



# NORTHERN FOCUS

COVERING NORTHERN NSW AND QUEENSLAND

## Preparing for rust in 2010

By Colin Wellings<sup>1</sup>

**E**conomic stripe rust control in 2010 will be based around variety choice, delaying disease onset and developing a proactive management plan around variety choice and fungicide.



Leaf rust symptoms (top) and stem rust symptoms (bottom).

### CONTROL OPTIONS FOR 2010

#### Variety choice

The revised response of Australian commercial wheats to pathotypes of stripe rust was distributed in December 2009 and is available at [www.nvtonline.com.au](http://www.nvtonline.com.au). Growers are encouraged to select varieties that show R, MR or MR-MS responses.

Choice of variety may also be based on the resistance genes where known. Diversity of resistance genes will provide a measure of insurance in the possible event of a pathotype change.

For example, Gregory (Yr33), Lincoln (Yr4), Livingston (Yr17, Yr27) have good resistance based on different genes all of which are currently effective in pro-

viding protection. Should one gene fail, we can expect that the remaining varieties will be resistant.

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### Consultants' Corner



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<i>...PREPARING FOR RUST IN 2010

**Delay disease onset**

Reduce the opportunities for pathogen survival over-summer by eliminating or reducing self sown wheat and triticale. The importance of the green bridge was evident in the 2009 season where the pathogen clearly survived and initiated early infection in commercial fields.

Provide protection to early emerging crops by using fungicide applied to seed or fertiliser and be aware the expenditure will vary with product choice.

Fertiliser coatings and granulated formulations have provided considerable protection and have certainly been adequate for the task of providing good disease protection in early sown crops.

Main season crops have frequently bene-

fited with protection through to GS39. Seed applied fungicide is relatively inexpensive, especially when integrated with seed grading operations. Good quality seed is important to mitigate against potential emergence problems associated with reduced coleoptile length when using triadimenol.

Consider withholding periods for grazing cereals sown with seed or fertiliser fungicide.

**RESEARCH VIEW**

**TEMPERATURE AND NITROGEN IMPACT ON STRIPE RUST**

By Steven Simpfendorfer, I&I NSW, Tamworth

Grain growers should be aware that moderate temperatures and higher nitrogen nutrition increase the severity of stripe rust in susceptible wheat varieties.

Temperature dictates the rate at which stripe rust cycles in wheat leaves with an optimum temperature range between 12–20°C.

Stripe rust cycles quickest with a minimum cycle time between infection and pustule appearance of 12 days.

The longer temperatures (during a 24 hour period) are outside this range the longer it takes stripe rust to complete a cycle. Stripe rust cannot be killed in the leaf with either high or low temperatures.

Increased stripe rust severity is not always directly related to increasing canopy size. Additional nitrogen can affect stripe rust development through changes in nitrate levels in wheat leaves which are a substrate for pathogen growth.

**New stripe rust pathotypes**

Stripe rust has re-emerged as a considerable issue to wheat production in Australia as a result of changes in the pathogen (new pathotypes) which has reduced the effectiveness of some resistance genes present in a range of commonly grown wheat varieties.

Australian research has focused on genetic resistance and fungicide management. Field observations, over a number of seasons, have indicated that a relationship exists between nitrogen status of crops and the severity of stripe rust.

Nitrogen nutrition is thought to be an important environmental factor affecting the quantitative resistance or Adult Plant Resistance (APR) of wheat to rust diseases in overseas studies, with high nitrogen being associated with increased severity of infection.

This current GRDC-supported study, in collaboration with the University of New England, examined the effect of nitrogen nutrition on stripe rust severity in susceptible wheat varieties over two seasons in northern NSW.

Increasing nitrogen application clearly increased the severity of

stripe rust in the two susceptible wheat varieties used in this study.

Several overseas studies have identified a range of pathosystems associated with this response including changes in biochemical processes in the plant, such as decreased phenol content within the plant.

Increased nitrogen application also changes the crop canopy structure creating a more favourable microclimate for rust infection as a result of increased crop density and canopy size.

