

Dry Rot and Clubroot – Identification and Treatment

Dry Rot

How serious is dry rot?

Dry rot can attack many brassicas, but it is most serious in swedes, kale and oilseed rape. Bulb lesions can cause major crop losses in swedes and complete losses of production of this crop have been experienced.

What causes dry rot?

The disease is caused by a fungus that has two spore stages and two names.

- The sexual stage is called *Leptosphaeria maculans*
- The asexual stage is called *Phoma lingam*

What are the first signs of infection?

Dry rot appears in a crop as a leaf spotting, small green-grey lesions about 3-5 mm in diameter appear on young leaves from around the 3-4 leaf stage onwards (in a swede crop this is often between Christmas and New Year). These lesions expand and become light brown to grey in the centre and darker at the margins with a yellow halo. Often the lesions become papery and crack in the middle. Within the lesions, small, pin-head sized black dots develop and they produce masses of asexual spores.

How does the infection get onto bulbs and stems?

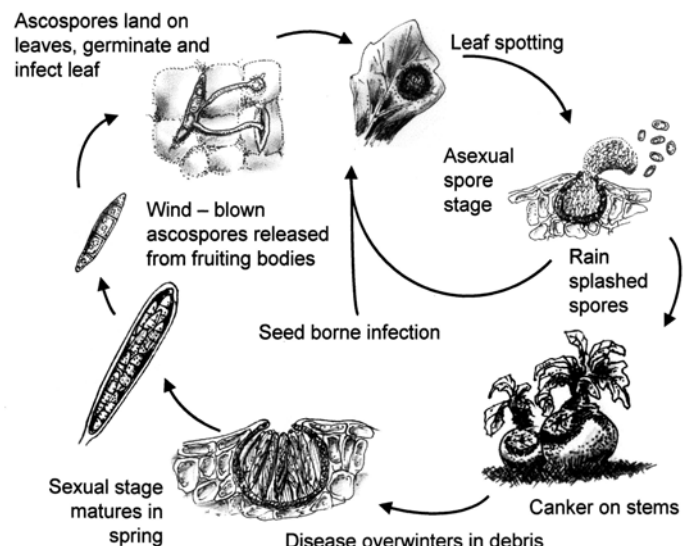
In swedes, the spores are washed by rain and heavy dew into the shoulders of the developing bulbs where they germinate and infect through growth cracks or small wounds.

How does dry rot infection get into a crop?

The primary cause of infection is by airborne sexual spores that are ejected from black fruiting bodies that develop on the trash of the previous season's infected brassica crop. This mainly occurs after rain showers throughout the spring, but in some seasons the release of spores extends into the summer.

These spores readily infect brassica plants (mainly leaves) either growing in the same paddock (second year crops) or neighbouring crops. Under certain atmospheric conditions these spores can be picked up by air currents and transported over several kilometres. Such spore showers can cause infection in crops that are isolated from other brassica crops.

Life cycle of dry rot in brassicas



How can the damage from dry rot be minimised?

- Chop and bury all crop debris as soon as possible after the crop has been utilised. Plough under trash if practical.
- If dry rot occurs in a crop, leave the paddock free of brassica for at least six years since the pathogen can remain on trash for at least 3 years.
- Control all rogue and volunteer brassica plants in crops and pasture.
- Try to separate consecutive crops on the farm by at least one paddock distance.
- Never plant two consecutive crops of swedes in the same paddock. If two brassica crops are to be sown, plant the second crop as kale (Kestrel, Regal® or Gruner).
- Sow dry rot tolerant swede cultivars like Keystone or Aparima Gold.
- Attempt to time swede planting to coincide with a reduction in spore numbers. This varies from season to season, but it is recommended that swedes are sown between 20th of November and the 20th of December.
- Ensure seed is from a reputable source and treated with a suitable seed treatment e.g. SUPERSTRIKE® or ULTRASTRIKE®.
- If early infection is noted in a seedling crop, consider treating with a suitable foliar fungicide.

Susceptibility of swede cultivars to dry rot infection in a first year situation:

Highly Susceptible	Highlander
Suceptible	Major Plus
Tolerant	Aparima Gold, Winton
Highly Tolerant	Keystone

Why is dry rot so prevalent today?

The increased use of summer forage brassicas effectively ensures brassicas are growing 12 months of the year in Otago and Southland. This provides a 'disease green bridge' and may be due to:

- Poor removal of crop residue, therefore providing the disease an easy route for re-infection.
- Not checking first year crops to see what level of infection is present.
- Growing susceptible swede crops for more than two consecutive years.
- Growing swedes with dry rot tolerance such as Keystone, Winton or Aparima Gold into infected soils or in consecutive years.

