

Cereal Root and Crown Diseases:

THE BACK
POCKET GUIDE



Using this Guide



Roots should be carefully dug up, washed and examined on a light background.



This guide will help you identify the common root and crown diseases that cause damage to cereal crops across Australia. Some of the diseases can be initially identified from paddock symptoms whilst others require a more careful inspection of the roots or lower stems of infected plants. Patches, or otherwise poorly performing crops, can also be caused by other factors such as poor nutrition, soil problems, insect pests or environmental stresses that cannot be covered in this guide.



Pythium



Poor emergence & seedling death

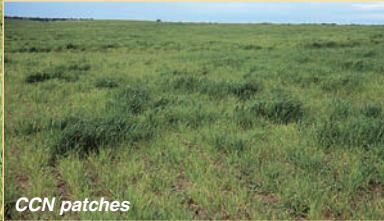
Pythium

Pythium damage is mostly observed where soil has been very wet after sowing and is usually associated with waterlogging damage. Damage from *Pythium* is also more likely to be observed when sowing occurs soon after grass herbicide applications and in direct-drilled crops. The damage may appear in patches where the soil is wetter.

Early patches in crops

Rhizoctonia, *Cereal cyst nematode (CCN)*

Rhizoctonia causes small patches that often have quite defined edges and where surviving plants within each patch are severely stunted, hence the common name 'barepatch'. Patches caused by CCN are generally larger, less distinct and plants are usually less affected but often have yellow lower leaves. With good soil nutrition, patches can partially recover later in the season. *Rhizoctonia* mostly occurs where there has been minimum soil disturbance and where grass growth before sowing has had insufficient time to rot down. CCN occurs where a series of CCN susceptible cereals have been grown frequently in rotation.



CCN patches



Rhizoctonia barepatch



Clean

Infected

Common root rot

Root lesion nematode



Poor plant vigour with later developing patches or no patches

Root lesion nematodes (Pratylenchus), common root rot

Root lesion nematodes and common root rot can cause poor plant vigour without producing distinct patches or crop symptoms. Damage is expressed as fewer tillers, smaller numbers of grain per head and/or reduced seed size. Yellowing of lower leaves is often present with root lesion nematode damage. Patching may occur with *Pratylenchus* although the time and degree of patching appears to vary with species and region. *Pratylenchus thornei* often causes patches from mid-tillering in northern NSW and Qld. In WA patches with high nematode populations have been observed from mid-tillering. Identifying the involvement of root lesion nematodes and common root rot requires careful examination of roots and sub-crown internodes. A plant or soil test is required for confirmation of high populations of nematodes.

Crown rot



Take-all



Whiteheads

Take-all, crown rot

Whiteheads occur where the head is starved of adequate moisture and nutrients. The diseases take-all and crown rot cause such extensive damage to the plant roots, crowns and lower stems that they are unable to transport these essential supplies up the plant. Take-all damage affects the whole plant and usually occurs in patches covering anything from a few plants to several metres across. Whiteheads caused by crown rot are usually confined to single tillers on plants and patches are less obvious. Whiteheads can also be caused by drought or early frosts.



Crown rot pinking on node



Crown rot



Take-all

Discoloured lower stems

Take-all, crown rot

Plants displaying whiteheads or heads lacking any grain often have stems which are darkened below the first node. Where take-all infection occurs, the lower stems and many roots will be black. Crown rot infection causes a brown discolouration of the lower stem and may also be accompanied by a pink colouration of nodes or stems under leaf sheaths. Growth of the crown rot fungus up the stem is more severe where the plant has been under moisture stress. Take-all growth is favoured by wetter conditions although whiteheads are more evident under water stress when the damaged plant is unable to transport water.



Common root rot



Take-all

Darkening of sub-crown internodes and roots

Take-all, common root rot

The sub-crown internode is the narrow portion of stem that links the old seed and primary root system to the crown and secondary root system just below the soil surface.

Take-all causes a blackening of the sub-crown internodes, primary and secondary roots. Take-all is best identified by breaking a piece of infected root and observing that the core is jet black. Common root rot specifically attacks the sub-crown internode causing it to darken brown. The fungus can also cause darkening of crowns when severe.



CCN



Cysts and knotting of roots

Cereal cyst nematode (CCN)

When cereal cyst nematodes feed on wheat and barley roots they cause the plants to produce a mass of small lateral roots at the site of feeding. This gives the appearance of root knotting 6-8 weeks after sowing. In oats, CCN feeding causes a thickening and shortening of roots rather than knotting. Eleven to thirteen weeks after sowing, infected plants have small white cysts at the knots or on the thickened roots. As plants hay off, the white cysts turn brown and become more difficult to see.



Rhizoctonia



Root lesion nematode



Pythium

Loss of lateral roots, spear tips and root browning

Root lesion nematode, Rhizoctonia, Pythium

Root lesion nematodes feed on the root tips and smaller lateral roots. Careful digging up and washing of roots usually reveals long secondary roots with few or no lateral roots branching off from them. Affected roots show brown rotted sections from 6-8 weeks after sowing. *Rhizoctonia* typically causes brown spear-tipped roots where the root has rotted through. These symptoms show from young seedlings and, when severe, there may be very little of the root system left. *Pythium* causes short stubby main roots with brown lesions near or at the root tips. *Pythium* usually occurs soon after sowing in very wet or waterlogged soils.



Stem nematode

Base rot



Other root and crown diseases

A number of other minor diseases have been observed on roots and crowns of cereal crops in Australia. Two of the more damaging are stem nematode which affects oats, canola and some pulses in southern Australia and base rot which occurs in central Queensland where it affects cereals, pulses and legume pasture species.

Stem nematode usually occurs in patches in oat crops and causes stunting of tillers and distortion of stem bases. Base rot causes death of plants at tillering or whiteheads after flowering. Stem bases and crowns are coloured brown and masses of white threads may be found around the plant at or below the soil line.

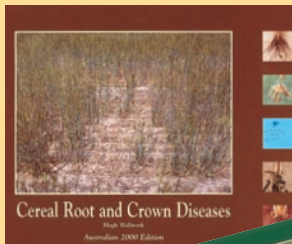


Control of root and crown diseases

The most effective form of disease control comes from the sowing of more resistant varieties. This is possible with CCN, root lesion and stem nematodes and to a lesser extent crown rot and common root rot.

Where resistance is not available, control is achieved through rotations with non-host crops, adjusting time of sowing in relation to the break of the season and weed kill, improved tillage techniques and by ensuring that adequate nutrition is available to help the plants recover.

Burning of stubbles will control crown rot but retaining stubbles for several years can lead to reductions in take-all and *Rhizoctonia* through a build up of soil micro-organisms that suppress these fungi.



This guide should be used in association with the following publications:

- **Cereal Root and Crown Diseases – 2000 edition**
– edited by Hugh Wallwork, SARDI;
- **Cereal Leaf and Stem Diseases – 2000 edition**
– edited by Hugh Wallwork, SARDI;
- **Cereal Diseases: The Ute Guide**
– edited by Hugh Wallwork, SARDI.

These publications carry more photographs for disease symptom identification as well as information and options for disease control. They are available from **'Rural Connect'** – Freecall 1800 11 00 44 or Free Fax 1800 00 99 88.

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