Getting the most from this brochure
This brochure will help you identify the major root and crown diseases of wheat and barley in northern NSW. For each disease, the symptoms in bold type are the distinguishing symptoms; if you have the disease you will always see these symptoms. Current best management practices are given for each disease.

Remember, accurate diagnosis is the first step in disease management. A number of other problems (e.g. frost and herbicide injury) can produce symptoms that may resemble those described in this brochure.

Further, the symptoms you see in your paddock can sometimes vary from those described in this brochure. We encourage you to use this brochure in the paddock as part of a group with your local agronomist and seek further diagnosis from the authors if unsure.
Crown Rot
(Cause - Bipolaris sorokiniana)

ONSET AND DISTRIBUTION
- Usually not noticed until after heading when straw comes in contact with the ground;
- Individual plants or patches sometimes not seen in wheat traits;
- Historical data is the main area of resistance;
- Ochre-colored heads may be present;
- Discoloration is highly susceptible;
- Transplant and establishment of Crown Rot is characterised by spiral or linear root pitting, exit and encircling feeding by cysts with even in the formation of satellite roots;

SYMPTOMS
- Tiller bases always brown
- On stalks:
  - Some tillers on diseased plants may be at risk
  - Whitish formation is more severe in seasons with warm and dry soils;
  - Dark brown to black discolouration of root bases appears;
  - Individual plants or patches may be affected;
  - Some tillers on diseased plants may be affected;
  - Burning does not occur;

Nematodes are spread by surface water, and plants may wilt later in the season.

MANAGEMENT
- First reduce RLN numbers by growing resistant varieties.
- Grow partly resistant wheat or barley;
- Avoid sowing wheat late, as these crops tend to be more susceptible to RLN;
- Use adequate fertiliser, especially phosphorus;
- Stunted yellow plants with reduced tillers;
- appears more prevalent in paddocks that are affected;
- Dark brown to black discolouration of roots;
- Crown Rot is characterised by spiral or linear root pitting, exit and encircling feeding by cysts with even in the formation of satellite roots;
- Break crops or pasture must be grass-free;
- Can occur from tillering onwards but most
- Pinched grain at harvest.

Tiller bases and surrounding leaf sheaths may be affected;
- Indistinct dark brown areas on roots, especially if moisture permits;
- Affects wheat, chickpea, soyabeans;
- Usually in poorly defined patches.
- Severely affected plants are yellow and die back;
- Burning does not occur;
- Nematodes are spread by surface water, and plants may wilt later in the season.

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- Nematodes are spread by surface water, and plants may wilt later in the season.
**Common Root Rot**
(Cause: *Thyatira Epsilon sodicola*)

**ONSET AND DISTRIBUTION**
- Can occur from budding onwards, but most obvious after flowering.
- No distinctive early symptoms other than the crop may lack vigour.
- Several reflections on need to start managing nematodes earlier.
- Apparent more prevalent in paddocks that are less tolerant.
- When in a non-limming, yield loss occurs through a reduction in fertility planta poor root length.
- At older stages, plants usually stunted through this stage.
- Widespread through the grain body: often flowers in association with Crown Rot.

**SYMPTOMS**
- Dark brown to black discolouration of whole or part of the G1.
- Plants with stunted tillers, dark bands, may become stunted.
- Severely affected plants are stunted and have fewer tillers.
- Frocked grain or all heads.

**MANAGEMENT**
- Reduce levels of the fungus in your paddocks by rotating with crops such as field pea, faba bean, canola, mustard, chickpea, wheat, barley, oats, mungbean, sunflower or sorghum to good break crops.
- This will work only if you control or have a weed barrier bases and surplus inputs to available soil water, and excessively high sowing rates, or sorghum. This will work only if you control.
- Break crops or sorghum. This will work only if you control.
- Sow bread wheat varieties with partial resistance to Crown Rot.
- Barley, sunflower, sorghum, canola and mustards are less affected.
- Some crops may be resistant to one species but susceptible to others (e.g. canola is very resistant to Crown Rot but susceptible to others).

**ONSET**
- When detecting symptoms, it is important to determine the extent and development of Crown Rot.
- Whiteheads develop with the onset of water stress, usually after flowering.
- The extent and development of Crown Rot is influenced by the interaction between soil and conditions, especially the production of whiteheads.
- Whitehead development worse after hot dry seasons.
- More common in no-till crops.

**SYMPTOMS**
- Pink/red discolouration of stems, often extending up to 2–4 nodes.
- Roots always black.
- Plants difficult to pull up, often breaking off at ground level.
- Plants easily pulled up, roots usually rotted.
- Severely affected plants are yellow and stunt growth.
- Stunted, with decreased tillering.
- Pinched grain at harvest.
- Yield loss occurs due to the fungus in the soil.