Summary – Dry Rot

Dry rot can also affect turnip, rape, cabbage and kale crops, but to a lesser extent than swede crops.

Infected seed does not cause dry rot. A trial conducted by Harvey Smith of the Plant Disease Division at the former DSIR Lincoln in 1960, showed that a level of more than 6% seed infection was required for significant initial infection. A level of only 0.24% seed infection was measured on commercial machine dressed seed, which categorically ruled out seed-borne infection as a factor in dry rot infection.

Dry rot is best controlled by destroying all brassica crop residues, preferably by adequate burial. Deep ploughing of paddocks between crops is recognised as the most effective method. This will not stop the dry rot, but will minimize the losses.

Brassica crops should not be sown in the same paddock for more than two consecutive years. In a crop rotation brassica crops should not be resown within six years.



Dry rot infected swede



Dry rot infected kale

Clubroot

What is it?

Clubroot (*Plasmodiophora brassicae*) is an infection that can occur in all brassica species and is a soil-borne fungus that can remain dormant in the soil for many years and can re-emerge only when a brassica crop is planted. This makes it extremely difficult to eradicate or prevent.

The soil-borne fungus penetrates the root hairs of the host plant and in due course stimulates the plant to develop large irregular swellings of the roots that impairs the supply of moisture to the plant. As a result, the first observable symptom of the disease is wilting of leaves, which is followed by decaying of the root swellings and plant death which releases fungal spores into the soil for future infection of brassica crops.

How to prevent infection?

To prevent or reduce the incidence of clubroot it is recommended to keep an interval of six years or greater between brassica crops.

If a second year brassica crop is being contemplated and there have been signs of either dry rot or clubroot in the first year crop, then sowing the paddock back into pasture is recommended. If a second year brassica option is needed then kale is the best option as kale is generally more tolerant to both dry rot or clubroot than other brassica options. Under extreme dry rot or clubroot pressure kale crops in the second year can still fail.

How does soil pH affect clubroot infection?

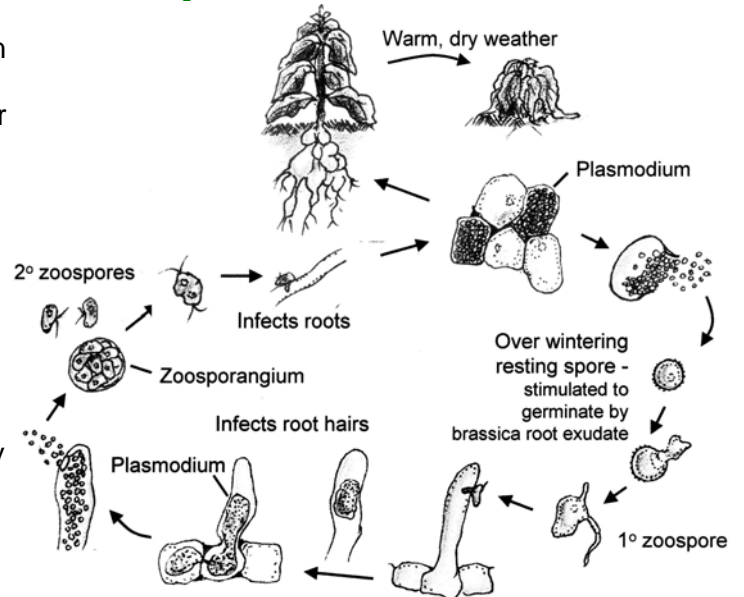
It has been shown that clubroot will infect brassica plants only if the soil in the vicinity of the host is relatively acidic. Application of lime is therefore a recognised method of prevention but it is not fully effective because of the heavy and continual application of lime needed to alter pH of the soil to the full depth to which brassica plant roots penetrate.



Clubroot infected swede plant

Photos and diagrams supplied by PLANTwise®

Life cycle of clubroot in brassicas



Disease risk assessment for brassica crops

First Year Crop	Dry Rot or Clubroot Tolerance
Swedes	Highlander and Major Plus have no dry rot or clubroot tolerance Aparima Gold and Winton have tolerance to dry rot and have clubroot tolerance. Keystone is highly tolerant to dry rot tolerance but has no clubroot tolerance
Rape	Limited dry rot and clubroot tolerance
Turnips	Limited dry rot and clubroot tolerance
Kale	Some tolerance to dry rot and club root

If there is a high risk of either dry rot or clubroot infection in the second year it is recommended to sow the paddock in either a pasture or cereal crop.