Pests, Diseases and Disorders of Carrots, Celery and Parsley

A FIELD IDENTIFICATION GUIDE
Acknowledgements

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Photographs

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Abbreviations

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Insects
**Aphid — carrot willow**  
*Cavarilla aegopodii*

**DESCRIPTION**

**Nymph:** Yellowish to green, similar to adult.  
**Adult:** Greenish to straw coloured with darker feet and antennae tips. Up to 3 mm long with slightly flattened shape. Winged adults are predominantly black to grey with clear wings.

**DAMAGE**

Heavy infestations can cause yellowing and distortion of foliage. Can act as a vector for Carrot virus Y, but transmission rates are low compared to other aphid species.

**MOST COMMON**

These aphids overwinter and sexually reproduce on willow trees. They migrate onto carrots and other apiaceous crops from early spring, and are favoured by dry conditions.

---

**Aphid — green peach**  
*Myzus persicae*

**DESCRIPTION**

**Nymph:** Varies from yellowish to green.  
**Adult:** Wingless adults are pale yellow to green and around 2 mm long; winged females have black heads with dark red eyes and patterned bodies.

**DAMAGE**

Causes leaf distortion through feeding, contaminates the product and potentially acts as a vector for many viruses. Large infestations can kill young plants.

**MOST COMMON**

During warmer months on a wide range of host plants.
**Beet / lesser armyworm**  
*Spodoptera exigua*

**DESCRIPTION**

**Egg:** Laid in a mass on the leaf underside and covered with white, cottony material.

**Caterpillar:** Hairless caterpillar, initially pale green, becoming darker green with variable brown, yellow and white stripes as it matures.

**Adult:** Mottled grey and brown moth around 15 mm long, wings held flat along the body.

**DAMAGE**

Young caterpillars often feed in groups, skeletonising leaves. Mature larvae feed singly, particularly preferring the centre of the plant.

**MOST COMMON**

Warmer months, particularly summer in southern areas. Attacks a large range of hosts including celery and parsnip.

---

**Carrot rust fly**  
*Psila rosae*

**DESCRIPTION**

**Larvae:** Creamy yellow, legless maggot up to 10 mm long.

**Adult:** Slender 6 mm long black fly with clear wings, yellow head and legs and large reddish brown eyes.

**DAMAGE**

Larvae feed on carrot and parsnip roots, burrowing into the plant tissue and leaving irregular brown channels under the surface. In celery, larvae bore into the roots, crown and petioles. Parsley taproots can also be infested. Seedlings are often killed, older crops are unsaleable.

**MOST COMMON**

Not currently in Australia, but present in NZ, South Africa and much of Europe and North America. Adult flies overwinter as pupae, emerging to lay eggs in spring.

Carrot rust fly damage (Rasbak), close up of the larvae responsible, and an adult fly (R Collier Warwick HRI)
Carrot weevil  
Listronotus oregonensis

**DESCRIPTION**

**Larvae:** Creamy grub with reddish brown head.

**Adult:** Mottled, dark brown weevil around 6 mm long with prominent snout.

**DAMAGE**

Both adults and larvae infest carrots, celery, parsnips and parsley. Adults feed mainly on foliage, larvae burrow into the petioles and the top parts of roots, forming zigzag tunnels. Young plants may be defoliated and die, roots are unmarketable.

![Carrot weevil (LDPC Quebec) and damage to roots (TAMU Ext)](image)

**MOST COMMON**

Not currently in Australia, but a major pest in North America.

Cutworm  
Agratis spp.

**DESCRIPTION**

**Egg:** Creamy spheres around 0.5 mm diameter with a slightly ribbed appearance. Usually laid in a large mass on vegetation or moist ground.

**Caterpillar:** Initially grey-green, caterpillars darken as they age, becoming grey to black with red, yellow and cream markings. Mature caterpillars can reach 50 mm long. Tend to curl into a ball if disturbed.

**Adult:** Wings held in a tent over back, patterned with brown, cream and grey. The Bogong moth is a type of cutworm.

![Cutworm attacking young celery plants; Active cutworm and Bogong moth](image)

**DAMAGE**

Larvae initially feed on leaves, leaving irregular holes. Older larvae cut off seedlings at soil level, usually during the night. Plants may be dragged underground to feed on during the day.