**ONSET**
- Usually not obvious until after heading, when pinkish fungal growth may form on lower tillers on diseased plants.
- All tillers on diseased plants are affected.
- ‘Winter clean’ pasture in late winter before sowing.
- Reduce moisture stress in your paddocks by reducing inputs to available soil water, and excessively high sowing rates.
- Reduce levels of the fungus in your paddocks by reducing inputs to available soil water, and excessively high sowing rates.
- Burning removes only above-ground whiteheads.

**ONSET**
- Can occur from tillering onwards.
- More common in no-till crops.
- Some crops may be resistant to one species but susceptible to others.

**ONSET**
- Browning of stem bases, often extending up to 2–4 nodes.
- Where mixed populations of species occur, use of crops resistant to only one species may negate the benefits of crop rotation.
- Weeds often invade Take-all patches.

**ONSET**
- Typically more severe in seasons with denser canopies and increased breaking of cereal residue in the paddock.
- Whiteheads in a crop affected by Take-all. (Percy Wong)

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**CROWN ROT** (Cause - *Rhizoctonia solani*

*SYMPTOMS ONSET AND DISTRIBUTION* (Cause - *Bipolaris* species)

- **Symptoms**
  - Whiteheads appear on wide or skip rows.
  - Pink/red discolouration of stem bases.
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- **ONSET AND DISTRIBUTION**
  - Crown Rot of stem bases will reduce the production of whiteheads.
  - Pink/red discolouration of stem bases.

- **MANAGEMENT**
  - Reduce levels of the Take-all fungus in your paddocks by rotating with crops such as field pea, faba bean, lupin, lentil, mungbeans and black gram.
  - Use of crop rotation and seed treatment with the fungicide flutriafol can provide suppression.
  - Where more than one species of RLN occurs, use of crop rotation with only one species may allow the other species to increase.

**ROOT LESION NEMATODE (RLN)**

- **Symptoms**
  - Rotted roots, blackened stems; stem and crown rotting.
  - Blackened stems; stem and crown rotting.

- **MANAGEMENT**
  - Frequent use of whitehead- and RLN-resistant wheat cultivars because these yield well in spite of being more susceptible.
  - Avoid flowering wheat stalks; stalks can be encouraged to become senescent or wither than earlier season crops.
  - RLN is a small (0.5 – 1.0 mm long) worm inhabiting the root system of the host plant; RLN (stained red) in a wheat root, as seen under the microscope.

**COMMON ROOT ROT**

- **Symptoms**
  - Black roots are a distinguishing feature of Common Root Rot.
  - Common Root Rot causes darkening of the SCI and decreases yield and root depth.

- **MANAGEMENT**
  - Increase the breakdown of grass weeds in these break crops – particularly sorghum. This will work only if you control weeds in the season where they are most susceptible, such as field pea, faba bean, lupin, lentil, mungbeans and black gram.
  - Use a limiter orromo to prevent introducing RLN to your paddocks.
  - Staining RLN in a wheat root, as seen under the microscope. RLN (stained red) in a wheat root, as seen under the microscope.
Usually not obvious until after heading, when Resistant crops reduce nematode Individual plants or patches; sometimes first can occur from tillering onwards but most first reduce RLN numbers by growing resistant plants difficult to pull up, often breaking off. Common Root Rot causes darkening of the SCI and Sow bread wheat varieties with partial Reduce levels of the fungus in your paddocks by Indistinct dark brown areas on roots, especially in a no-till system. Uneven patches or waviness across the Tiller bases and surrounding leaf sheafs may Avoid sowing wheat late, as these crops tend Dark brown to black discolouration of Severely affected plants are stunted and Whitehead formation is most severe in seasons Ensure adequate Break crops or pasture must be grass-free. Burning stubble does not guarantee freedom Can occur from tillering onwards. Some crops may be resistant to one species Barley, sunflower, sorghum, canola and Reduce moisture stress in your (Cause - The fungus Fusarium pseudograminearum) Crow Rot Browning with a wet start and dry finish. or sorghum. This will work only if you control nodes especially during moist weather. plant water potential, soil N and inoculum loading. (e.g. cultivation, mulching, grazing) redistributes as intact as possible, because any fragmentation establishes new wheat or barley crops in between the soil. Darkened SCI is a distinctive symptom of Common susceptible to canola is less affected. mustard are less affected. paddocks browning of the roots; healthy plant on right. (Lester Burgess) Brown discolouration of stem bases; normal plant on (centre), compared with tolerant varieties each side. Mungbean, sorghum or sunflower. The darkened SCI is a distinctive symptom of Common usually after flowering. Nutrition especially especially in a wet season, also a Amylase is a key factor in breaking down the rice starch; normal plant on right. (Lester Burgess) Often seen in poor soil and rain patches. Generally more severe on wheat than on other grass hosts. SYMPTOMS (Cause - The fungus Gaeumannomyces graminis var. tritici) TAKE-ALL Management Reduce the level of Take-all fungi in your paddocks byrotational with contrasting cereals such as field peas, faba bean, canola, mustard, desembling any crop that favours the disease, and provide one year of grass weeds. Wheat roots are a source of amylopectin, Take-all prefers. (Kevin Moore)
ONSET AND DISTRIBUTION

- Causes head blight in wheat and barley, causing losses in yield and quality.
- Usually observed in wet weather conditions during heading and grain fill.
- Overhead fungicides can control the infection.
- In susceptible varieties, the fungus can build-up in the field.

