other diseases. For efficient and cost effective application, future research of promising fungicides to control botryosphaeria dieback will involve testing existing application technology with the ultimate aim of finding products suitable for efficient broad spectrum application that control all grapevine trunk diseases.

## Further information

[www.nwgic.org](http://www.nwgic.org)

Pitt, W.M., Huang, R., Savocchia, S. and Steel, C.C. (2010). Identification and distribution of *Botryosphaeria* spp. associated with grapevine decline in New South Wales and South Australia. *Australian Journal of Grape and Wine Research* 16: 258–271.

Pitt, W.M., Sosnowski, M.R., Huang, R., Qiu, Y., Steel, C.C. and Savocchia, S. (2012). Evaluation of fungicides for the management of Botryosphaeria canker of grapevines. *Plant Disease* (In Press, <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-11-11-0998-RE>).

Further information on botryosphaeria dieback in Australia can be found in the NWGIC factsheet *Grapevine trunk diseases—symptoms and distribution* available from the NWGIC website.

For information on eutypa dieback see the GWRDC Innovators Network factsheet '*Eutypa dieback*' ([http://www.gwrdc.com.au/webdata/resources/factSheet/GWR\\_068\\_Eutypa\\_Dieback\\_Mangement\\_Fact\\_Sheet\\_FINAL.pdf](http://www.gwrdc.com.au/webdata/resources/factSheet/GWR_068_Eutypa_Dieback_Mangement_Fact_Sheet_FINAL.pdf))



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