**MOST COMMON**

Damage most likely during spring, especially in damper areas.
Earwig – black field, European
Nala lividipes, Forficula auricularia

DESCRIPTION

Nymph: Similar to adult, although lighter in colour and with less developed pincers.

Adult: Black field earwigs are dark brown to black, European earwigs are reddish brown. Both are slender with flattened bodies up to 15 mm long and beaded antennae. Obvious pair of pincers at the end of the body; curved in males and straighter in females.

DAMAGE

Usually a minor pest that feeds on decaying plant matter. Can be a contamination issue in crops such as celery.

MOST COMMON

Black field and European (Flagstaffotos) earwigs

Heliothis / Native budworm
Helicoverpa armigera, H. punctigera

DESCRIPTION

Egg: Ribbed, white domes 1 mm diameter that darken before hatching. Eggs are laid singly or in small clusters on foliage.

Caterpillar: Initially 1.5 mm long, light brown with dark heads. At around 15 mm long they darken and develop distinctive stripes along their length. Colour varies from brown to greenish or reddish. Caterpillars grow up to 50 mm long.

Adult: Stout moth with lightly patterned brown wings spanning up to 25 mm, held flat across the body, hind wings pale brown with dark edges.

DAMAGE

Feeding damage to leaves, frass can be a contamination issue.

MOST COMMON

Warm weather. Larvae prefer leaf undersides or the central part of the plant.

Heliothis caterpillar and adult moth

Black field earwigs
Hoverfly
*Syrphidae spp.*

**DESCRIPTION**

**Larvae:** Cream coloured maggot with a stripe on the upper surface and dark mouth hooks, up to 10 mm long.

**Adult:** Resembles a small wasp with black and yellow bands across its rather flattened abdomen, but actually harmless. Often hovers near plants, feeding on nectar and pollen.

**BENEFIT**
Larvae attack small insects such as aphids and thrips.

——

**Beneficial insect ✓**

——

Lacewing — brown and green
*Micromus tasmaniae, Mallada signatus*

**DESCRIPTION**

**Nymph:** Brown lacewing nymphs are slender, brown and up to 10 mm long with a smallish head but large jaws and a long tail. Green lacewing nymphs are thicker bodied, up to 8 mm long and usually camouflage themselves with the remains of their prey.

**Adult:** Brown lacewings are up to 8 mm long with large green eyes. Green lacewings are up to 15 mm long with large round red eyes and long antennae. Both have large, delicately-veined wings held upright along the body.

**BENEFIT**
Adults and nymphs are voracious predators of aphids, small caterpillars, thrips and mites.

**MOST COMMON**
Year round.

——

**Beneficial insect ✓**

——

Hoverfly larvae and adult photographed mid-air *(Flagstaffotos)*

Brown lacewing nymph attacking aphids *(P Scanlon DAFWA)*; Adult green lacewing
### Ladybird
*Coccinella transversa, Hippodamia variegate*

**DESCRIPTION**

**Nymph:** Black with coloured markings and ‘crocodile like’ appearance, up to 6 mm long.

**Adult:** Most are brightly coloured, dome shaped beetles 3–5 mm long with distinctive spots and stripes on their outer wing covers.

**BENEFIT**
Both adults and larvae are active predators of aphids, thrips, moth eggs and mites.

**MOST COMMON**
Late spring to autumn.

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### Leafhopper / Jassid
*Austroasca viridigrisea*

**DESCRIPTION**

**Nymph:** Similar to the adult but wingless. Habit of moving sideways when disturbed.

**Adult:** Look like tiny cicadas; torpedo shaped, ranging in colour from yellowish to green and mottled brown. Tend to feed on the undersides of leaves but jump away quickly if disturbed.

**DAMAGE**
All lifestages suck plant sap, reducing vigour and leaving whitish patches on the leaves.

**MOST COMMON**
Warmer months, only occasionally a major pest.
Looper
*Chrysodeixis spp.*

**DESCRIPTION**

**Caterpillar:** Light green to dark green slender caterpillars with distinct looping motion (unlike heliothis caterpillars, they have no central prolegs). Mature larvae are 35–40 mm long and feed openly on a wide range of host plants.

