



Department of
Primary Industries and
Regional Development

Digital Library

Biosecurity factsheets


Biosecurity

9-2024

Stem rust and its management in wheat

Department of Primary Industries and Regional Development, Western Australia

Follow this and additional works at: https://library.dpird.wa.gov.au/bs_factsheets

 Part of the [Agribusiness Commons](#), [Agricultural Economics Commons](#), [Agricultural Education Commons](#), [Agricultural Science Commons](#), [Agronomy and Crop Sciences Commons](#), [Biosecurity Commons](#), [Fungi Commons](#), [Plant Biology Commons](#), and the [Plant Pathology Commons](#)

This factsheet is brought to you for free and open access by the Biosecurity at Digital Library. It has been accepted for inclusion in Biosecurity factsheets by an authorized administrator of Digital Library. For more information, please contact library@dpird.wa.gov.au.

Stem rust and its management in wheat

DPIRD-26

Stem rust (*Puccinia graminis* f. sp. *tritici*) is a foliar disease that can significantly reduce wheat yields if it occurs in early spring and is not controlled. Risk factors, management strategies (including variety choices and foliar fungicides), and yield loss from different varieties are discussed here.

In Western Australia, stem rust typically causes losses of 10 to 50% in wheat, but this can increase to 90% when it occurs in early spring and is not controlled.

Stem rust affects wheat and triticale, but barley can also be a host during summer months. Stem rust produces large, reddish-brown spore masses on both sides of the leaf, on leaf sheaths, stems, and outside of heads. The pustules have tattered edges.

Stem rust requires living plants on which to grow and reproduce. To infect crops during the season, it must survive summer by infecting volunteer cereals or grass hosts, known as the 'green bridge'.

Other rusts that infect wheat in WA are stripe rust and leaf rust, but these do not occur on stems. For more information on these rusts, see the page, [Managing stripe rust and leaf rust in wheat in Western Australia](#).

Risk factors

While variety resistance will influence individual crop risk, the overall risk of serious rust outbreaks is influenced by several factors that include:

- the amount of stem rust present in the previous season – more stem rust in a year means there is more chance of carry over to the next season. See the online tool, [PestFacts WA Map](#), at dpiird.wa.gov.au for current stem rust reports.
- summer and autumn rains – summer rains permit the development of volunteer hosts (green bridge), and autumn rains permit the early build-up of rust on these volunteers. Stem rust primarily infects wheat and triticale but can infect barley and some grasses, including barley grasses and common wheat grass.
- spring rains and humid, warm conditions – if all the other factors occur and early rust breaks out in crops, a stem rust epidemic is more likely if the spring is suitably wet. Stem rust prefers temperatures of 15-30°C and humid conditions.
- keep up to date with stem rust finds across the wheatbelt by subscribing to [PestFacts WA newsletter](#) on the [About PestFacts WA page](#) at dpiird.wa.gov.au or email the [PestFacts WA editor](#).
- wind can spread spores' large distances, so any disease outbreak in a season poses a risk.



Image 1: Stem rust appears as red-brown pustules on wheat stems and both sides of leaves

Yield losses

Yield loss will depend on the disease resistance of the variety and how early the disease starts in the crop (Table 1). Quality reductions, such as increased screenings and lower hectolitre weights, can add to high yield loss impacts.

Table 1 Wheat variety resistance ratings and potential maximum yield loss due to stem rust

Resistance rating	Definition	Potential yield loss (%)
Very susceptible (VS)	Early high disease build-up; can promote epidemic development	50 to 90
Susceptible (S)	High disease build-up	25 to 50
Moderately susceptible (MS)	Develops disease less quickly and so reduces loss risk	10 to 35
Moderately resistant to moderately susceptible (MRMS)	Some partial resistance - losses depend on disease pressure	5 to 25
Moderately resistant (MR)	High partial resistance; generally, few losses	5 to 15
Resistant (R)	Highly effective resistance; no or slight losses	0 to 5
Highly resistant (HR)	Complete resistance	0

Fungicide control may be required for varieties rated VS-MS. Varieties with an MRMS disease rating may benefit from fungicide control if early disease occurs or high spore loads are present, like when next to a severely rusted paddock. High crop yield potentials also increase the rate of return from fungicides.

Pre-season management

Remove summer volunteers that created the green bridge

Self-sown summer and autumn volunteers (predominantly wheat and barley), which help to produce the green bridge, should be destroyed with herbicides or heavy grazing as soon as they develop and at least four weeks before crop sowing. This will reduce local carryover of rust spores and reduce the risk of early infection. Refer to the department website at dpird.wa.gov.au and search for 'Control of green bridge for pest and disease management'.

Use resistant varieties

Sowing varieties with resistance to wheat stem rust is encouraged in Western Australia, particularly in years where rust risk is high and in rust prone environments. Varieties that are partially or fully resistant to rust are effective in reducing disease build-up and preventing losses. In rust-prone environments or high-risk seasons, it is important to avoid susceptible and very susceptible varieties.

To identify varieties with resistance to stem rust, refer to the current Western Australian crop sowing guide on the website at dpird.wa.gov.au.

