



Fig. 1. Powdery mildew on carrot leaves (a). Conidiophore with conidium (b). Conidium (c). The difference in susceptibility of the carrot type on parsnip and parsley (d). Photo credits A. Watson (a, d) and J. Liberato (b, c).

Common Name: Powdery mildew of carrots.

Pathogen: *Erysiphe heraclei*

Classification: K: Fungi, D: Ascomycota, C: Leotiomycetes, O: Erysiphales, F: Erysiphaceae

Erysiphe heraclei (Fig. 1) causes powdery mildew on members of the Apiaceae. The pathogen is in all Australian states but only found affecting carrots in Australia in 2007. *Erysiphe heraclei* has various formae speciales which are generally (but with some cross over) specific to the different genera within the Apiaceae. Outbreaks of carrot powdery mildew since 2007 have been sporadic and dependent on climatic conditions, preferring drier and warm to hot summers. Cultivars vary in disease tolerance and fungicide control is possible.

Host Range:

Erysiphe heraclei is a pathogen of many members of the Apiaceae including carrot (*Daucus carotae*), parsnip (*Pastinaca sativa*), parsley (*Petroselinum crispum*) and dill (*Anethum graveolens*). However there appears to be formae speciales of the fungus which infect different genera, for example the carrot type which was recently found in Australia in 2007, did not infect parsley, parsnip or celery as severely as carrot. Restricted colonies were only observed on parsnip. Weed hosts have not been observed.

Impact:

In the case of carrot powdery mildew, the disease can cause yield loss as well as a reduction in the ability to mechanically pull carrots from the ground due to leaf damage. Disease has the most effect on yield with early infections. Yield of seed can be reduced in seed production systems. In carrots there are differences in disease expression and severity across cultivars. The disease appears to be severe in temperatures typically found in summer and autumn.

It is not a problem in winter in the southern states. Overlapping plantings carry the disease through the season.

Key Distinguishing Features:

The symptoms are typical of powdery mildews, with typical white fungal growth covering all leaf surfaces. Conidia are cylindrical and produced singly. Powdery mildew growth is difficult to observe early in infection due to the fine leaflets of the carrot. As with other powdery mildews the disease increases and spreads rapidly.

Control:

Chemical controls are available but should be used as part of an integrated approach. Monitoring for disease is essential. Sulphur and other fungicides effectively control this powdery mildew, however treatment needs to be applied early for successful control to be achieved. Fungicides must be used in rotation and the choice may be dependant on other leaf diseases present such as *Cercopsora* and *Alternaria*. Cultivars with powdery mildew resistance should be further developed and adopted by industry.

Further Reading:

Braun U (1987) A monograph of the *Erysiphales* (powdery mildews). *Beiheft zur Nova Hedwigia* **89**, 1–700.
 Cunnington JH, Watson A, Liberato JR, Jones R (2008) First record of powdery mildew on carrots in Australia. *Australasian Plant Disease Notes* **3**, 38-41.

Key Contacts:

Andrew Watson Science and Research, Primary Industries
 T: 02 6951 2647 | F: 02 6951 2719 | E: Andrew.Watson@industry.nsw.gov.au

Erysiphe heraclei DC.