CROWN ROT—QUEENSLAND

Key points
- Crown rot is a fungal disease that can attack all winter cereals.
- Crown rot survives on infected stubble, from where it is passed onto the following crop.
- Effective management involves a combination of appropriate variety selection, the use of break crops and good crop management.

Background
Crown rot is a disease caused by the fungus *Fusarium pseudograminearum*, and can attack all winter cereals and many grassy weeds. The presence of the pathogen within the plant stem limits water movement, which can result in premature death of the tiller and the presence of white (dead) heads. Crown rot survives from one season to the next on infected stubble, from where it is passed onto the following crop.

The effects of crown rot on yield tend to be most severe when there are good crop conditions in the first part of the season followed by a dry finish. This is because the moist conditions at the beginning of the season enable the fungus to grow from infected stubble to an adjacent seedling, while the dry conditions during flowering and grain filling cause moisture stress, allowing rapid growth of the pathogen within the plant. A wet finish to the season can reduce the damage caused by crown rot, but will not prevent yield loss in all cases.

Symptoms and detection
The infection of plants with crown rot occurs at the base of the plant and spreads up the stem during the growing season. The onset of crown rot is often not obvious until after heading, when whiteheads appear with the onset of water stress (figure 1). Plants infected with crown rot display a number of symptoms, including:

- Brown tiller bases, often extending up 2–4 nodes. This is the most reliable indicator of crown rot, with browning often becoming more pronounced from mid to late grain filling through to harvest.
- Whitehead formation, particularly in seasons with a wet start and dry finish. These are usually scattered throughout the crop, and do not appear in distinct patches. These may first appear in wheel tracks where crop-available moisture is more limited.
- A cottony fungal growth that may be found around the inside of tillers, and a pinkish fungal growth that may form on the lower nodes, especially during moist weather.
- Pinched grain at harvest.

In addition to visual symptoms, the DNA-based soil test (PreDicta™) can be used to assess the level of crown rot in the paddock. Soil samples that include plant residues should be tested early in late summer to allow results to be returned before seeding. This test is particularly useful when sowing susceptible wheat varieties, and for assessing the risk after a non-cereal crop.

Management
The effective management of crown rot involves a combination of variety selection, rotation management, and crop management.

Variety selection
Where growers are aware their paddocks are infected with crown rot, resistant varieties can be used to limit yield losses. Figure 2 shows some of the most commonly grown wheat varieties in Queensland and their relative resistance to crown rot. The Queensland Government has been working to develop winter cereals with resistance to crown rot, and the wheat varieties Lang, Baxter and Sunco are some of the most resistant varieties commercially available (figure 2).

Growers need to be aware of the levels of crown rot disease in their paddocks, as even the most resistant crops
Crown Rot—Queensland

can suffer yield loss under high levels of the disease. At intermediate levels, the grower can make a calculated risk of returns versus yield loss by growing only resistant varieties. However, where high levels of disease are present even resistant varieties may be affected, and a break crop may be required.

Rotation Management
Because crown rot survives from one season to the next on infected stubble, the use of break crops can give stubble a chance to decompose and thus reduce soil inoculum levels. The use of break crops with dense canopies, such as canola and sorghum, can be particularly effective, as these help to maintain a moist soil surface, encouraging the breakdown of cereal residues.

The number or break crops required to sufficiently reduce crown rot levels will vary, depending on rainfall in the break year. In dry years, when residue breakdown is slower, a two-year break crop may be required to reduce crown rot to acceptable levels. In wetter seasons a one-year break may be sufficient.

It should be noted that incorporating plant residues into the soil by cultivation during the break period can increase the rate of residue decay. However, cultivation also spreads infected residue, which may increase plant infection rates in following crops—thus counteracting any benefits from increased residue breakdown.

Baling, grazing and/or burning crop residues are also not effective solutions for the removal of crown rot. The majority of the crown rot inoculum is below ground and in the bottom 7 cm of the stem. Thus the crown rot fungus can still survive in below ground tissue even if above ground material is removed.

Crop Management
Stressed plants are most susceptible to the effects of crown rot. Thus the use of management practices to optimise soil water and ensure good crop nutrition can help reduce the impacts of crown rot. Effective strategies can include:

- Reducing moisture stress in plants through good fallow management and avoiding excessively high sowing rates.
- Matching nitrogen fertiliser inputs to available soil water to avoid excessive early crop growth.
- Ensuring good crop nutrition. Zinc nutrition can be particularly important as the expression of whiteheads can be more severe in zinc-deficient crops.

Further reading and references
‘Crown rot in cereals’ (2009) factsheet, Grains Research and Development Corporation. (online)