New technology facilitates control of Eutypa dieback in apricots and grapevines

P. A. Magarey
Loxton Research Centre, Loxton, South Australia 5333

M. V. Carter
Waite Agricultural Research Institute, Glen Osmond, South Australia 5064

In recent years interest in Eutypa dieback in orchards and vineyards has resurged because of the introduction of mechanical pruning and the increased reworking of out-dated cultivars. Both practices raise the risk of this disease occurring. New technology, however, can now lessen these risks. Spraying secateurs provide the only viable method for commercial growers to control the disease (Carter 1983).

Eutypa dieback, often called 'gummosis' by orchardists and home gardeners, or 'dying arm' by viticulturists, is the most serious pruning-wound disease of apricots and grapevines in Australia, commonly causing decline and death of crops in high rainfall regions of the south-eastern portion of the continent, viz. Barossa Valley, Southern Vales and North-eastern Victoria. It is also a risk in some of the drier regions, viz. Riverland, especially in reworked plantings with overhead irrigation.

Wilted leaves on one shoot and exuded gum from a recent infection through a pruning wound on apricot.

In recent years the name 'Eutypa dieback' has been introduced because the same fungus, *Eutypa lata* (=*E. armeniacae*) causes the disease in both crops, though only apricots show the gumming symptom.

Symptoms in apricot

The disease in apricot trees appears as a sudden wilting of the leaves on single branches in summer. Fruit on these branches may ripen earlier than those on the rest of the tree and the affected branch usually dies before the end of the season (Figure 1). Gum sometimes exudes from affected branches.

After the branch has died, the dry, brown leaves often remain attached for several months. Progressive shedding of wilted leaves does not occur as with some diseases of apricot, e.g. Verticillium blackheart.

Symptoms in grapevine

In vineyards the disease appears on randomly scattered vines as cankers that extend from old pruning wounds (Figure 2), and as weak and stunted shoots which, in mid-spring, contrast strikingly with adjacent healthy ones (Figure 3). Early in spring, leaves on diseased shoots are often small, chlorotic (yellowed) and sometimes cupped, tattered or otherwise mis-shapen (Figure 4). They can be necrotic (brown) at the margins or spotted with small brown lesions. With aging they can develop a tattered and scorched appearance. Many of the flowers on these shoots fail to set berries, and the few that form usually fail to mature.

Figure 1 As the disease progresses the limbs die and others are affected.

Figure 2 An old canker of Eutypa dieback on an arm of a Grenache grapevine next to pruning wounds. The point of entry for the fungus has been exposed by removing the bark.

Figure 3 Each of these old Grenache vines has one severely affected cordon showing typical weak and stunted shoots in striking contrast with the adjacent healthy foliage.

All vine cultivars in Australia are susceptible to Eutypa dieback. Symptoms can vary but are most striking on Grenache. The shoots on an affected arm weaken in successive growing seasons until the arm dies. Many such dead arms may be found on close inspection of a mature commercial vineyard in spring or summer.

A variety of other woody plants is occasionally infected. These can serve as alternative sources of infection and, in Australia, include almond, apple, pear, plum, tamarisk and at least 16 ornamentals, among them being the common garden plants Ceanothus, Pittosporum and Guelder rose (Viburnum).

Nature of the disease

Eutypa lata is a wound parasite. During wet weather the spores of the fungus enter the open cells of the water-conducting tissue (xylem) at pruning wound surfaces. The fungus will germinate and grow slowly down the xylem, at 10 to 20 cm a year, until the limb or arm is killed. When the zone of infection reaches the trunk, the tree or vine eventually dies.

Two or more growing seasons may elapse between the time of infection and when a canker can be seen around an infected wound. The cankered bark may be depressed and distorted, often with longitudinal cracks (Figure 2).

Figure 4 Symptoms on Grenache in early spring. Leaves are often small, yellowed, misshapen and tattered at the edges.

Internally, the infected sapwood is discoloured light to dark brown.