But evidence from this study suggests the effect of nitrogen on stripe rust is mediated via the nitrogen content of leaves, rather than through changes in canopy microclimate caused by increased canopy size.

This supports the findings from a range of other studies conducted overseas. In one study, increases in the severity of stripe rust and stem rust were observed with the application of nitrate-nitrogen, but decreases were observed with ammonium-nitrogen, although both nitrogen forms would have been expected to increase canopy size.

In another split nitrogen application study, stripe rust increased significantly in nitrogen treatments applied after canopy formation was complete – this was after any substantial effect of microclimate through canopy size was possible.

In the same study, stripe rust was curtailed, even in a variety with poor APR and despite an abundance of remaining green leaf area, by limiting nitrogen supply to the plants.

This suggests that nitrogen affects stripe rust through changes in nitrogenous levels in the leaf which serve as a substrate for pathogen growth.

Delaying nitrogen application has been shown to reduce the severity of stripe rust in overseas field experiments.

This effect may complement varietal resistance, although the effect of nitrogen may be less strongly expressed in varieties with better resistance.



A compromise needs to exist in nitrogen management between promoting canopy growth and minimising the development of stripe rust.

**Proactive planning for anticipated in-season foliar sprays**

- Know what to expect with the disease response of each variety.
- If the variety is known to be vulnerable, monitor regularly.
- Keep abreast of district and regional stripe rust activity.
- Be prepared to act in a timely manner.
- Be alert to any early disease pressure in long season wheats and triticales.
- Grazing management can be an effective strategy to reduce an early burden of stripe rust. Heavy grazing gives superior results.
- Consider tank-mixing fungicide with broad leaf herbicide post 'lock-up'.
- Foliar fungicide choice will be governed by variations in efficacy, availability and price. Seek local advice.

**Pathogen monitoring**

Disease reporting and sample collection will be important activities to maintain industry awareness in 2010. Using paper envelopes, send leaves carrying stripe rust infection to:

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

Include sample information (location, variety if known, date) and collector's details. An email address will be more con-

venient so that results can be reported in a timely manner.

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**TABLE 1: Stripe rust samples received from regions and time periods in the 2009 wheat growing season**

Region	Month, 2009							Total
	June	July	Aug	Sept	Oct	Nov	Dec	
QLD		13	21	15	9			58
Northern NSW	1	45	54	29	9	2		140
Southern NSW		5	41	87	93	10		236
VIC			5	5	33	8		51
SA			17	9	24	4		54
WA		1	1	1	2		1	6
TAS						7		7
<b>Total</b>	<b>1</b>	<b>64</b>	<b>139</b>	<b>146</b>	<b>170</b>	<b>31</b>	<b>1</b>	<b>552</b>

**TABLE 2: Pathotype determinations across regions and time periods in 2009 (data current to mid December 2009)**

Region	'Jackie' Pathotype			'WA' Pathotype			'WA Yr17' Pathotype		
	June–July	Aug–Sept	Oct–Nov	June–July	Aug–Sept	Oct–Nov	June–July	Aug–Sept	Oct–Nov
Qld	8	26	2	2	5		3	3	1
Northern NSW	29	41	1	6	9		7	30	6
Southern NSW	1	79	35	1	7	3	4	36	24
Vic		7	18		3	2			9
SA		15	8					11	11
<b>Totals</b>	<b>38</b>	<b>168</b>	<b>64</b>	<b>9</b>	<b>24</b>	<b>5</b>	<b>14</b>	<b>80</b>	<b>51</b>
	<b>270 (60%)</b>			<b>38 (8%)</b>			<b>145 (32%)</b>		

THE COMMERCIAL VIEW

RUST THREATENS 2010 BARLEY CROP

By Greg Platz<sup>1</sup>

The 2010 barley crop is under a potential threat from leaf rust as a new pathotype of barley leaf rust virulent on Rph3 is now widespread in northern NSW and Queensland.

This has rendered the variety Fitzroy susceptible and impacted heavily on the breeding program.