**Adult:** Stout moth with richly patterned wings held in a tent over its body.

**DAMAGE**

Holes in leaves, leaves can be skeletonised.

**MOST COMMON**

Summer–autumn.

Lucerne leafroller
*Merophyas divulsana*

**DESCRIPTION**

**Caterpillar:** Light grey-green to brown, up to 12 mm long. Caterpillar wriggles backwards if ejected from its leaf tunnel.

**Adult:** Light tan (female) or tan with brown markings (male) moth up to 10 mm long.

**DAMAGE**

Caterpillars roll leaves up with webbing, then feed from inside.

**MOST COMMON**

Most common during late summer–autumn, mainly a pest of parsley.
Nematode — root knot

*Meloidogyne* spp.

**DESCRIPTION**

Nematodes are microscopic, wormlike organisms <1 mm long, rarely visible to the naked eye. They reproduce in the soil, where they parasitise plant roots.

**DAMAGE**

Root knot nematodes cause severe damage to many crops, but particularly carrots.

Juveniles hatch from eggs in the soil, penetrate plant roots and set up a permanent feeding site. The root cells around this site swell, forming a knot or gall. Upper parts of the plants fail to thrive, yellow and wilt easily. Carrots can be hairy, stunted and misshapen, with branch roots or knobby growths attached.

**MOST COMMON**

Symptoms are increased in warm environments (over 25°C), with major egg hatching during spring. Nematodes are spread in irrigation water, on machinery and by infested seedlings, making farm hygiene and crop rotation important control methods.

Root knot nematode damage to celery (MA Hansen Virg Polytech Bugwood.org)

Root knot nematode damage to carrots (L DuToit, WSU) and symptoms in a carrot crop (DAFWA)
INSECTS

Nematode — root lesion
Pratylenchus spp.

**DESCRIPTION**
Nematodes are microscopic, wormlike organisms <1 mm long rarely visible to the naked eye. Root lesion nematodes can reproduce in the soil or inside plant roots.

**DAMAGE**
Unlike root knot nematodes, root lesion nematodes move around inside the plant roots, rupturing cells and digesting the cell contents. Small feeder roots die; black lesions appear on larger roots. Above ground symptoms are stunting, yellowing and wilting of the plant, while carrots can be stunted and misshapen. Feeding injuries to the roots increase the chance of infection by soil borne fungi, causing secondary damage.

**MOST COMMON**
Optimum development temperature is around 23°C, with populations potentially increasing a thousandfold over 3–4 months. Nematodes are spread in irrigation water, on machinery and by infested seedlings, making farm hygiene and crop rotation important control methods.

Plague soldier beetle
Chauliognathus lugubris

**DESCRIPTION**
**Larvae:** Carnivorous, soil-dwelling grub that eats pupae, insect eggs, small caterpillars and other small insects.

**Adult:** Slender beetle with bright orange abdomen and metallic, olive green wing covers. Up to 15 mm long. Feeds mainly on pollen and nectar.

**DAMAGE**
Although larvae are potentially beneficial, the adult beetles can create significant contamination problems in leafy crops such as parsley and celery.

**MOST COMMON**
Summer and early autumn in south-eastern Australia. Large swarms can form, possibly to mate. Little is known about this insect.
Redlegged earth mite
*Halodytus destructor*

**DESCRIPTION**

**Nymph:** Reddish pink with six legs, 0.2 mm long, darkens as it matures.

**Adult:** Completely bluish-black body with bright red legs. Generally feeds in groups of up to 30.

**DAMAGE**

Lacerates plant leaves to release sap, resulting in large, whitish patches on leaves.

Mainly feeds in the morning or in overcast conditions. If disturbed, mites will drop to the ground and hide.

**MOST COMMON**

Cool, wet weather, generally autumn to early summer in southern parts of Australia. Spends most of the time in the soil.

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Rutherglen bug
*Nysius vinitor*

**DESCRIPTION**

**Nymph:** Reddish brown and pear-shaped with developing wing buds.

**Adult:** Slender, dark grey bugs about 5 mm long with transparent wings and black eyes.

**DAMAGE**

Not usually a significant pest although it can cause some feeding damage through sap sucking leaves. Can be a contamination issue for leafy crops such as celery or parsley.

