FUSARIUM—NEW SOUTH WALES

Key points

- Fusarium species are responsible for causing two distinctly different diseases in winter cereal crops—crown rot and Fusarium head blight.
- Use non host crops (pulse, oilseeds and broad leaf pasture species) in rotation sequences to reduce inoculum levels.
- Control grass weed hosts to reduce opportunities for Fusarium to survive fallow or non host rotations.
- Sow varieties with partial resistance or improved tolerance where available.
- All durum wheat varieties are very susceptible to both Fusarium diseases.

Background

There are two types of fusarium disease that affect NSW crops, Fusarium head blight (FHB) and crown rot (CR). Durum wheats are all highly susceptible to both diseases. FHB is usually caused by the fungus *Fusarium graminearum* but the crown rot fungus *Fusarium pseudograminearum* may cause the disease in wet years as rainsplash distributes the fungus from lower stem nodes into grain heads. Both FHB and CR become apparent after flowering, however head blight requires prolonged wet weather during flowering and grain fill whilst crown rot expresses as whiteheads following periods of moisture and/or heat stress. Crown rot can sometimes be first seen in patches or in wheel tracks, but is often not obvious until after heading. Dead heads containing shrivelled or no grain, called ‘whiteheads’ appear, although it is important to note that yield loss can occur even without the formation of whiteheads.

Pathogen survival and infection

Fusarium survives from year to year in previous season’s stubble, root residues and on host plants such as grass weeds, maize, wheat, barley, sorghum, oats and triticale. *Fusarium graminearum* spores (perithecia) are produced on host plants (especially maize), which are released in wet weather and can be carried into heads by the wind. The overriding factor assisting FHB is wet conditions during flowering and/or grain fill so overhead irrigation can favour infection.

*Fusarium pseudograminearum*, the main species that causes crown rot, survives as mycelium (‘cottony growth’) with the residues of host plants both above (stubble) and within the soil (crowns). Infection occurs in moist soil when there is physical contact between infected residue and the host plant. In no-till systems inoculum becomes concentrated in the previous winter’s cereal rows. All current barley varieties are very susceptible to CR and encourage considerable build-up of inoculum but tend to suffer lower levels of yield loss relative to wheat. Its earlier maturity limits the impact of moisture stress interactions with CR infection, which lead to the production of whiteheads.

Symptoms

**Fusarium head blight**

FHB is an infection of the head rather than root or crown as with CR. In wheat, FHB appears as premature bleaching of spikelets within a head (figure 1a). Frequently only part of the head (usually the upper half) is affected. Salmon pink to orange spore masses (sporodochia) at the bases of infected spikelets can also be apparent during prolonged warm, humid weather. Infected wheat grains have a chalky white appearance and are usually shrivelled and lightweight; they may sometimes have pink staining too (figure 2). In barley, infected spikelets have a brown or a water-soaked appearance, rather than bleaching (figure 1b). The grains have an orange or black encrustation on their surfaces rather than being chalky white.

Figure 1: (a) Durum wheat head infected with FHB. (b) Barley head infected with FHB. Photos: Steven Simpfendorfer.
Crown rot
Crown rot affects the base of the stems rather than the roots. Tiller (stem) bases are always brown. This discolouration often extends up 2–4 nodes, however there can be uninfected tillers present on diseased plants. Plants infected with crown rot are difficult to pull up with roots attached, and often break off near ground level.

Cottony fungal growth may be found inside tillers. Pinkish fungal growth may form on lower nodes especially during moist weather. Whilst infection is encouraged by moist conditions, the expression of whiteheads is exacerbated by hot/dry conditions during grain-fill, which results in pinched grain at harvest. Yield and grain quality losses from CR are most severe in seasons with a wet start and dry finish.

Control
Reducing the level of Fusarium inoculum in your paddock is the aim of most control strategies for both these diseases. Rotations and controlling grass weeds remain the key management strategies. Burning stubble does not guarantee freedom from crown rot. Burning removes only above-ground inoculum; the Fusarium fungus still survives in crown tissue within the soil.

Fusarium head blight
- Avoid sowing durum in close rotation with maize or adjacent to maize paddocks.
- Rotate to non-host pulse or oilseed crops.
- Control grass weeds in break crops and fallow.
- Sow partly resistant wheat and barley varieties in high-risk situations.
- Stagger planting within the recommended sowing window, or select varieties differing in days to maturity to minimise risk of all crops flowering during a period when weather is favourable for infection.
- Avoid high-risk rotational series when using overhead irrigation.
- Use clean seed to reduce seedling blight.
- The application of fungicide Prosaro® at early flowering can reduce infection but application timing and nozzle configuration are critical for success.

Crown rot
- Rotate with non-host crops such as field pea, faba bean, canola, mustard, chickpea, mungbean, sunflower or sorghum. AND control grass weeds in these break crops—particularly barley grass and phalaris.
- Conditions that favour faster stubble decomposition reduce the amount of Fusarium inoculum present more quickly. Use break crops with denser canopies as they can increase the breakdown of infected cereal residue. Sowing break crops on wide or skip rows reduces the breakdown of cereal residue in the inter-row area.
- Reduce moisture stress in your wheat or barley crop through fallow management, avoiding excessively high sowing rates, matching nitrogen fertiliser inputs to available soil water, and controlling in-crop weeds.
- Ensure adequate nutrition, especially with zinc.
- Use precision guidance tools to establish new wheat/barley crops in between previous cereal rows. This relies on the previous cereal rows remaining as intact as possible, any fragmentation (e.g. cultivation, mulching, grazing) redistributes inoculums to the inter-row area.
- Sow bread wheat varieties with partial resistance and/or improved tolerance to crown rot.

Further reading and references
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