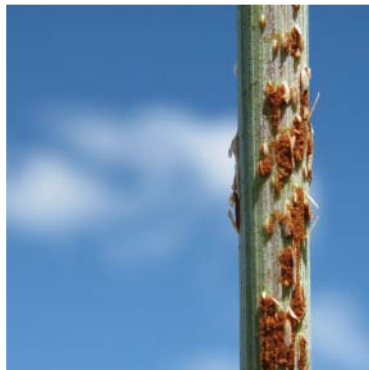




the
RUST
BUST



**Management strategies to benefit you,
your neighbour and your industry.**

www.rustbust.com.au

Acknowledgements

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Photos kindly supplied by Dr Grant Hollaway, Department of Primary Industries Horsham.

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Need further information?

www.rustbust.com.au



The ACRCP monitors cereal rust pathogens throughout Australia, finds and characterises new sources of rust resistance, and assists Australian cereal breeding groups to incorporate rust resistance in new cultivars. It is supported by the GRDC.

The Rust Bust

The Australian Cereal Rust Control Program Consultative Committee (ACRCP CC), with support from the GRDC, is pleased to launch the 'Rust Bust' campaign. The campaign aims to raise awareness of wheat rust management strategies that reduces risk of disease outbreak.

The ultimate goal is to encourage growers to phase out susceptible and very susceptible varieties from their rotation and to be more effective managers of the disease.

The Rust Bust campaign encourages wheat growers to use all the tools available for rust management including:

- Removing the green bridge (volunteer plants) four weeks prior to the intended sowing date.
- Growing varieties with adequate resistance to stem, stripe and leaf rusts.
- If needed, applying fungicides to seed or fertilisers for early season rust suppression.
- Monitoring crops for rust and if needed, applying foliar fungicides for disease control.

These strategies will benefit you, your industry and your neighbour.



A bit about rust...

- Rusts are caused by fungi. Rust spores are spread readily by the wind over large areas in a short time.
- There are three rust diseases of wheat in Australia - stripe, stem and leaf. Cultivars resistant to one may be susceptible to another.
- Rust becomes a problem in areas where susceptible varieties are grown. These varieties also enable inoculum levels to build up on volunteer plants during summer and autumn and give the rust an early opportunity to re-establish in commercial crops. Rust epidemics are more common following wet summers and in wet growing seasons.
- Rusts can mutate (alter or change form) to overcome resistance genes it is essential to use a current disease guide to check the resistance rating of your cultivars.
- The three rusts can be distinguished on the basis of spore colour (see below). These are the urediospores which move readily on the wind and are responsible for disease transmission between plants, within fields and across large regions. In high disease pressure and as crops begin to turn, darker coloured spores become evident. These are teliospores which, under Australian conditions, have no role in disease spread.
- All rusts can cause significant loss to wheat yields, given appropriate environmental conditions and susceptible varieties.
- The earlier in a season a rust epidemic starts, the greater the potential yield loss.
- Crops must be monitored to detect rust early. Timing is critical for the effective control of rust diseases with fungicides. Varieties known to be Susceptible (S), Moderately Susceptible (MS) and Moderately Resistant (MR)-MS will need to be monitored regularly from emergence if fungicide protection has not been applied at sowing. In these cases, fungicide application should be considered at the first appearance of symptoms. Monitoring should continue as protection periods following foliar fungicides will vary according to chemical product and growth rate of the crop. Varieties S and MS will need further protection where disease begins early.
- A note of caution when applying fungicides. The withholding period should be carefully observed when applying chemical protection to crops intended for grazing. Similar precautions need to be taken when considering fungicide applications to crops in the flowering to grain fill stages late in the season.



- The leaf rust fungus forms small circular, orange-brown pustules with spores that will rub off on your finger. These are usually on the top of the leaf, and rarely on the under-side.
- The most notable signs of an infection are the reddish-orange spore masses of the fungus breaking through the leaf surface.
- Leaf rust is a significant problem for susceptible cultivars during seasons following wet summers, particularly if this is followed by a mild winter and a warm wet spring.