**MOST COMMON**

Multiplies during spring in weed species. Usually moves into vegetable crops during summer when other hosts are unavailable.
**INSECTS**

**DESCRIPTION**

Identification of the many different species of thrips is difficult due to their tiny size — significant magnification is required.

**Nymph:** Cream to yellowish, wingless, generally <1 mm long.

**Adult:** Light to dark brown with thin bodies approx 1–2 mm long. Narrow transparent wings held along their backs.

**DAMAGE**

Onion, tomato and Western Flower Thrips (WFT) can transmit Tomato Spotted Wilt Virus (TSWV) in the crop. Plague thrips are the most commonly found species in celery, but these insects do not carry TSWV and usually cause only minor feeding damage. Generally a minor pest in apiaceous crops.

**MOST COMMON**

Onion thrips are most common in early summer, WFT and tomato thrips most common in mid–late summer. Thrips tend to hide in the centre of the plant, particularly around the new shoots and the inner petioles.

**Vegetable weevil**

**Listroderes difficilis**

**DESCRIPTION**

**Larvae:** Up to 12 mm long, cream to greenish grub with brownish orange head. Pupates in the soil in early spring.

**Adult:** Mottled brown beetle about 8 mm long with pale V-shaped mark on its back and a prominent snout.

**DAMAGE**

Usually nocturnal, the larvae cause the most damage. They feed on carrot roots, making small, irregular holes mainly in the upper parts. Both adults and larvae make distinctive round chewing holes in the leaves of many crops. While damage is usually superficial it affects saleability and can kill seedlings.

**MOST COMMON**

Larvae are mainly present during autumn and winter, emerging as adults in spring. Adults are generally inactive in the soil during summer.

**Vegetable weevil larvae** (A Prather) and **adult weevil** (JD Hopkins)
Wireworms — false, true

_Gonocephalum_ spp., Family _Elateridae_

**DESCRIPTION**

**Larvae:** False wireworm larvae are smooth, golden to brown and up to 30 mm long with a round head and dark mouthparts. True wireworm larvae are creamy to light brown with a darker, reddish head and tail. They are softer bodied than false wireworms and the tail is usually forked with a serrated edge.

**Adult:** False wireworms mature into ‘darkling’ beetles. These dark, oval-shaped beetles have a thorax with flanged edges (like a pie dish). Adult true wireworms are known as ‘click beetles’ because they can right themselves with a ‘click’ if placed upside down.

**DAMAGE**

Larvae live in the soil where they feed on young plant roots. They can tunnel into carrot roots, forming cavities and providing entry points for disease.

**MOST COMMON**

Most likely to be a problem when crop is in a field formerly planted with pasture or mulches.

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False wireworm larvae with damage to a carrot root (D Young WSU) and in closeup (L DuToit WSU)

Click beetle, the adult form of the true wireworm
Diseases
**Alternaria leaf blight**
*Alternaria spp.*

**CROPS AFFECTED**
Carrots

**SYMPTOMS**
Small, dark grey to black spots initially develop on the older leaves. These are irregularly shaped and have distinct yellow halos. As the disease develops the spots grow and combine, resulting in the whole leaf yellowing and collapsing. Lesions also develop on petioles, resulting in death of the leaf and breakage during harvest.

**FAVOURED BY**
Rainy weather and/or overhead irrigation especially during autumn and winter. Although the optimum temperature for development is around 28°C, infection can occur over a wide temperature range (approx 13–35°C). The disease is usually seed-borne and spread in water. Although the fungus can survive on carrot debris in the soil, it dies once this decomposes.

**Bacterial leaf blight**
*Xanthomonas hortorum pv. carotae*

**CROPS AFFECTED**
Carrots

**SYMPTOMS**
Small, yellow, angular spots that rapidly enlarge and turn brown. Spots are initially at the leaf margins, particularly at the junctions of the lobes of individual leaflets. As they spread, leaves become chlorotic, twisted and distorted. Disease can spread into the petioles, which become shrivelled and brown.

**FAVOURED BY**
Warm (25–30°C), wet weather, especially if overhead irrigation is used extensively.

The bacterium is seed borne, but spreads through irrigation water and runoff as well as carried on machinery and by insects. The bacterium can survive in the soil on crop residues, but has a limited host range so crop rotation is an important control strategy.