In apricots, leaves wilt and the limbs die when the fungus disrupts the water flow, usually in mid-summer when the tree suffers moisture stress. In grapevine, the disease progresses more slowly and external symptoms will not be seen for 2 or more years after infection.

Life cycle

Eutypa spores are produced in masses of small, black, fruiting bodies (perithecia) which form in a blackened layer (stroma) 2 or more years after the death of an infected branch (Figure 5). This stage of the life cycle occurs most readily in districts where the mean annual rainfall exceeds 350 mm, but it also occurs less abundantly in drier regions such as the Riverland, when stumps are allowed to remain after diseased apricot trees or vines are incompletely removed from orchards or vineyards irrigated by overhead sprinklers.

A new generation of fruit bodies is produced each winter. After reaching maturity these discharge abundant numbers of Eutypa spores with each rainfall or period of irrigation of 2 mm or more. Thus if rain falls during pruning or within the following 2 weeks, when the new wounds remain susceptible to infection, spores released from dead wood will be carried by air currents and deposited on the branches.

Some spores will be washed or splashed into pruning wounds and infection will begin immediately. Once spore germination has occurred, chemical treatment cannot prevent the fungus from invading the branch.

Risk of infection

Eutypa infection occurs when spores enter wounded tissue. The greater the target area, i.e. the number and size of pruning wounds, the greater the chance of infection. The susceptibility of wounds is greatest on the day of pruning, declining markedly during the following 2 weeks as the natural healing processes restrict entry of the fungus.

Spores are released only when the fruiting bodies are wet, and the most abundant releases accompany rainfall in late autumn and spring. *Pruning in wet weather therefore increases the risk of infection.* Trees and vines are at greatest risk when the spore sources are close at hand within the orchard or vineyard; however, some of the spores, once airborne, will travel many kilometres.

In a young orchard or vineyard, with good growing conditions and where diseased branches or arms are promptly removed, new growth will quickly replace the diseased parts. In these instances, economic loss from Eutypa dieback is small. The main losses occur in young plantings in which large pruning wounds have been left unprotected (Figure 7) and in older plantings when plant vigour has declined. For instance, in a vineyard at Loxton, S.A., in November 1984, 7% of 32-year-old Pedro vines were found to be diseased. Of these, more than 20% bore disease in more than one arm.

