

STEM RUST OF WHEAT

FACT SHEET

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Seasonal conditions drive outbreaks

Resistant wheat varieties have reduced the incidence of stem rust outbreaks but ongoing vigilance is needed to prevent the pathogen mutating to overcome this resistance.



PHOTO: BRAD COLLIS



Stem rust is characterised by reddish-brown, powdery, oblong pustules that can affect all plant parts.

KEY POINTS

- Seasonal conditions are the key factors driving outbreaks of stem rust.
- Growing resistant wheat varieties reduces the risk of yield loss and build-up of stem rust inoculum.
- To reduce the rust inoculum carried between seasons it is important to control the green bridge.

Background

When conditions favour a stem rust epidemic, it can be a very damaging disease that can cause complete crop loss in susceptible wheat varieties. The introduction of resistant varieties and a greater range of effective foliar fungicides have helped to reduce the impact of stem rust in recent years. Outbreaks have been confined to a few localised occurrences. However, the combination of a wet spring, susceptible varieties and inoculum build-up on volunteer cereals can result in an outbreak.

What to look for

Stem rust is caused by the fungus *Puccinia graminis*. It is characterised by reddish-brown, powdery, oblong pustules that can affect all parts of the plant. The pustules have a characteristic torn margin and can occur on both sides of the leaves, on the stems and the glumes. Stem rust spores are much darker in colour than leaf rust spores. As the wheat plant matures, the pustules produce black spores known as teliospores. These occur mainly on the leaf sheaths and stem. Rust spores are wind-blown and can

be spread over large areas in a short time. Stem rust usually becomes evident later in the season than stripe rust; warmer weather accelerates the spread of the disease.

Conditions that favour stem rust

Stem rust can occur in all grain growing regions where susceptible varieties are grown. However, there are several key factors that will increase the likelihood of a stem rust epidemic.

The amount of stem rust present in the previous season

The more stem rust in a given year, the greater the likelihood of carryover into the next season. This risk occurs where there are local outbreaks of stem rust and with outbreaks in neighbouring districts, because stem rust inoculum can quickly spread long distances on the wind.

Summer and autumn rains

Summer rain will allow volunteer cereal hosts to flourish, creating a green bridge to carry the rust from one season to the next. Autumn rains will support the early build-up of rust on volunteer cereals.

The risk increases with the severity of the outbreak in the previous season. Outbreaks will have been more severe where susceptible wheat varieties were grown, with a greater number of susceptible volunteers present in the green bridge.

The widespread planting of susceptible varieties in the current growing season

Table 1 provides a list of the most susceptible wheat varieties, compiled from the various state cereal variety guides.

Favourable weather conditions during the current growing season

Seasonal conditions that favour the outbreak of stem rust include spring rain and warm, humid weather.

The combination of a wet spring, susceptible varieties and inoculum build up on volunteer cereals is likely to result in an outbreak.

Infection generally occurs when temperatures are in the 15°C to 30°C range. However, infections in South Australia in 2010 indicate that susceptible varieties may become infected at lower temperatures.

Pre-season management of stem rust

Stem rust can be managed using an integrated approach. This includes reducing the amount of inoculum in a district by managing the green bridge, avoiding susceptible cultivars and closely monitoring crops with a view to fungicide applications.

Green bridge

Rust can only survive from one season to the next on living plant material (mainly self-sown cereals). It does not survive on stubble, seed or soil. The most important hosts are susceptible wheat, but it can also survive on barley, triticale and some grasses.

