

## Managing fungal leaf spot pathogens in production nurseries

Most nursery plants are susceptible to fungal leaf spot diseases that can blemish plants and affect nursery trade. A pathogen that causes minor damage to plants in a nursery may cause serious damage in the field environment, and vice versa. Pathogens may sometimes spread to other host species that may be highly susceptible. Therefore, care should be taken to supply healthy plants only.

This article refers to leaf spot fungi that can occur in nurseries; e.g. *Pestalotiopsis*, *Pseudocercospora*, *Cercospora*, *Bipolaris*, *Curvularia*, *Septoria*, *Cladosporium*, *Phyllosticta*, *Elsinoe*, *Diplocarpon*, *Phoma* and other minor fungal leaf spot pathogens. More common leaf spot pathogens such as *Botrytis*, *Colletotrichum*, *Fusarium*, *Alternaria*, *Phytophthora* and *Cylindrocladium* (now in the genus *Calonectria*), as well as powdery mildew and downy mildew pathogens are not included here, as each are covered in more detail in other fact sheets. Fungal leaf spots are easily confused with bacterial leaf spots and often require a diagnostician to confirm identity. A variety of abiotic factors can also cause leaf spots that appear superficially similar to that caused by pathogens, e.g. edema; a factsheet on this topic will be released in 2018, as will one on rust fungi.



Leaf spots caused by *Pseudocercospora* sp. on *Nephrolepis* fern.

### SYMPTOMS

Leaf spots caused by fungi are highly visible. Different fungi may cause similar spots. Leaf spots may be circular, or irregular, often with a yellow halo; angular and delimited by veins; or appear as small black specks. Spots may coalesce to form a blotch or blight. Some leaf spot fungi also attack young shoots and cause a tip dieback; others are associated with stem cankers. Spots may be confined to young leaves, or adult foliage, or only occur on lower shaded leaves where humidity is high. In severe cases, one spot on a leaf may cause abscission even before visible symptoms appear; as a result, defoliation may occur. As spots age, fungal fruiting bodies may form, which can be seen with a hand lens.

**FOR MORE INFORMATION REFER TO THE FACTSHEETS ON EACH OF THESE GROUPS:**

[Botrytis](#)

[Alternaria](#)

[Powdery mildew](#)

[Colletotrichum](#)

[Phytophthora](#)

[Downy mildew](#)

[Fusarium](#)

[Cylindrocladium](#)

[Bacterial diseases](#)

---

## PHYSIOLOGICAL EFFECTS

All leaf spot fungi weaken plants to some degree by affecting photosynthesis. Some affect a small percentage of the overall leaf area with a minimum effect on plant health and growth, whereas others will impact a large area of leaf tissue and reduce growth rate. In some cases, leaf spots are more likely to occur on weak plants. Therefore, do not overlook the health of other plant systems when making in-field diagnoses. In particular, examine the root and stem vascular systems as a matter of course to ensure that leaf spot pathogens are the primary cause and not a symptom of a larger, less obvious problem.

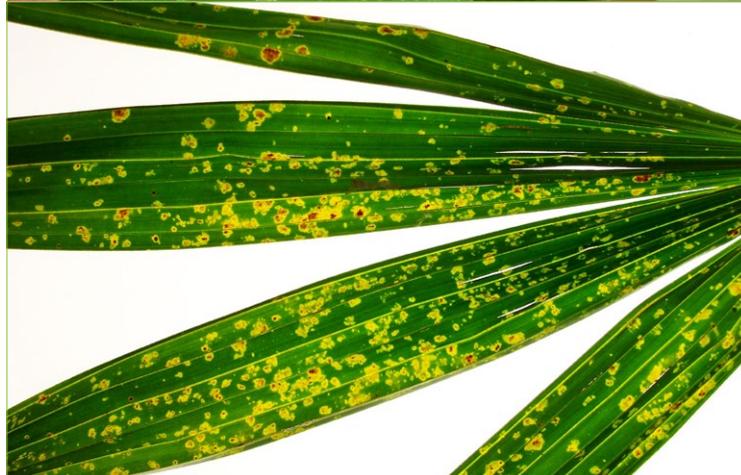
---

## BIOLOGY AND EPIDEMIOLOGY

Each leaf spot pathogen has its own specific biology and pathology. Nursery managers need to know where the fungus came from, how it spreads, its likely severity, and the environmental and host factors that favour disease development. This knowledge is important when developing disease management strategies.