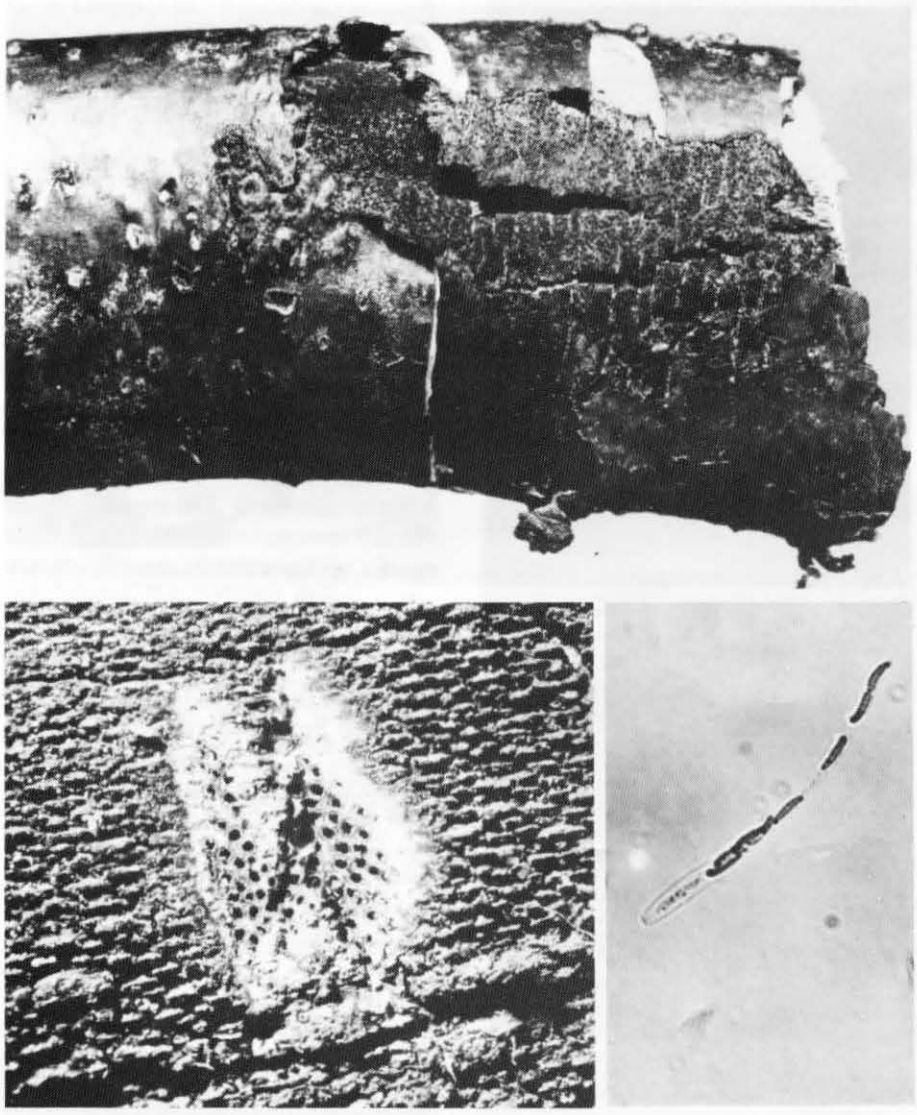

Figure 5 Top: spores for new infection come from fruiting bodies on old, dead, host wood, including apricot. Below left: close-up of the fruiting body of *Eutypa lata*. Below right: asci and ascospores of *E. lata*.

Ten practical steps for growers

Control measures for Eutypa dieback are more important in the wetter regions. *They are aimed at reducing the likelihood of spores reaching unprotected wound surfaces.*

1. *Where practical, prune early in winter* (June) when spore production is lowest; but no time of year is safe if wounds are left unprotected.
2. *Reduce apricot-tree pruning to the minimum* needed to maintain tree shape and size and fruit production.

