

Stem Rust of Wheat

Dr Grant Hollaway, Senior Plant Pathologist Cereals

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Stem rust is an occasional, but devastating disease of wheat. Epidemics occur when there is a carry over of stem rust from the previous season, susceptible varieties of wheat are grown, and warm humid conditions in the spring encourage disease development.

Stem rust in Victoria

Conditions that favour stem rust epidemics are rare and occur on average once every 16 years in Victoria. However, when conditions are conducive, the disease can cause complete crop loss in susceptible varieties.

Historically, the most severe epidemics in Victoria occurred (in descending order of severity) in 1973, 1947, 1934 and 1955. In 1973 stem rust reduced the Victorian wheat harvest by 25 per cent. It is unlikely that stem rust losses will ever be as severe as in 1973 due to the increased cultivation of stem rust resistant varieties, and the greater availability of effective foliar fungicides. In recent years, there have been few localised occurrences of stem rust.

Following the exceptionally wet January of 2011 there was a large amount of inoculum carry over that resulted in widespread stem rust in Victoria during 2011. In spite of this, the widespread use of chemicals helped minimise losses from this disease.

What to look for

Stem rust is characterised by reddish-brown, powdery, oblong pustules. The pustules have a characteristic torn margin that can occur on both sides of the leaf, on the stems and the glumes. Stem rust spores are much darker in colour than leaf rust spores, which are light brown and don't have torn margins (Figure 1). As the plant matures, the pustules produce black spores known as teliospores. They occur mainly on the leaf sheaths and stem.



Figure 1. Symptoms of stem rust on wheat (left), symptoms of leaf rust on wheat (right)

Economic importance

In Victoria, severe stem rust infections can reduce grain yield by more than 80 per cent in susceptible varieties, and can also reduce grain quality.

Disease cycle

Stem rust (caused by the fungus *Puccinia graminis*) can only survive from one season to the next on a living host. 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. Carry over on wheat from one season to the next is greatest during wet summer/autumns.

Rust spores are wind-blown and can be spread over large areas in a short time. Wet conditions and temperatures of approximately 15-30°C favour the establishment of stem rust within crops. Stem rust usually becomes evident later in the season than stripe rust.

Conditions favourable to stem rust

Stem rust can occur in all regions of Victoria where susceptible varieties are grown. However, the likelihood of a stem rust epidemic is increased by several factors:

- The build-up of stem rust inoculum on volunteer wheat before sowing, both locally and in neighbouring states.
- The widespread planting of susceptible varieties.
- Favourable weather conditions, which includes good spring rains and warm (15-30°C) humid conditions. If the two requirements above are met and there is a wet spring, an outbreak is likely to occur.

Pre-season management

Stem rust can be managed using an integrated approach. This includes reducing the inoculum in a district by managing the green bridge, avoiding susceptible cultivars and close monitoring to enable timely fungicide sprays.

Green bridge

Stem rust can only survive from one season to the next on living plant material (mainly self-sown cereals). Therefore, the removal of the green bridge is essential to reduce the amount of inoculum present to infect a new crop. This is why stem rust epidemics have been worse following wet summer/autumns that favour volunteer cereal growth.

Variety selection

Sowing resistant varieties provides the best protection against stem rust. In most parts of Victoria stem rust has been controlled because of the use of resistant varieties.

Stem rust occasionally produces new pathotypes (races) which are capable of attacking resistant varieties. These new pathotypes occur when a chance mutation occurs in this asexually reproducing fungus.

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Use of resistant varieties minimises the amount of rust in a district, thus reducing the chance of new pathotypes occurring. It is important that growers are aware of a variety's resistance reaction to stem rust. For a comprehensive list of varieties, consult a current disease guide [Cereal Diseases Guide \(AG1160\)](#).

In crop management of stem rust

The effects of stem rust can be minimised with the timely application of foliar fungicides. As there is limited information on the management of stem rust in Victoria, the following recommendations for the in-crop management of stem rust are based on experience in Western Australia (Beard *et al*, 2004).