Fungal spore production, dispersal, germination and infection depend on environmental conditions, especially temperature, humidity and rainfall. Each pathogen has a favourable temperature and humidity range for growth and development. Spores are either spread by wind or splashed by water, or both. Most need a film of water (i.e. rain or > 90% humidity) on the leaf surface for several hours for germination and infection to occur; different pathogens require different amounts of time with leaf wetness. This is in contrast to the powdery mildews where spores germinate at very low humidity and are inhibited by free water.

Many fungal pathogens can survive, grow and reproduce on crop trash that may be present on top of growing media, on the ground or on benches. As the amount of crop trash in the growing area increases, so too does the risk of infection from pathogens that may be present in the crop trash. Furthermore, many pathogens may produce resting bodies that may survive in the growing area for months or even years without infecting a host plant.



*Pseudocercospora* sp. causing leaf spots on Azalea (above) and *Rapis* palm (below).



Tar spot on *Callistemon* caused by *Phyllachora* sp.

## MANAGEMENT

Nursery managers need to be aware of the leaf spot pathogens likely to affect a particular crop. They should obtain plants for propagation from a reputable dealer, and not accept plants with leaf spots. Regular health checks are required in a nursery so that any leaf disease problem can be detected early. Early removal of infected leaves before sporulation occurs is essential; sometimes it may be necessary to destroy plants or entire batches of plants.

Many leaf diseases can be managed by modifying cultural practices. High humidity, heavy shading, overhead irrigation, and nutrition will influence the progress and extent of disease. Over-crowding plants will favour leaf spots, as this prevents drying of leaves after rain, irrigation or fogs. Therefore, in most cases the following recommendations apply.

- » Increase ventilation.
- » Increase plant spacing (effectively increases ventilation).
- » Decrease period of leaf wetness (overhead irrigation should be avoided during these periods or strategically applied to decrease the period of time leaves are wet).
- » Apply protectant fungicides to susceptible lines during high risk periods when plants are healthy. Protectant fungicides may need to be applied fortnightly during high risk periods to protect healthy plants, but should be discontinued once the risk period has subsided.
- » Remove crop trash from the nursery to reduce the inoculum load.
- » Remove weeds.
- » Grow plants under optimal conditions (e.g. nutrient regimes, growing media properties etc.).

Inevitably, problems will occur from time to time. Management actions will vary with the severity of the problem. However, in general the following recommendations apply.

- » Rigorously adhere to above recommendations, remedying any lapses in these practices.
- » Assess root health; if root systems are poor it is recommended to send a sample for diagnostic testing.
- » Ensure the pH and EC of the growing media are within optimal ranges.
- » Apply protectant and curative/eradicator fungicides at an early stage of the infestation.
- » Remove heavily infested plants that are not economically viable to restore to good health.
- » Remove crop trash and apply a disinfectant to the growing area in which the infested batch was grown after it has been sold, moved or removed.



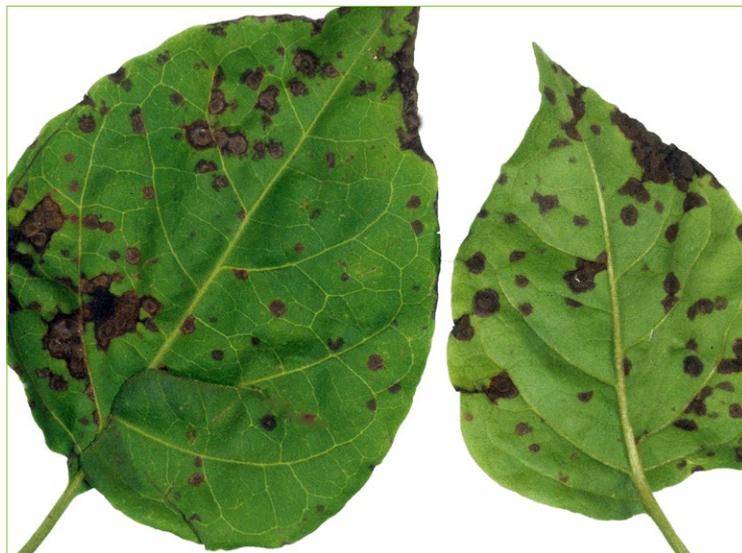
Leaf spots on *Waratah* caused by *Phyllosticta* sp.



Scab caused by *Elsinoe* on *Leucodendron*. Notice the difference in the appearance of spots on old growth (left) and new growth (right).