SYMPTOMS

- In wheat, symptoms are characterized by streaky blighting of individual panicles or spikelets on the head, leading to bleaching of the upper leaf sheaths of infected wheat.
- During prolonged rain, fungal growth occurs, which may result in a chalky appearance on the head, giving a chalky whitish effect.
- Infected wheat grains have a chalky white appearance, and ears of infected wheat may also have a light orange to brown discoloration.
- Infected ears have a chalky white appearance rather than bleaching.
- Infected barley heads have an orange or black discoloration on the surfaces rather than being chalky white.

APPLICATIONS

- Application of fungicides (e.g., mancozeb or mancozeb + thiram) can reduce infection and improve yields.
- For increased control, fungicides (e.g., mancozeb + thiram) can be applied at the heading stage and again at the dough stage.
- Avoid high-risk rotational situations when using fungicides.
- Use clean seed or re-infected seed with mancozeb + thiram to prevent seed-borne infection

REFERENCES

Is my crop diseased?

- Inspect your crop regularly – is it healthy or diseased?
- Diseases can produce symptoms even years, after heading, all season.
- Cereal Heads (C.H.): Typically spindly, overtopped, or yellowing leaves.
- Are there plants or clusters that are generally less vigorous?
- Are there dead, discoloration, or dead plants?
- Are the crop growing generally more slowly?
- Are there obvious signs of insect or mite damage?
- Any evidence of flocks of birds?
- What is the temperature like – cool and wet?
- What damage has it not done (or not done yet)?
- What is the natural density of this crop?
- How should I compare with other crops?

Reducing losses from disease

These management practices are for all the diseases covered in this brochure:

- Don’t grow wheat or barley after wheat, barley.
- Cultivate weeds in crops and in fallow – some herbicides and all crops with your crop for water and nutrients.
- Compost-seed mixtures – change of the disease is necessary.
- Plant to provide adequate nutrition – well.
- Follow crop or cycle below with disease; source where available: must be suitable to the soil and irrigation care plant.

Identifying

- Does the plant or leaf move or do they break off on own?
- Dry or wilted plants, make rust in water and shatter readily to go to seed.
- Leaves with clean cut edges in the leaves.
- Leaves with a mixed texture of yellow and green.

Plant terminology

- Wheat: Triticum
- Crop: Grain
- Secondary roots: Sub crop
- Intermediate: Stem
-发送短信
- Primary root

Acknowledgments


Further Information

For advice, contact your local NSW DPI District office, the NSW DPI website, www.dpi.nsw.gov.au (02 6763 1100). Tel: 02 6763 1100


Winter Crop Variety Sowing Guide

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Cereal Cyst Nematode (CCN)  
(Cause - *Heterodera avenae*)

**ONSET AND DISTRIBUTION**
- Rainy weather early in the season.
- Usually seen early in the season.
- Immobile parasites in crop that persist throughout the season.
- Can occur on heavy and light soils.
- Optimum season for cysts to be present is from June to September.
- Symptoms:
  - Roots are always infected.
  - Soil adheres root hairs and is off a soft white waxy film.
  - Roots are shrivelled and yellow, become dark brown and collapse.
  - Plants appear to grow up, stunted with a ball of soil attached to them.
  - Roots are asymmetrical and may be shrivelled, split, deformed, cysts are 3-5 mm in diameter usually in the roots, these cysts eventually turn brown.

Rhizoctonia Bare Patch
(Cause - *Rhizoctonia solani*)

**ONSET AND DISTRIBUTION**
- Usually seen early in the season.
- Wilted areas where seedlings or cereals have been cut.
- Usually seen in light soils.

**SYMPTOMS**
- Well defned patches to crop up to several metres across that persists throughout the season.
- Seedlings are dark red colour, and those affected are stunted with curled leaflets.
- All affected plants are very stunted and have reduced tillers and stems lowest that are often reddish/purplish.
- All affected plants either die or remain stunted with reduced tillers and appear nutrient deficient.

**MANAGEMENT**
- Soil disturbance to 0–15 cm below seeding depth at 3/h and 2 weeks after sowing.
- Best results are obtained when the parasite is not present in the seed.
- Take care in using group 9 and 14 chemicals especially on alkaline soils.
- Optimise crop nutrition through application of fertilizers.

[Image: Cereal Cyst Nematode (CCN) and Rhizoctonia Bare Patch]