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*Alternaria leaf blight on carrot leaves (DB Langston Uni Georgia Bugwood.org); Effects of Alternaria leaf blight on a carrot crop (RM Davis UC IPM)*

*Bacterial leaf blight symptoms (L DuToit WSU)*
Bacterial leaf spot
*Pseudomonas syringae pv. apii*

**CROPS AFFECTED**
Celery, parsley

**SYMPTOMS**
Initially appears as bright yellow spots, which turn brown in the centre as the disease progresses. Spots are usually roughly circular, surrounded by a yellow halo. Leaves may die and saleability is reduced.

**FAVOURED BY**
Damp, humid conditions, such as in a dense crop canopy. Leaves remaining wet for at least 7 hours over several days will increase infection. The bacterium is seed borne, but spreads through irrigation water and runoff.

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Bacterial soft rot
*Erwinia spp., Pectobacterium spp.*

**CROPS AFFECTED**
All

**SYMPTOMS**
Water-soaked lesions can appear on stems, leaves or roots. As these enlarge the tissues collapse into a slimy mess, often with an unpleasant smell. Pre-harvest can cause plant collapse due to rotting of the crown or roots. Parsley plants can suffer complete collapse and distinct white bleaching of leaves. Bacterial soft rots are also important postharvest, especially affecting carrots and celery.

**FAVOURED BY**
Warm, wet conditions, particularly if combined with high levels of nitrogen. A common secondary infection following physical damage or injury.

---

Moderate and severe symptoms of bacterial leaf spot (L. Tesoriero NSW DPI)

Symptoms of bacterial soft rot on carrots in the field (B-Ming Wu Oregon State University); Symptoms of bacterial soft rot on celery in the field
Black canker / Itersonilia canker

*Itersonilia perplexans, Cylindrocarpon spp., Mycocentrospora acerina*

**CROPS AFFECTED**
Parsnips

**SYMPTOMS**
Dark reddish brown to black cankers develop on the parsnip roots, particularly around the crown. These are initially superficial but extend into the inner tissues as the disease progresses. Small (1–2 mm diameter) yellow spots appear on leaves. These spread and turn brown as they age.

**FAVOURED BY**
Superficial root damage—particularly damage by root rot fungi such as Pythium—predispose parsnips to this disease. Symptoms are often the result of infection by a complex of fungal pathogens, many of which can survive in the soil and on crop residues. Can also be seed borne or the result of infection by air borne spores washed into the crown. The *Itersonilia* fungus is favoured by temperatures around 20°C.

Black root rot

*Thielaviopsis basicola, Chalaropsis thielavioides*

**CROPS AFFECTED**
Carrots and parsley

**SYMPTOMS**
Dark grey to black fungal growth develops on the surface of the carrot crown, particularly around remnant leaf bases. Blackened areas with diffuse margins develop on roots.

**FAVOURED BY**
Predominantly a postharvest problem that occurs when washed carrots are not properly dried and cooled below 5°C before packing. Spores are often present in the soil and can grow rapidly in the injuries produced by harvest and packing processes.
Carrot black rot  
*Alternaria radicina*

**CROPS AFFECTED**
Carrots

**SYMPTOMS**
Dark brown to black, irregularly shaped lesions occur on leaves, similar to *Alternaria* leaf blight. Black rot can result in poor establishment or death of seedlings, similar to damping off. In mature plants infection often occurs through the older leaves, resulting in a black, decayed ring at the junction of leaves and root. This area has a distinct margin, unlike black root rot.

**FAVoured BY**
Warm, humid weather. The disease is seed borne and can survive in crop residues in the soil for several seasons.

The blackened area at the junction of leaves and root typical of carrot black rot (R Coles PaDIL) and symptoms on the roots (L Tesoriero NSW DPI) 

Cavity spot  
*Pythium sulcatum, P. violae*

**CROPS AFFECTED**
Carrots, parsnips

**SYMPTOMS**
Small, oval, sunken spots develop on the surface of roots. The carrot skin may disintegrate, revealing a sunken cavity in the underlying tissue. Carrots are likely to fork or branch if the centre of the taproot is infected early in development. Even moderate infection makes carrots unmarketable.