## FUNGICIDES

The mode of action of fungicide products is complicated, with protectant, curative and eradicant products available for use in production nurseries against a range of leaf spot pathogens. Many such products are available on the minor use permit, [PER81491](#) (valid until July 2020). Other products may have registrations available. For assistance on searching for registrations on the APVMA PubCRIS database and Infopest, refer to the webinar on [pesticides](#). For more detailed information on the terminology and mode of action of protectant, curative and eradicant fungicides and the degree of systemic activity, refer to the webinar on [fungicides](#).



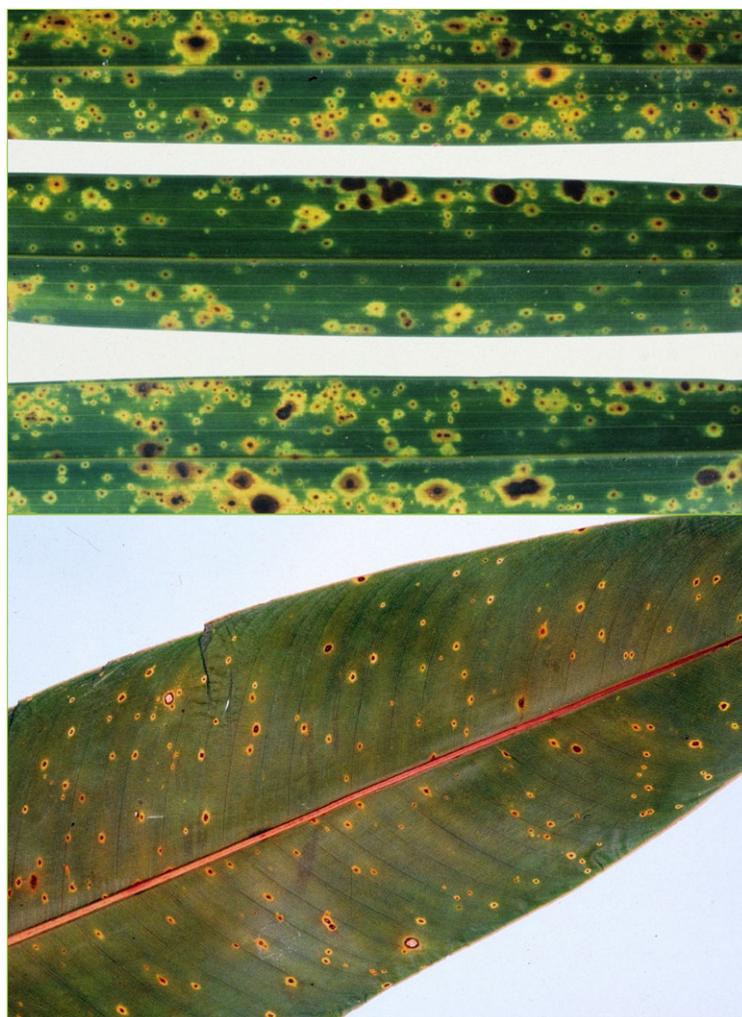
Leaf spots on bougainvillea caused by *Cercosporidium*.

## BIOSECURITY

The national and international nursery/plant trade continues to actively move seed, seedlings, cuttings, plants, fruit, vegetables and cut flowers. No nursery is exempt from the threat of an exotic leaf spot pathogen; the risk of such an incursion can never be completely eliminated. Every nursery should make sure that source material is free of disease and routinely submit diagnostic samples for testing, particularly when new symptoms occur. If detection occurs early enough certain pests and pathogens can be eradicated. If you observe unusual symptoms and suspect an exotic species, call the Exotic Plant Pest Hotline on 1800 084 881 and or submit a sample to a diagnostic laboratory for identification.



Leaf spots on *Hakea laurina* caused by a species of *Verrucispora*.



Leaf spots caused by *Bipolaris* (golden cane featured above, *Heliconia* below) can be indistinguishable at a superficial level from that caused by other leaf spot pathogens.

*This document was prepared by Ken Pegg and Andrew Manners (Agri-science Queensland, Department of Agriculture and Fisheries, Ecosciences Precinct, GPO Box 267, Brisbane QLD 4001) as part of the nursery levy and Hort Innovation funded project Building the resilience and on-farm biosecurity capacity of the Australian production nursery industry (NY15002) in 2017. Thanks also go to Tony Cooke and Lindy Coates for assistance in preparing this fact sheet. All photos by DAF, particularly Leif Forsberg.*