Removing the green bridge, including volunteer cereals, is essential to

Table 1 Commonly grown wheat varieties most susceptible to stem rust

Susceptible – very susceptible (S-VS)	Arrino, Preston, Westonia
Susceptible (S)	Amarok, Beaufort [Ⓛ] , Binnu [Ⓛ] , Bowie, Calingiri, Mansfield [Ⓛ] , Pugsley [Ⓛ] , Rudd [Ⓛ] , Yitpi [Ⓛ]
Moderately susceptible – susceptible (MS-S)	Bumper [Ⓛ] , Hornet [Ⓛ] , Marombi [Ⓛ] , Tammarin Rock [Ⓛ] , Wyalkatchem [Ⓛ]
Moderately susceptible (MS)	AGT Katana [Ⓛ] , AGT Scythe [Ⓛ] , Axe [Ⓛ] , Bowerbird, Brennan [Ⓛ] , EGA Bonnie Rock [Ⓛ] , Fortune [Ⓛ] , Frame, H45 [Ⓛ] , King Rock [Ⓛ] , Waagan

SOURCE: AUSTRALIAN CEREAL RUST CONTROL PROGRAM



PHOTOS: HUGH WALLWORK

Stem rust (left) occurs on both sides of the leaf, while leaf rust spores (right) rarely appear on the back of the leaf. This is a helpful method of distinguishing the two fungal diseases.



Self-sown (volunteer) cereals during the non-cropping phase form a green bridge between cropping cycles that allows rust pathogens to survive from one season to the next. Wherever possible these plants should be destroyed to minimise rust survival.

In-crop management of stem rust

Monitoring

- Volunteer plants should be monitored during summer and particularly before sowing.
- Crops of susceptible varieties should be inspected every seven to 10 days in seasons when stem rust has been detected in a region and more frequently from flag leaf emergence to when grain is at the early dough stage.
- Carefully inspect different plant parts, including the lower stems, for symptoms of stem rust.
- Inspect different areas of a paddock including where crops are thicker.

Fungicide treatments

The effects of stem rust can be minimised with the timely application of foliar fungicides.

Research carried out in Australia in 2010, and facilitated by the Foundation for Arable Research (New Zealand) and others, indicates that the earlier fungicide is applied the more effective it is in controlling stem rust.

In susceptible wheat cultivars fungicides need to be applied as early as possible in the development of the disease and preferably as a preventive treatment, to avoid potential yield losses and restrict the spread of the disease.

To be effective, fungicides should also be applied at the highest registered rate. If the stem rust outbreak occurs late in the season (for example, after mid-dough) and the level of infection

reduce the amount of inoculum present that could infect the following crop. Stem rust epidemics have been worse in years where wet summers/autumns favoured volunteer cereal growth. Rust spores are wind-blown and can be spread over large areas in a short time.

Variety selection

Sowing resistant varieties provides the best protection against stem rust. Varietal resistance to stem rust pathotypes has remained stable during the past five years. Some of the most commonly grown susceptible wheat cultivars are detailed in Table 1. Please note, this is not a comprehensive list.

Stem rust occasionally produces new pathotypes (races) that are capable of attacking resistant varieties. The risk of a new pathotype developing increases the more often outbreaks occur. New pathotypes occur when a chance mutation occurs in this asexually reproducing fungus.

Using resistant varieties minimises the amount of rust in a district and reduces the chance of new pathotypes occurring. It is important that growers are aware of a variety's resistance reaction to stem rust.

Consult a current wheat variety guide when selecting cultivars for stem rust management to check the susceptibility rating. As new rust pathotypes can develop, the rust reaction or cultivars can change with

time and older disease guides may no longer be relevant.

Yield loss

Potential yield loss depends on the resistance rating and how early the disease starts in the crop. Stem rust is most severe in susceptible varieties when it begins to develop in the crop before flowering. Yield loss from later infections are possible, but not as severe.

Table 2 provides an indication of varietal resistance ratings and potential crop yield loss from stem rust in seasons with conducive conditions. In addition to yield loss, the grain quality (for example, grain size) may also decline.