Monitoring

Stem rust is most severe in susceptible varieties when it begins to develop in the crop before flowering and crop losses of 50 per cent are possible. Yield losses from later infections are possible, but not as severe.

As stem rust requires warmer conditions than stripe rust for development, it is advisable to begin monitoring for stem rust from flag leaf emergence onwards. Monitoring will be necessary in seasons when stem rust has been detected locally, or on volunteer plants before sowing.

Guidelines for monitoring for stem rust in wheat crops:

- Inspect wheat crops every 7 to 10 days from flag leaf emergence to early dough grain development. However, if stem rust is detected within a region, then increase inspection frequency to every 4 to 7 days.
- Carefully inspect different plant parts, especially the lower stems, for symptoms of stem rust. Spend at least 15 minutes walking through each wheat crop.
- If stem rust is detected, walk through the paddock in a 'W' pattern and collect 10 stems from 10 random locations (total 100) to determine the percentage of stem rust infection. See Table 1 for control options.

When to spray

The information in Table 1 is a guide for the application of foliar fungicides. Note that this table is not based on Victorian data, but on limited experimental data from Western Australia (Beard *et al* 2004). Fungicides will give better control of stem rust when applied early in the epidemic. A late, low level occurrence of stem rust (ie after mid-dough) will have little impact on yield.

In 2011 when there were paddocks of self-sown wheat heavily infected with stem rust at sowing the prophylactic application of fungicides to susceptible varieties was important in the area wide control of this disease. Such an approach would not be warranted in most seasons.

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Contact/Services available from DEPI

DEPI Field Crop Pathology, Grains Innovation Park, 110 Natimuk Rd, Horsham 3400. Tel (03) 5362 2111, or the DEPI Customer Service Centre 136 186.

Table 1. A guide for timing fungicide control of stem rust (Beard *et al* 2004).

| Crop growth stage | Stems infected ^A % | Resistance rating ^B | |
|---------------------------|----------------------------------|--------------------------------|---------|
| | | VS, S, MSS | MRMS |
| Before ear emergence | 1-5 | Spray | Monitor |
| | > 5 | Spray | Spray |
| Ear emergence / mid dough | > 5 | Spray | Monitor |
| | >50 | Spray | Spray |

^A Based on 100 stems selected in a W pattern across crop.

^B R= Resistant, MR = Moderately Resistant, MS = Moderately Susceptible, S = Susceptible, VS = Very Susceptible

Choice of fungicide

In Victoria, there are a number of active ingredients (available in a range of products) registered for the control of stem rust.

It is always important to read the chemical label before use. In particular, check that the product is registered, and use the maximum recommended label rate for stem rust control in wheat.

Note products containing tebuconazole break down relatively slowly in plants, and users must observe the product label restrictions regarding the total amount that can be applied to one crop per season. This will ensure harvested crops don't exceed the tebuconazole maximum residue limit (MRL) in cereal grains. See [DEPI Taking Care with Foliar Fungicides](#), for more information.

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 4 to 6 weeks.

Further Information

[DEPI Information Note Series](#)
[Victorian Cereal Disease Guide \(AG1160\)](#)

[Beard *et al* \(2004\) Managing Stem Rust of Wheat. Western Australian Department of Agriculture and Food, Farmnote No73/2004 \(reviewed 2006\)](#)

[Decimal Growth Stages of Cereals](#)
[DEPI Taking Care with Foliar Fungicides](#)
[SARDI Cereal Seed Treatments](#)

[The Rust Bust](#)
[Victorian Winter Crop Summary.](#)
[Wallwork H \(2000\) Cereal Leaf and Stem Diseases.](#)

For rust identification, send rusted plant samples in a paper envelope (do not use plastic wrapping) to: Australian Cereal Rust Survey, Plant Breeding Institute, Private Bag 4011, Narellan NSW 2567

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