Spring management

Monitor paddocks

Stem rust disease becomes apparent after flag leaf emergence. When stem rust risk exists (such as in green bridge areas or after reports of stem rust in your region):

- monitor susceptible crops at 7 to 14-day intervals, from flag leaf emergence to early dough grain development
- inspect different parts of the crop by carefully examining plants, especially lower stems, for signs of infection
- if stem rust is found, walk through the paddock in a 'W' pattern and collect 100 random stems from the crop (that is, 10 stems from 10 locations), to determine the number of stems with any stem rust in the crop
- to monitor rust pathotypes in Western Australia, send rust samples, particularly from varieties showing unusually high levels of rust, at no cost to the Australian Cereal Rust Survey. Sampling instructions and dispatch forms are available from the Australian Cereal Rust Survey webpage. Post samples in paper envelopes to:
University of Sydney
Australian Rust Survey
Reply Paid 88076
Narellan NSW 2567.

Diagnosis

If you need help with disease diagnosis, a chargeable diagnostic service is available through the department's DDLS Plant pathology services. For information, email [DDLS Plant pathology services](mailto:DDLS.Plant.pathology.services).

Broadacre diagnostic submission forms are available from the DDLS Plant pathology services webpage at dpird.wa.gov.au.

Foliar fungicides

Where wheat stem rust occurs in susceptible varieties, economic control can be achieved with fungicide applied at early onset of disease. Economic responses result from improvements in yield and grain quality (reduced screenings, increased hectolitre weight). A range of fungicide active ingredients are registered in Western Australia for stem rust control. For more information, see the page, Registered foliar fungicides for cereals in Western Australia.

All strategies assume that rust is detected soon after the start of infection. It is essential to regularly monitor susceptible crops to achieve this. Experiments show that disease control is more effective if the fungicide is applied early in the development of the disease (Table 2). The degree and duration of control depends on the application rate. The disease becomes more difficult to control as it progresses. Poor control is likely at rates below those recommended, particularly when disease levels are high. Under high disease levels, high rates should be used.

Table 2 Summary of experimental findings from trials in Esperance from 1997 to 1999 of natural stem rust infections

Crop stage at which stem rust is detected	Crop stage at which fungicide is applied	Tillers ¹ detected with stem rust (%)	Crop yield potential (t/ha)	Yield response with one spray (t/ha)	Yield response with two sprays (t/ha)
Flag emergence	Booting	Trace (<1)	3.0 to 3.5	0.9	1.5
Early head emergence	Mid-head emergence	5	2.5 to 3.0	0.2	0.2
Early grain fill	Late milk-early dough	90	1.5 to 2.0	0.5	n/a

¹ Any stem rust detected on stem or leaves from each of 100 tillers.

Foliar spray strategies

It is important to reduce early epidemic development, particularly in VS-MS varieties, is most important. Economic responses have been achieved in susceptible varieties from registered foliar fungicide sprays, from pre-head emergence to grain filling. Responses in less susceptible varieties will be reduced with later sprays.

Crops infected with stem rust before flowering are considered at high risk, as yield losses of 50% or more are possible. If infection starts or re-starts after flowering, losses of around 25% are possible.

When and what rate to spray

If any stem rust is detected, spray susceptible or moderately susceptible crops as soon as possible with an appropriate fungicide at a high rate. For crops with intermediate resistance, continue to monitor and spray if infection exceeds an average of 5% of random stems infected.

If stem rust is detected after head emergence, short term control can be achieved with standard application rates, provided infection is not severe. However, high fungicide rates have been found to be more profitable in experiments.

If stem rust is detected after grains are at the dough stage, apply fungicide if the crop has at least four more weeks of grain filling to go before hard dough stage. It is important to consider withholding periods when choosing an appropriate fungicide.

Biosecurity measures

Because there are different pathotypes of stem rust, care must be taken when travelling to or receiving visitors from interstate/overseas. Rust spores are small, light and may survive for several days without a host. Spores can also spread long distances by wind, on machinery/vehicles, on tools, clothing, and footwear.

Minimise the risk of rust becoming established or spreading on your farm. If you, your agronomist, or visitor walk through infected crops, thoroughly clean boots, hands, and trousers after leaving the crop, especially before entering another paddock or travelling.

Follow these recommended biosecurity measures when entering an infected crop:

- wear protective overalls and rubber boots
- after crop inspection, clean any material off boots with a brush. Prepare footbath of bleach (10% household bleach, 90% water), and spray bottles of methylated spirits brew (95% metho, 5% water), for use to disinfect footwear, pants, and hands
- decontaminate vehicles, tools, and machinery,
- walk instead of driving through crops
- ask visitors/agronomists to leave their vehicle at the gate and only travel on your property in your vehicle.

In addition to conducting rust pathotype testing, the Australian Cereal Rust Control Program details new rust incursions that are a threat to Australian cereal varieties each year.

More information

Refer to the department website at dpiird.wa.gov.au for more information about the following:

- Diseases and pests of wheat
- PestFacts WA map
- DDLS Plant pathology services
- Crop diseases
- Managing crop diseases

[Australian Cereal Rust Research program](#) | The University of Sydney (sydney.edu.au)

[Yield loss and fungicide control of stem rust of wheat](#), Journal of Crop and Pasture Science, 2005
Rob Loughman et al

Contact us

Kithsiri Jayasena, Grains Senior Research Scientist
+61 8 9892 8477 | [Email Kith Jayasena](#)

Geoff Thomas, Grains Principal Research Scientist
+61 8 9368 3262 | [Email Geoff Thomas](#)

Last updated September 2024

Important Disclaimer

The Chief Executive Officer of the Department of Primary Industries and Regional Development and the State of Western Australia accept no liability whatsoever by reason of negligence or otherwise arising from the use or release of this information or any part of it.

Copyright © State of Western Australia (Department of Primary Industries and Regional Development) 2024.

dpird.wa.gov.au