STEM RUST



- Stem rust is characterised by reddish-brown, powdery, and longer pustules.
 - The pustules have a 'torn margin' that can occur on both sides of the leaves, on the stems and the glumes. They tend to run parallel to the long axis of the leaf or stem.
 - Stem rust spores are darker in colour than leaf rust spores.
 - Stem rust prefers warm conditions and will often not be evident in a crop until late spring and early summer. Outbreaks are more likely following above average growing season rainfall.
- Stem rust is a significant problem in seasons following wet summers, particularly, if this is followed by a mild winter and a warm wet spring.
 - While fungicides may work very well on leaf and stripe rust, they are less effective on stem rust especially in thick canopies where fungicides may not reach all stems.

STRIPE RUST



- Stripe rust forms long yellow/orange stripes of small pustules on the leaf. The pustules, which run parallel to the long axis of the leaf, consist of masses of spores.
 - The stripes can turn black as the disease progresses and teliospores develop. The teliospores are non-functional in Australia. The infection of leaves stresses the plant and reduces the ability to fill grain.
 - Stripe rust requires temperatures of less than 18°C (optimum 6-12°C) with a minimum of three hours of leaf-wetness (for example, dew) for new infections to occur.
- Of the three wheat rusts, stripe rust is best suited to cooler temperatures that occur during late autumn and early spring.
 - Stripe rust is potentially less damaging than stem rust, but suitable conditions for stripe rust infection occur regularly.
 - Once an infection is established the fungus can survive short periods of temperatures as high as 40°C.

The importance of variety selection



Dr Grant Hollaway

Growers are currently facing the worst disease risk in nearly 40 years and must be proactive and plan their 2011 and 2012 rust management strategy.

ACRCP Consultative Committee chairman Dr Grant Hollaway says where possible, growers need to select wheat varieties that have rust resistance and adopt management strategies that protect themselves, their neighbours and their industry.

“

“During 2011, wheat growers face a high risk of stripe, stem and leaf rust because of increased inoculum levels in crops during 2010 and the potential for carryover on volunteer plants (called the green bridge) thriving following high summer rainfall,” he said.

“Varietal selection along with disease management will be crucial to minimise disease risk because a rust outbreak can slash grain returns by more than half.”

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In the past, many people have relied on fungicide applications. While this still remains an effective management tool, growers should be aware:

- Fungicides are generally less effective at controlling stripe and stem rust when head infection occurs.
- While fungicides may work on leaf and stripe rust, they are less effective on stem rust especially in thick canopies where fungicides may not reach all stems.
- Fungicides may not always be available due to heavy demand elsewhere or because weather conditions prevent application at an appropriate time. For example, in 2010, spray rigs became bogged in wet paddocks and aerial application was not always possible due to a lack of aircraft.

Variety selection is the first line of defence

The ACRCP CC encourages growers to phase out susceptible and very susceptible varieties from their rotation where possible, but if these cultivars are grown, farmers need a management plan ready in advance in case of a rust outbreak.

A grower's individual disease management plan must take into account their property's level of risk, including rainfall, location and variety selection.

More information on selecting varieties for your region can be found at:

www.rustbust.com.au

Did you know...

A recent poll of Australian wheat growers found that 70% make their annual variety selections based on yield potential. However, when considering a variety's yield potential many do not factor in the potential yield penalty or management costs of a rust outbreak.

Data collected by DPI Victoria (see table below) has found that a stripe rust outbreak in MS-S varieties could cause a 26% yield loss compared with growing a rust resistant variety which has no yield loss.

Rating	Average yield loss %
Resistant (R)	0
Moderately Resistant (MR)	3
Moderately Resistant-Moderately Susceptible (MR-MS)	17
Moderately Susceptible (MS)	20
Moderately Susceptible-Susceptible (MS-S)	26
Susceptible (S)	65
Very Susceptible (VS)	70

Explanation for Resistance Classification

R The disease will not multiply or cause any damage on this variety. This rating is usually only used where the variety also has seedling resistance.

MR The disease may be visible and multiply but no significant economic losses will occur.

MR-MS Rust can establish early and an epidemic can develop from these infections. The level of resistance may improve as the crop develops, although losses up to 20% can be expected if fungicides are delayed or not used.

MS Disease may develop at any stage of crop growth and leaf area damage can be high, leading to serious crop losses if left unchecked.

MS-S Disease can develop rapidly at any growth stage with high crop loss potential.

S The disease can be severe at any growth stage on these varieties. Losses over 50% are likely if the disease is not controlled and losses of 15-50% can occur.