**FAVoured BY**
A common problem in many areas, particularly where carrots are rarely rotated with other crops and/or crops develop during late summer to autumn. Also associated with acid soils and poor drainage. Sunken spots usually appear when carrots are within one month of harvest, and increase fastest on overmature roots.

Cavity spot lesions (L DuToit WSU)
Cercospora leaf spot
*Cercospora carotae*

**CROPS AFFECTED**
Carrots

**SYMPTOMS**
Usually occurs first at the margins of younger leaves. Small, round spots develop with pale centres and dark brown margins. Areas around the spots become yellowed and leaflets curl. Infected petioles turn dark brown.

**FAVoured BY**
Warm conditions, with development fastest at around 28°C. Spores are mainly carried on seeds but survive in plant debris. Although superficially similar, usually not as damaging as Alternaria leaf blights.

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Crater rot
*Rhizoctonia carotae*

**CROPS AFFECTED**
Carrots

**SYMPTOMS**
Horizontal bands of dark brown canker-like lesions appear on the roots, mainly on the crown and upper parts. Pits then develop under the lesions, enlarging into sunken, brown craters. White fungal growth may be observed under high humidity.

**FAVoured BY**
Cool weather (less than 23°C) combined with high humidity.
Crown rot
*Fusarium spp., Rhizoctonia spp.*

**CROPS AFFECTED**
All

**SYMPTOMS**
Above ground, plants become yellowed, wilted and stunted. In carrots, blackened lesions initially develop at the junction between the root and the leaves. These can spread, encircling the top part of the root. This results in the leaves breaking off during lifting and harvest. In parsley and celery, soft, brown rot develops at the junction with the soil surface, roots become brown and discoloured and the root mass is severely reduced.

**FAVOURED BY**
Mild conditions (over 18°C) and wet soils. Symptoms have been associated with low soil pH, nutritional imbalances and high organic matter in soil. Crown rot is common in Tasmania, and during winter in more northern production areas.

Crown rot due to *Rhizoctonia* spp. in young (L Tesoriero NSW DPI) and mature (H Pung Peracto) carrots

Crown rot of carrots due to *Fusarium* (H Pung Peracto)

External and internal symptoms of crown rot caused by *Fusarium* spp. infection in parsley (L Tesoriero NSW DPI)
Damping off
Rhizoctonia spp. Pythium spp.

CROPS AFFECTED
All

SYMPTOMS
Pre-emergence, damping off can cause seeds to rot within the seed coat. Seedling emergence is poor and plants are stunted. Post-emergence, reddish brown lesions develop near the soil junction. Seedlings collapse and die.

FAVoured BY
Mild weather and wet conditions, especially if soil becomes waterlogged. Fungal species are present in soils, and can also cause symptoms in mature plants, such as 'collar rot' (R. solani) in parsley.

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Early blight
Cercospora apii

CROPS AFFECTED
Celery, celeriac

SYMPTOMS
Initially appears as small yellow spots on the outer leaves. These develop into irregularly shaped, orange-brown lesions that become dry and papery. Lesions may also develop on the petioles. In the later stages, fuzzy grey mould may become visible in the centres of the spots.

FAVoured BY
Warm (15–30°C) and wet conditions, such as during showery weather or with prolonged heavy dews. The fungus is seed borne but may also be carried on wind or in irrigation water.
Late blight / Septoria spot
*Septoria apicola*

**CROPS AFFECTED**
Celery, celeriac

**SYMPTOMS**
Small yellowish spots appear first on the older and lower leaves. These enlarge, turn brown, and become speckled with small black fruiting bodies. Leaves become discoloured, wither and die. Greyish spots and lesions may also develop on the petioles.

**FAVoured BY**
Leaves remaining wet for extended periods due to cool, rainy weather. Spores spread on seeds and in irrigation water, and can survive in the soil on crop residues.

Closeup of the spores (Len Tesoriero NSW DPI)

Septoria spots on celery leaves

The effects of severe late blight infection on celery petioles and crop growth
**Leaf curl / Celery anthracnose**  
*Colletotrichum acutatum, C. orbiculare*

**CROPS AFFECTED**  
Celery

**SYMPTOMS**  
Early symptoms include leaf cupping and translucent lesions on petioles. As the disease develops, leaves and petioles become distorted, curled and twisted. Leaves brown off, becoming brittle. Spots on the petioles turn brown and spread through the vascular system, producing a striped appearance.