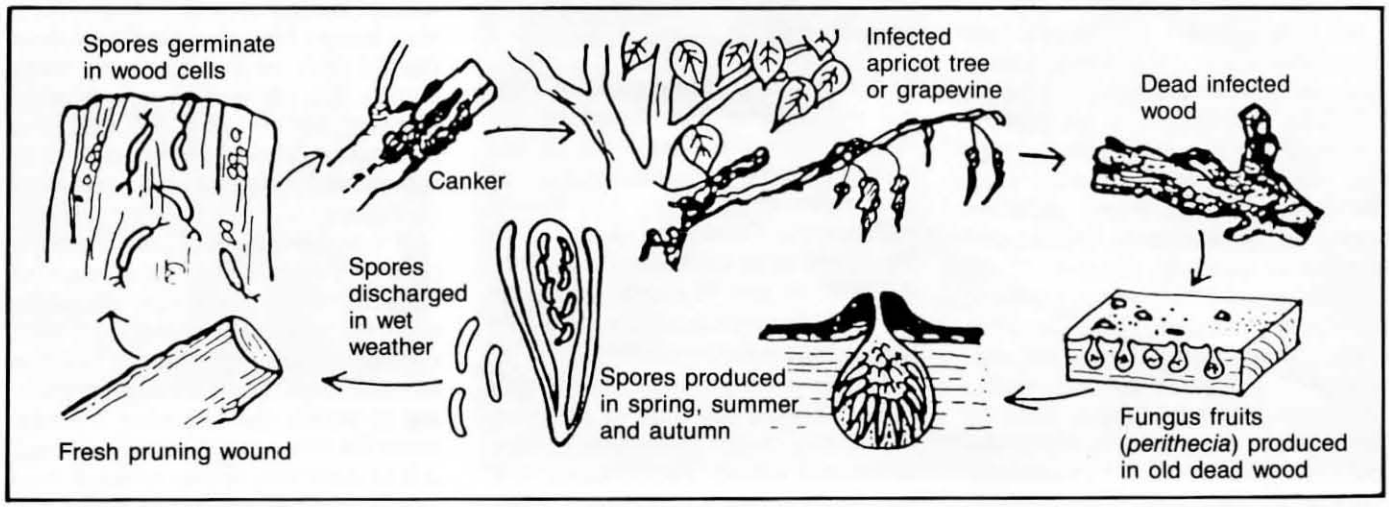

Figure 6 Life cycle: *Eutypa lata* (Eutypa dieback) in apricot and grapevine.

Figure 7 Eutypa dieback infection in an unprotected, reworked grapevine. It is important to treat large pruning cuts.

3. *Where large cuts are needed*, and for all cuts on young apricot trees, apply Benlate® fungicide immediately, mixed with water at 20–25 g l^{-1}. This can be readily applied with manual or pneumatic-powered spraying secateurs, or by means of a small, hand-operated spray bottle. The dose should be enough to flood the cut surface thoroughly, ensuring penetration of the chemical into all the water-conducting cells. Pruning wounds of less than 10 mm in diameter usually do not warrant treatment in mature trees. *Note that whole-tree spraying with lower-strength mixtures is not only wasteful, but also ineffective* because conventional machinery does not provide sufficient coverage of pruning wounds.
4. For annual vine pruning, adequate protection will be achieved when *all cuts in 2-year and older wood are treated with Benlate®* (as above). Pruned spurs can be disregarded without serious risk. *Reworked trees or vines* are at risk of infection through the large pruning wounds. The symptoms may not be seen for 2 or 3 years but once the disease is established in the trunk, the diseased portion cannot be removed by surgery. Consequently, the life of the tree or vine is severely limited and the cost of reworking wasted. Trunk wounds pose the greatest threat to the productivity of the orchard or vineyard and therefore should be treated immediately.
5. Home gardeners are strongly advised to treat every cut made on their apricot trees. The cost of the chemical is insignificant and very little extra time is needed to apply this highly effective protection. Surveys have shown the highest incidence of Eutypa dieback is found in apricot trees in home gardens. It is entirely practicable to prevent the heavy loss in domestic production caused by this disease.
6. Where possible, burn all infected branches as soon as pruning is completed. This applies particularly to large branches and removed trees and vines; do not leave them on the woodheap. Infected branches from either apricot or grapevine in nearby orchards or vineyards are also hazardous. Collaborative control within a neighbourhood is therefore highly desirable.
7. When a diseased tree or vine is cut down, no part of the stump should be allowed to remain above ground. (The roots are not a source of infection.)
8. Diseased apricot and grapevine wood, along with some alternative hosts, provide sources of infection for either crop.
9. Young apricot trees should be treated with Benlate® during the budding operation. Infection can occur in nurseries at the time rootstocks are headed back during budding. These trees will not show symptoms for several years, but affected trees will have a short life because the fungus can grow directly into the trunk. Again, the diseased portion cannot be removed by surgery.
10. Hedging machines and other power-operated systems for mass pruning in Australian viticulture require close attention to ensure that control of Eutypa dieback is minimized in vineyards, especially in wetter districts.

The advent (1985) of manual and pneumatic-spraying secateurs that apply a fungicide to the pruning wounds as the cuts are made has, however, alleviated the problem of tree and vine protection for commercial growers. Although large cuts will still need special treatment, the routine use of these secateurs during orchard and vineyard pruning operations will enable growers to ensure effective protection against Eutypa dieback.

Acknowledgment

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References

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