VS Where a disease is a problem this variety should not be grown. Losses ranging from 50-80% can be expected and the variety will create significant problems to other growers.

This classification is only a general guide.

Minimum Disease Resistance Standards

Rust can be effectively managed by growing resistant varieties. The level of resistance varies between regions depending on weather and seasonal conditions. If a variety does not meet the minimum resistance level, then additional rust control will be needed.

As part of its role, the ACRCPC CC revised the Minimum Disease Resistance Standards in March 2011 taking into account regional differences relating to rust threat. The following table indicates the suggested minimum levels of resistance required for wheat.

Region	Stem	Stripe	Leaf
Northern (Queensland and northern New South Wales)	MR-MS	MR-MS	MS
South-Eastern Region (southern New South Wales, Victoria and South Australia)			
i) Conventional spring wheats	MS	MR-MS	MS
ii) Long season and early sown (before mid-April) wheats	MR-MS	MR-MS	MS
Western (Western Australia)	MS	MS	MS

How your variety selection decision affects you, your industry and your neighbour.

While rust can be controlled in susceptible and very susceptible varieties through the careful use of fungicides, growing these varieties jeopardises current and future disease resistance.

A poorly managed crop, combined with untreated volunteers following harvest could contribute significantly to building high inoculum levels within and between seasons.

If there are high levels of rust disease in a region then you, your neighbour and your industry are at risk. High levels of rust inoculum increases the risk of rust disease mutation, putting existing rust-resistance genes at risk.

Because rust is an airborne disease, the spores can spread quickly between regions. By selecting varieties with appropriate levels of resistance it is possible to:

- Reduce the build-up of rust populations that cause regional epidemics.
- Decrease pressure from existing rust strains.
- Lower the risk of mutations in the current strains into more virulent forms.
- Reduce production costs associated with chemical use.
- Decrease the risk of rust fungi developing resistance to available chemical fungicides.

Rust Bust – Management Checklist

By planning ahead to manage rust it is possible to minimise its cost to your business. It is important that growers choose a strategy that is appropriate to their situation, and follow it during the growing season.

This checklist outlines a simple rust management strategy.

1 Have you controlled the green bridge?

In the 4-6 weeks before seeding, there should be no 'green bridge' in and around paddocks to be sown. Remove green material by grazing, burning, cultivation, and/or herbicides. The green bridge is rust susceptible living plants or volunteers (mostly wheat, and to a lesser extent barley, triticale and barley grass) that grow in paddocks during summer/autumn. The more susceptible volunteer wheat plants growing during summer and autumn, the greater the risk of a rust epidemic. Rust does not survive on seed, stubble or soil.

Susceptibility of the volunteer wheat plants over summer influences the quantity of inoculum generated by the green bridge. If most varieties in a district are resistant there will be considerably less inoculum than if the majority of plants are susceptible or very susceptible.

It is critical that all volunteer wheat plants are removed either by spraying, cultivation or heavy grazing in the four week period leading up to sowing.

Particular care should be taken to destroy plants around sheds and silos, as rust often survives on these plants.



2 Variety selection: Have you considered alternate varieties to S & VS?

Growers should, wherever possible, select varieties with sufficient rust resistance to suit their individual risk situation. Select varieties with the highest levels of rust resistance possible, keeping in mind other agronomic and disease traits of the variety. While it is generally agreed that S and VS varieties are best avoided, if growers do select them a **rust management plan is a must**.

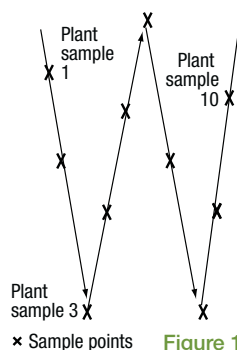
The actual disease response that occurs in the field will depend on many factors, including the amount of inoculum carry over, the timing of the rust outbreak in the crop, seasonal conditions and the pathotypes (races/strains) of rust occurring in a region.