**FAVOURED BY**  
Warm, moist conditions. Disease spreads in irrigation water.

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**Licorice rot**  
*Mycocentrospora acerina*

**CROPS AFFECTED**  
Carrots, celery, parsnips

**SYMPTOMS**  
Although infection can occur any time, symptoms mainly develop during postharvest storage. Large, water soaked lesions develop on the roots. Initially brown, these turn black as they develop, but retain a margin of water-soaked tissue.

**FAVOURED BY**  
Humid or moist conditions.
Powdery mildew
_Erysiphe heraclei_

**CROPS AFFECTED**
Carrots, parsnips and parsley can be weakly affected.

**SYMPTOMS**
Powdery white fungal growth initially appears on the oldest leaves but spreads to cover all leaf surfaces. Infected foliage becomes brittle and distorted and the petioles turn brown and die. Yield is reduced and petiole breakage affects mechanical harvesting.

**FAVoured BY**
High humidity and moderate temperatures. Spores are easily spread by wind.

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Root rot complex
_Phyllophthora spp., Pythium spp._

**CROPS AFFECTED**
All

**SYMPTOMS**
Above ground—rapidly progressing wilting, plant collapse and death. Below ground, the roots develop a brown, spongy rot. _Pythium_ particularly destroys the lateral roots, while _Phyllophthora_ infections leave the root system intact but brown.

**FAVoured BY**
Soils which are wet or waterlogged and cool, especially if below 10°C. Plants of any age can be affected. Spores are carried in irrigation water or runoff and may survive in the soil for extended periods.
Septoria leaf spot
*Septoria petroselini*

**CROPS AFFECTED**
Parsley

**SYMPTOMS**
Small, tan leaf spots develop with a pronounced dark red-brown margin. Black spores develop inside the lesions, which enlarge and become papery. Foliage yellows and can die.

**FAVOURED BY**
Mild temperatures (20–25° C) combined with high humidity and foliage remaining wet for several hours.

Symptoms on celery petioles (ST Koike UC Ext) and dill (L Tesoriero NSW DPI)

Virus — Apium virus Y

**CROPS AFFECTED**
Celery, parsley

**SYMPTOMS**
Older leaves become mottled with yellowing around the veins, brown lesions and distorted leaflets. Mosaic or mottling is fainter on the younger leaves. Some celery cultivars develop long, brown lesions on the petioles. Plants may appear stunted.

**FAVOURED BY**
Virus persists in weed species and is transmitted by aphids. Susceptibility varies greatly between cultivars.
**Virus — Carrot motley dwarf disease (red leaf)**

**CROPS AFFECTED**
All

**SYMPTOMS**
Carrot leaves become reddened, plants are stunted, and seedling roots are prone to developing rots. Mature roots are more likely to have internal browning. Parsley also becomes chlorotic; especially the outer leaves which can develop a pink tone. Although a serious disease in the past, now rarely causes commercial losses.

**FAVoured BY**
Outbreaks are most likely when carrots are cropped continuously, especially if volunteer carrot plants remain after harvest. Virus is transmitted mainly by the carrot willow aphid, which remains able to infect plants for its lifespan. Symptoms are caused by the combined effects of two viruses: Carrot redleaf virus and Carrot mottle virus.

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**Virus — Carrot virus Y (CarVY)**

**CROPS AFFECTED**
Carrots, parsnips, dill

**SYMPTOMS**
Leaves develop yellow mottled patches with browning of the leaf margins. Plants may be mildly stunted with a feathery appearance. If infection occurs within the first six weeks of growth, the mature roots tend to be short, knobbly and malformed, making them unmarketable. Symptoms are less severe if infection occurs later, but can still significantly reduce yield.

**FAVoured BY**
Outbreaks are most likely when carrots are cropped continuously, especially if volunteer carrot plants remain after harvest. The virus is spread by aphids, particularly green peach aphid. Infectivity is lost once the aphid feeds on a non-host plant.
**Virus — Mosaic**  
*Celery mosaic, alfalfa mosaic*

**CROPS AFFECTED**
All

**SYMPTOMS**
Symptoms vary but include leaf distortion, stunting, discolouration of the vascular system and development of a bright yellow mosaic pattern on the leaves. Thickening of the interveinal tissue can produce a crinkled effect.