Table 2 Wheat variety resistance ratings and potential per cent yield loss due to stem rust in conducive seasons

Resistance rating	Definition	Potential yield loss %
Resistant (R)	Highly effective resistance; no or slight losses	0
Moderately resistant (MR)	Some disease may be observed under high pressure	0-5
Moderately susceptible (MS)	Moderate disease levels with damaging losses under high pressure	0-15
Susceptible (S)	Severe disease under favourable conditions	0-30
Very susceptible (VS)	Disease may be damaging under less favourable conditions and complete losses may occur under ideal conditions	0-100

SOURCE: SARDI

is low there will be little impact on yield and no economic benefit from fungicide treatments.

Choice of fungicide

There are a number of active ingredients (available in a range of products) registered for the control of stem rust.

These include tebuconazole (eg. Folicur®), propiconazole (eg. Tilt®, Bumper®), plus combinations such as cyproconazole/propiconazole (eg. Tilt® Extra), prothioconazole/tebuconazole (Prosaro®) and epoxiconazole/pyraclostrobin (Opera®).

There are a number of additional fungicides which have efficacy on stem rust; the registration of these products for use is being pursued by GRDC. It is always important to read the chemical label before use. In particular, check that the product is registered for use in your state and use the maximum recommended label rate for stem rust control in wheat.

As sprays for stem rust may be applied late in the season, it is extremely important to know the harvest withholding period for the chemicals, which can vary from four to six weeks.

Rust identification services

Plant samples infected with rust can be mailed in paper envelopes (do not use plastic wrapping), to:

- Australian Cereal Rust Survey
Plant Breeding Institute
Private Bag 4011
Narellan NSW 2567

Samples should be accompanied by location and your contact details.

Frequently asked questions

What are the most effective ways to reduce the risk of a stem rust infection on my property?

Growing resistant wheat cultivars has proven to be the most effective way to prevent the spread of stem rust infections and to reduce the risk of damage in years when an outbreak does occur. Removing the green bridge, including volunteer cereals, is essential to reduce the amount of inoculum present that could infect the following crop.

I have identified stem rust in my wheat crop. Now what do I do?

Once stem rust has been positively identified growers will need to evaluate:

- the potential yield of the infected crop (and any nearby crops);
- likely impact of infection on yields against the cost of applying fungicides;
- their potential to control the infection on a crop-by-crop basis.

Where the evaluation indicates a positive economic benefit the selected fungicide should be applied at the maximum registered label rate as soon as possible.

Can I prevent stem rust spreading between paddocks, or from neighbouring crops?

Once a stem rust outbreak has occurred the wind will quickly spread the rust spores. Standard biosecurity measures, such as washing down equipment and eliminating potential sources of infection, are unlikely to stop nearby crops becoming infected. Fungicide treatments may reduce the severity of infection in a crop and the spread of rust to nearby wheat crops. Growers should evaluate the potential yield and likely impact of infection on yields against the cost of applying fungicides and their potential to control the infection on a crop-by-crop basis.

Useful resources:

- **GRDC rust links** www.grdc.com.au/rustlinks
- **Rust bust** www.rustbust.com.au
- **Australian Cereal Rust Control Program** http://sydney.edu.au/agriculture/plant_breeding_institute/cereal_rust/reports_forms.shtml
- **National Variety Trials** www.nvtonline.com.au
- **Farmnote No 73/2004 (reviewed 2006)** www.agric.wa.gov.au
- **Victorian Department of Primary Industries Information Note Series** www.dpi.vic.gov.au/graindiseases
- **Various state cereal variety growing guides, available from the GRDC website** www.grdc.com.au/director/events/grdcpublications/sowingguides
- **Cereal Leaf and Stem Diseases** [Ground Cover Direct 1800 11 00 44, www.grdc.com.au/bookshop](http://www.grdc.com.au/bookshop)
- **Australian Pesticides & Veterinary Medicines Authority Public Chemical Registration Information System** <http://services.apvma.gov.au/PubcrisWebClient/welcome.do>
- **GRDC Update papers southern 2011 – Stem Rust Control in Wheat – 2010 Trials Review** www.grdc.com.au/updates

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