

# Evaluating fungicides as pruning wound treatments to control eutypa dieback



**Mark R. Sosnowski**

Cooperative Research Centre for Viticulture  
PO Box 154, Glen Osmond, SA 5064  
South Australian Research and Development Institute  
GPO Box 397, Adelaide, SA 5001

**M.L. Creaser**

Cooperative Research Centre for Viticulture  
South Australian Research and Development Institute

**T.J. Wicks**

Cooperative Research Centre for Viticulture  
South Australian Research and Development Institute



## Summary

The fungus which causes eutypa dieback enters through pruning wounds. Therefore pruning should be avoided when conditions are most conducive to infection, such as during and following rainfall, the colder conditions of winter and before sap flow begins at the end of winter. As this is sometimes impractical, pruning wound protectants can be used to reduce infection, especially on larger wounds. Benomyl products such as Benlate® that have proved effective in the past are no longer being manufactured and an important aim of this project is to seek alternatives. This paper deals with the testing of fungicides already registered for use on grapevines for other diseases. Bavistin® was the most-effective product, but testing of products is continuing each season to expand the range of suitable products. In addition, trials are under way to determine the efficacy of Bavistin® at lower rates and, if effective, we aim to develop a cost-effective method of spraying wounds with a commercial sprayer. A biological control product, Vinevax™, has recently been registered for use on pruning wounds and is also being tested in field trials.

## Introduction

Eutypa dieback is a major disease of grapevines caused by the slow-growing fungus *Eutypa lata*. In many grapegrowing regions of Australia, eutypa dieback is a significant problem that reduces vineyard productivity and longevity. The disease is considered a



Fig. 1. Thirty-three year old Shiraz vine in Eden Valley showing severe stunting of the shoots on the right cordon, due to infection by *E. lata*. On the left cordon some shoots are unaffected by the disease.

problem of established vineyards, particularly premium red cultivars such as Grenache, Shiraz and Cabernet Sauvignon. The cost to the Australian grapegrowing industry, based on yield-loss alone, has been estimated at between \$14.9 and \$22.7M per year for Shiraz alone (Wicks and Davies, 1999; Creaser, unpublished).

The disease is introduced into vineyards during wet weather when ascospores are blown in from dead, diseased wood, and land on wounds made during pruning or re-working operations. Ascospores are released within two hours of the onset of rainfall ▶

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and release can continue for about 36 hours (Dubos 1987, cited by Carter 1991). Wounds are more susceptible to infection when made in early winter and less susceptible as the temperature rises in late winter and early spring due to greater competition by other natural wound colonisers (Chapuis *et al.* 1998). Furthermore, it is believed that the movement of sap as the growth cycle begins at the end of winter has a counteractive effect on ascospores entering the vessels (Dubos 1987, cited by Carter 1991). Therefore, delaying pruning until late winter and avoiding rainfall events will reduce the likelihood of infection by *E. lata*. Once established, the disease causes stunting of the shoots and deformation of leaves (see Figure 1), with spurs and, eventually, whole cordons dying.

As it is often difficult to delay pruning and avoid rainfall when pruning, the application of pruning-wound protectants may help to reduce infection in these vulnerable periods. Treatment of wounds with a benzimidazole fungicide, such as Benlate® (benomyl), immediately after cutting, using either a paintbrush or knapsack sprayer (Creaser and Wicks, 2002a) has been effective. However, manufacture of Benlate®, the industry standard, was discontinued in 2001. The production of an alternative, Marvel® (benomyl), is also under review. Creaser and Wicks (2002a) also reported the ability of ATCS tree-wound paint (with or without Benlate®) to give 100% control of infection by *E. lata* when applied to pruning wounds. Recently, Vinevax™ pruning-wound dressing has been registered for use in Australia (Hunt 2004). There is a need to identify additional chemicals for the protection of pruning wounds with the aim of registering them for this purpose.

The current CRCV project; “Managing grapevine trunk diseases” aims to develop an integrated approach to control eutypa dieback in grapevines through chemical, cultural and biological means. This paper reports on current progress in evaluation of fungicides for the protection of pruning-wounds and future plans.

### Pruning-wound trials

In 2001 and 2002, trials were established on Cabernet Sauvignon vines at the Nuriootpa Research Centre in the Barossa Valley to evaluate the efficacy of various fungicides as wound protectants against *E. lata* infection (see Table 1).

In both years, pruning wounds were made in mid-August on one-year-old canes and the treatments applied with a paintbrush within one hour of wounding (see Figure 2). Wounds were inoculated with 500 ascospores of *E. lata* either before or after treatment (see Figures 3 and 4). To determine the incidence of natural inoculum in the trials, some vines were treated with water but not inoculated.

Table 1. Treatments applied in field trials to wounds made on one-year-old canes.

Trade name	Active ingredient	Application rate (/L water)
<b>2001-02 trial</b>		
Bavistin®	Carbendizim (500g/kg)	25g
Scala®	Pyrimethanil (400g/L)	15ml
Fungaflor®	Imazalil sulfate (750g/kg)	1.36g
<b>2002-03 trial</b>		
Benlate®	Benomyl (500g/kg)	2g
Cabrio®	Pyraclostrobin (250g/L)	1.6g
Bayfidan®	Triadimenol (250g/L)	0.2g
Flint®	Trifloxystrobin (500g/kg)	0.3g
Teldor®	Fenhexamide (500g/L)	2g
Thiovit®	Sulphur (800g/kg)	4g
Topas®	Penconazole (100g/L)	0.5g
<b>Both trials</b>		
I Control#	Water	-
NI Control *	Water	-

# Inoculated (I) control, treated with water and received *E. lata* ascospores.

\* Non-inoculated (NI) control, treated with water only, so that the level of natural infection could be determined.