**FAVOURED BY**
Virus persists in weed species such as sowthistle and clover. It is transmitted by aphids and through infected seeds. Outbreaks are most likely where celery is cropped continuously or plants are grown next to pastures of lucerne or clover.

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**Virus — Yellow blotch**

**CROPS AFFECTED**
Celery

**SYMPTOMS**
Veins become yellowed and yellow blotches with diffuse margins appear on the leaves. Foliage may be mildly deformed and stunted.

**FAVOURED BY**
Unknown

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Mosaic virus symptoms on celery and in the field *(L Tesoriero NSW DPI)*

Symptoms of yellow blotch on parsley leaf and on coriander in the field *(L Tesoriero NSW DPI)*
White mould
*Sclerotinia sclerotiorum*, *S. minor*, *S. rolfsii*

**CROPS AFFECTED**
All

**SYMPTOMS**
Soft, water-soaked rots develop on lower leaves and stems, initially at the soil junction but spreading into upper parts as the disease progresses. The affected areas are covered with white cottony fungal growth. In the later stages hard black resting bodies (sclerotia) form within the decayed tissue. These can be up to 10 mm across and irregularly shaped. Rots can also develop during postharvest storage.

**FAVOURED BY**
Cool (15–21°C), moist conditions, such as may occur with rain, fog or use of overhead irrigation. Sclerotium rot caused by *S. rolfsii* is favoured by warmer conditions. Storing products wet increases postharvest rots. Sclerotia can survive in the soil for many years, re-infecting other crops.
Disorders
**Black heart**

**CROPS AFFECTED**
Celery

**SYMPTOMS**
Light to dark brown and black lesions appear on the developing leaf tips inside the celery heart. Leaf tips may continue to die back as the plant grows and can develop secondary fungal infections.

**CAUSED BY**
Similar to tip burn in lettuces and other leafy vegetables, blackheart is caused by rapid growth under humid conditions. This results in calcium deficiency at the growing tips. Associated with warm conditions, uneven irrigation and high rates of fertiliser application.

![Black heart of celery](ST Koike UC Ext)

**Bolting**

**CROPS AFFECTED**
All

**SYMPTOMS**
Flowering stems start to form. This draws energy reserves away from the rest of the plant. Carrots will shrink and toughen, parsley loses flavour and celery becomes pithy and soft.

**CAUSED BY**
Cold conditions (4–13°C for more than ten days), especially if followed by warmer conditions, can cause premature bolting of plants still at seedling stage.

![Bolting parsley](Bolting parsley)

![Bolted carrot](C Allender Uni Warwick)
Iron deficiency

**CROPS AFFECTED**  
All

**SYMPTOMS**  
Young leaves are pale or yellowed with green veins.

**CAUSED BY**  
Can be caused by high soil pH (above 6.5), waterlogging or heavy fertilisation with other micronutrients which can tie up available iron in the soil.

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Nitrogen deficiency

**CROPS AFFECTED**  
All

**SYMPTOMS**  
Older leaves and petioles become yellow and die off prematurely. Plant may be generally pale with stunted growth.

**CAUSED BY**  
Insufficient fertiliser or loss from the soil. Heavy rain and irrigation leach nitrogen from the soil, especially if organic matter is low. Waterlogging can result in nitrogen loss as gas, while incorporation of woody crop residues can temporarily lock up nitrogen in the soil. Most likely late in the cropping cycle.
Waterlogging

CROPS AFFECTED
All

SYMPTOMS
Plants grow poorly, develop root diseases and eventually die.

CAUSED BY
Excess water in the root zone.

Waterlogged parsley and resulting development of root rots (L Tesoriero NSW DPI)

<table>
<thead>
<tr>
<th>CROPS AFFECTED</th>
<th>SYMPTOMS</th>
<th>CAUSED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Plants grow poorly, develop root diseases and eventually die.</td>
<td>Excess water in the root zone.</td>
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Carrots, celery and parsley problem solver

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<tr>
<th>Problem Description</th>
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