Phytophthora diseases of almonds (AL16005)

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Phytophthora species are highly destructive plant pathogens that cause root rot, crown rot and trunk cankers. All of these symptoms have been reported by Australian almond growers.

They require high humidity or free water in order to reproduce and spread. Long periods of rainfall, standing water and over-irrigated soils are more likely to result in Phytophthora diseases.

Phytophthora can be introduced in to and spread throughout an orchard through infected plant material, soil, or contaminated water. Once introduced, the population can rapidly increase and become established in the orchard. The pathogens can last in soil for a number of years and eradication can be difficult.

Phytophthora disease symptoms

Trees with crown and root rot decline over time, with signs of decreased vigour and limb dieback. Trees with root rot will have blackened and rotting roots and fewer root hairs (Figure 1A). Trees with crown rot will have stained woody

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tissue under the bark at the base of the tree (Figure 1B). However, diseased trees can be hard to distinguish from healthy ones in the early stages of infection.

Cankers on the trunk and scaffolds are characterised by profuse gumming, chlorotic leaves and limb dieback. Gummosis occurs in the area of infection (Figure 1C), with irregular shaped staining under the bark of infected trunks or scaffolds.

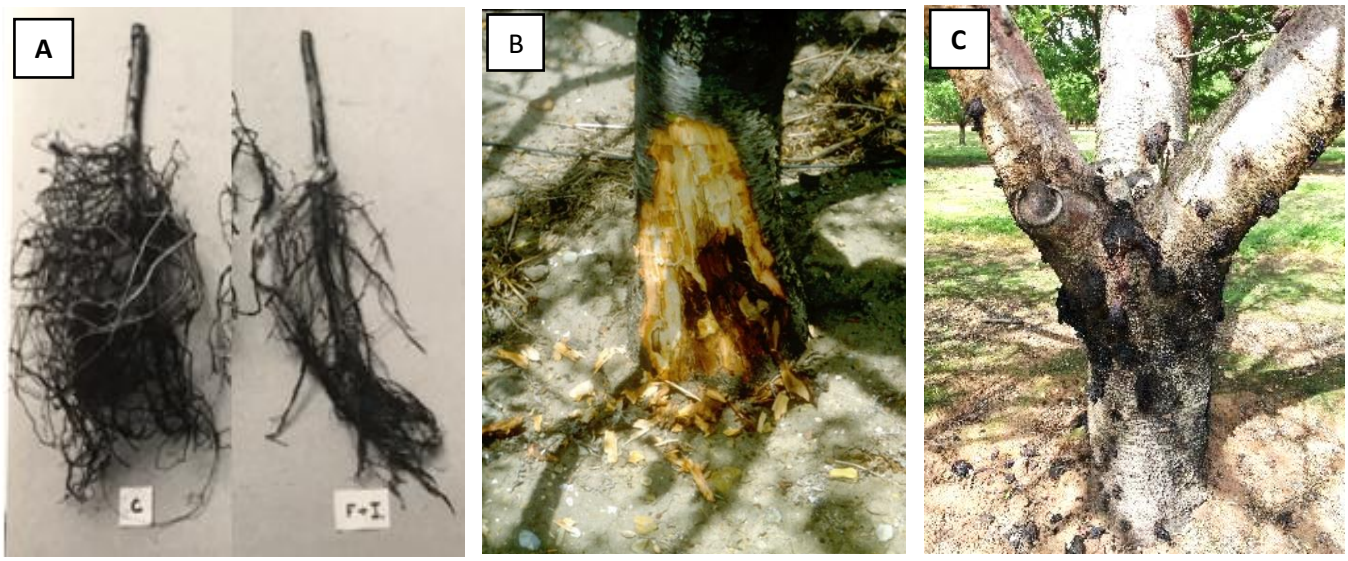

Figure 1. Almond trees of different ages with Phytophthora disease. **A.** Healthy Chelaston almond roots (L) compared to root rot (R). (Photo taken by T. Wicks) **B.** Crown rot extending from the soil surface into the scion of the infected almond tree. There is a sharp contrast between reddish brown affected tissues and healthy wood (Photo taken by T. Wicks). **C.** A mature almond tree with phytophthora canker. Gumballs are exuding from the scaffolds and trunk.

Disease management

Successful management of Phytophthora begins at planting. Good soil drainage and tolerant rootstocks are important prevention measures, and ensuring that the more susceptible scion is well above the soil surface will help to prevent *Phytophthora* infection at the graft union.

To avoid creating an environment conducive to infection, it is important to avoid excessive wetting of the trunk from sprinklers and to reduce the occurrence of free-standing water. Mounding soil around trees and planting on sloping ground with well-drained soil, will assist.

Quarantine and sanitation is also extremely important. Minimising movement of vehicles and people, as well as removal of soil from tyres and boots in a designated clean up area before entry can prevent the introduction and spread of *Phytophthora* into an orchard or nursery.

Good orchard hygiene is fundamental to effective Phytophthora management. Orchards should be kept free of plant debris that may be infected with *Phytophthora*. Roadways, inter-rows and equipment should also be kept clean to reduce the spread of disease in the orchard.

Several reports have indicated that phosphonates and metalaxyl fungicides can control infection by *Phytophthora.* In Australia, phosphonic acid is registered for the control of Phytophthora in almond and can be applied as a foliar spray or through irrigation as a soil treatment. More research is required to evaluate other fungicides and biological options for management of Phytophthora diseases.

Chemical control of *Phytophthora* and the cost of replanting diseased trees can be high, therefore good orchard hygiene and cultural practices are important to minimise conditions conducive for infection and prevent the introduction and spread of these highly destructive plant pathogens.

Acknowledgement

This project has been funded by Hort Innovation using the almond research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

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