Treated canes were removed after one year, in July 2002 and June 2003, and the presence or absence of *E. lata* determined by isolating the fungus on agar.

### Results

In the 2001-02 trial, Bavistin® reduced infection of wounds by *E. lata* compared to the inoculated water control, at all three inoculation times (see Figure 3). In fact, Bavistin® provided 100% control when inoculation occurred seven or 14 days after the treatment was applied. Scala® reduced infection when inoculation occurred one or seven days, but not 14 days following treatment. Fungaflor® did not reduce the infection of wounds compared to the inoculated water control.

In 2002-03, Benlate® reduced infection by *E. lata* compared to the water control at all three inoculation times (see Figure 4). Cabrio® reduced infection of wounds when inoculation occurred one day before and one day after treatment. Bayfidan® and Teldor® reduced infection of wounds only when inoculation occurred before treatment. Topas® reduced infection only when inoculation occurred 14 days after treatment and Thiovit® was unable to reduce infection by *E. lata*.



Fig. 2. Application of a pruning-wound treatment to a one-year-old cane using a paintbrush.

Infection from natural inoculum was detected by the NI controls in both seasons with more infection occurring in 2002-03 than in 2001-02. The effect of natural-wound healing was evident by the I controls. In 2001-02, pruning-wound infection was reduced from 60% to 18% at two weeks after wounding and in 2002-03 infection was reduced from 64% to 37% (see Figures 3 and 4).

### Conclusions

These trials show that Bavistin® was effective in preventing infection of pruning wounds by *E. lata* and therefore may be a suitable alternative to Benlate®. Both of these products belong to the benzimidazole fungicide group. Furthermore, Scala® and

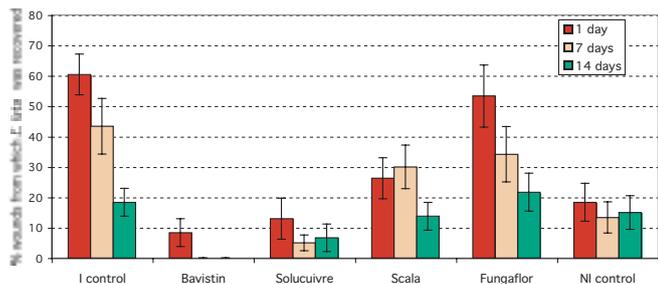


Fig. 3. Percentage of wounds (n=15) from which *E. lata* was recovered following wound treatment and artificial inoculation at three times after treatment in 2001. I control = inoculated water control, NI control = not-inoculated water control, bars represent standard error of the mean.

Cabrio® were able to reduce infection by *E. lata*, although they were not as effective as Bavistin®. All of these products are registered for use on grapevines, but for the control of diseases other than eutypa dieback.

Currently, trials are being undertaken to test the efficacy of Bavistin® at a lower rate, comparing it in the same trial with Benlate® as well as a number of other products including acrylic paint and Vinevax™, the biocontrol product based on the fungus *Trichoderma*. John *et al.* (2003) recently reported the potential of *Trichoderma* for the control of eutypa dieback. In view of the extent of reworking activities being conducted on grapevines in Australia (Creaser and Wicks, 2002b), a trial is under way to determine the efficacy of these products on larger wounds, such as those left when cordons or trunks are cut.

If wound protection using fungicides is to become commercially viable, application of lower rates with spray equipment will be necessary. Future experiments are planned to test the efficacy of spraying vines with Bavistin® after pruning, using a commercial sprayer.

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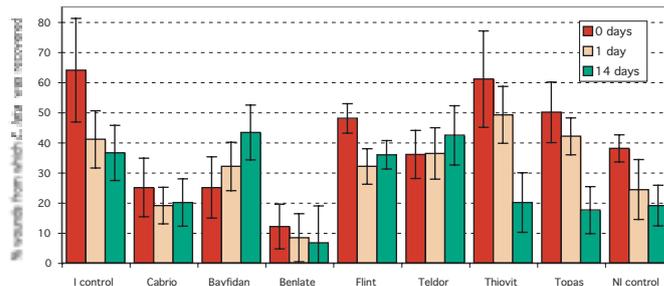


Fig. 4. Percentage of wounds (n=50) from which *E. lata* was recovered following wound treatment and artificial inoculation one day before inoculation (curative) and two times after treatment (preventative) in 2002. I control = inoculated water control, NI control = not-inoculated water control, bars represent standard error of the mean.

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Mark Sosnowski has a Bachelor of Agricultural Science from the University of Adelaide and commenced working for SARDI in 1997 in the Field Crop Pathology Unit. He commenced a PhD in 2000 at the University of Adelaide, studying the epidemiology and management of blackleg disease of canola, which was successfully completed in 2002. In January 2003, Mark took up his current position with SARDI, working on the CRCV/GWRDC project, management of eutypa dieback in grapevines. Mark can be contacted on (08) 8303 9489 or email [sosnowski.mark@saugov.sa.gov.au](mailto:sosnowski.mark@saugov.sa.gov.au)

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