- **For MS-VS varieties:** It is highly recommended that these cereal varieties should be protected throughout the entire growing season. Rust management options, depending on the current seasonal risk in your region, include:
 - Fungicide with rust activity applied as a seed dressing.
 - Fungicide amended fertiliser (coated or granulated with fertiliser) or liquid fungicide applied in furrow at sowing.
 - Foliar fungicide.
- **For MR-MS varieties:** One or more of the following rust management options should be considered at sowing, especially in seasons of high rust risk:
 - Fungicide with rust activity applied to seed or fertiliser (coated or granulated with fertiliser).
 - Fungicide amended fertiliser (coated or granulated with fertiliser).
 - Foliar fungicide.
- **For R or MR varieties:** For MR varieties or higher, additional rust management (listed above) at sowing is unnecessary.

3 Are you monitoring crops at every growth stage?

It is critical to monitor all crops for the presence of rust, particularly during spring. This can be done by either visually assessing the thicker patches in a crop or by walking in a W shape through the paddock to ensure a representative sample of the crop. It is suggested wheat growers collect five plants at ten different locations (see Figure 1). Inspect the lower parts of the plant, the stem and the leaves for rust symptoms.

If a fungicide has been applied, monitoring must start in the week before the protection period is expected to end.



- **For MS to VS varieties:** These will require continual monitoring, even if there has been protection applied at sowing. Growers cannot afford to miss the early detection of a rust outbreak as epidemics can be explosive in susceptible varieties. Growers will have to consider in their budgeting seedling protection and up to three foliar sprays to achieve yield potential in highly susceptible


varieties. In these varieties, a fungicide spray must be applied either before, or soon after, the detection of rust in the canopy. If stripe or leaf rust first appears after ear emergence then a fungicide spray may not be required, depending on the seasonal outlook. However varieties MS to VS will need stem rust protection until early grain fill.

- **For MR-MS and MS varieties:** Foliar sprays must be considered for these varieties if disease begins early (before second node) and if chemical protection was not applied at sowing. Post-emergence herbicide applications can include a tank-mixed fungicide to reduce application costs and provide early protection against rust. Follow-up spraying to protect flag leaves may be valuable in high disease pressure seasons. Fungicides are not expected to give economic protection after heading in the MR-MS and MS varieties for stripe rust and leaf rust. However, stem rust is a late season disease and these varieties may benefit from post-heading fungicide protection if disease pressure remains high.
- **For R or MR varieties:** Although resistant varieties should be fine throughout the season and not require fungicide support, it is wise to continue monitoring because pathogen change is a possible scenario.

4 Have you talked to your neighbour?

Rust management is a group effort. To deliver an effective rust management strategy, growers must communicate with their neighbours. Here's why:

- It only takes one neighbour or others in the district using S and VS with no control for a rust outbreak to occur.
- Growing S and VS varieties increases inoculum levels and the vulnerability of other less susceptible varieties being used in the vicinity.
- Fungicide treatments will be most effective when adopted across a region as they will greatly reduce the inoculum levels in a district.

A photograph of two men standing in a field. The man on the left is older, with grey hair, wearing a blue and white checkered short-sleeved shirt and blue jeans. The man on the right is younger, wearing a dark jacket, a black cap, and sunglasses. They are both looking at each other and talking. In the background, there is a red tractor and a field of crops.

“If you spot rust in your crop – be proactive and tell your neighbour”

Rust Bust checklist:

Be prepared this season.

1. Grow varieties with adequate resistance to stem, stripe and leaf rust.
2. Phase out very susceptible (VS) or susceptible (S) varieties from your rotation, otherwise develop a plan to manage rust.
3. When selecting varieties, ensure you have a specific rust management strategy, including green bridge control and intended fungicide use.
4. Know the seedling and adult rust resistance characteristics of the varieties you decide to grow, and identify whether they require chemical support.
5. Remove the green bridge (volunteer plants) four weeks prior to the intended sowing date.
6. Ensure close crop monitoring to enable early detection and management.
7. Use appropriate fungicide support to maximise crop performance and minimise disease build-up in your crop.
8. Talk to your neighbour about your rust situation so management can be tackled more efficiently.

Leaves or stems bearing suspected rust infection should be placed flat in paper envelopes, and marked with relevant contact details, location and variety if known. Send samples without delay to:

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

Need more information?
www.rustbust.com.au

BUST THAT RUST

Remember... Plants infected with rust produce large amounts of powdery spores. These are wind-dispersed and can stick to clothing and footwear. Ensure you change or wash clothing and shoes before having contact with other crops, farms or machinery.