**Implications for management plans in 2010**

- Avoid sowing susceptible varieties early.
- Monitor crops for presence of leaf rust from early nodding paying particular attention to lower leaves.
- Apply fungicides to protect a minimum of the last three leaves. In very susceptible varieties this may mean split applications at GS32/33 and again after GS39.
- Mackay and Shepherd have the best leaf rust resistance of current commercial varieties in the Northern Region and the new release Oxford is resistant.

Growers should not select varieties solely on resistance to leaf rust as yield and quality losses can be avoided by early disease detection and timely application of fungicide.

In March, 2009, a sample of leaf rust from barley at Legume, NSW was sent to the Plant Breeding Institute (PBI) at Cobbitty, NSW for pathotype determination.

This isolate proved to be a new pathotype with virulence for the

resistance gene Rph3. and was the first record of virulence on this gene in Australia.

**Lessons learned from the detection of this new pathotype**

- High levels of rust inoculum often lead to the development of new virulence.
- Breeding programs need to maintain diversity in the resistances used.
- Pathotype 5453P+ dominated in 2009 yet 5457P+ increased and spread later in the season.
- Varieties that were protected from leaf rust by Rph3 must now be considered susceptible.

The immediate commercial impact of this development is only minor as Fitzroy is currently the only variety in the Northern Region carrying this resistance gene – but virulence on Rph3 has had a serious effect on the breeding program.

The gene was being used extensively as a source of resistance and its breakdown rendered many lines in the program susceptible.

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# Glyphosate resistance

## STRIPE RUST EPIDEMIC 2009

The first reports of stripe rust for 2009 were received from the New England region in NSW in May. The initial epidemic development focused in northern NSW during July-August, with disease pressure shifting to southern NSW from late August to October (Table 1). These patterns were indicative of:

- Significant over-summer survival in Region 1 (northern NSW/Qld).
- Delayed rainfall and sowing led to late emerging crops in southern NSW that were in the vulnerable vegetative growth stages when pathogen inoculum moved south.

## PATHOTYPES

By Autumn 2010, 85 per cent of samples had been identified and the results reported to individual co-operators. Wheat stripe rust pathotypes identified in Australia in 2009 are indicated in Table 2.

### Points to note

- Three pathotypes predominated in eastern Australia. The 'Jackie' pathotype dominated early but the 'WA Yr17' pathotype clearly staged a comeback in late spring, particularly in southern NSW.
- The 'WA Yr17' pathotype increased significantly from 15 per cent in 2008 to over 30 per cent in 2009.
- The increased frequency of the 'WA Yr17' pathotype was predicted, based on previous experience with emerging pathotypes, and the expected response of wheats likely to be affected by this pathotype assisted decisions with fungicide control options.
- The 'Jackie Yr27' pathotype was not detected in 2009. Wheats carrying Yr27 performed very well to stripe rust during the season.
- The 'WA Yr17' pathotype was noticeably under-represented in Queensland, despite its presence from the early phases of the epidemic.
- In contrast, the 'WA Yr17' pathotype was more frequent in South Australia at 50 per cent of isolates. A large proportion (30 per cent) of these isolates was recovered from the susceptible variety, Mace.

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Glyphosate is a key herbicide used widely in Australia and around the world and is a valued component of modern agricultural farming systems. But glyphosate resistance poses a serious threat to the long term viability of Australian farming systems.

Recently, there have been five confirmed cases of glyphosate resistant Awnless Barnyard grass (*Echinochloa colona*) and two cases of resistant Liverseed grass (*Urochloa panicoides*) in northern NSW and southern Queensland. In each case resistance developed as a result of over reliance of glyphosate in the farming system combined with zero or minimum tillage farming practices.

### How does resistance develop?

In any weed population, even before the herbicide is used, individual plants may contain genes conferring resistance to that herbicide. Susceptible weeds will be killed when herbicide is applied. But weeds containing the resistance gene over time may become dominant in the population depending on:

- How often the herbicide is used;
- The type of herbicide;
- The size of the weed population;
- The initial resistance gene frequency;
- The weed seed characteristics; and,
- The proportion of the weed population being treated.

### Glyphosate resistance and Integrated Weed Management

#### Monitor

While it may not be possible to totally eliminate the likelihood of resistance developing in modern farming systems, there are ways to reduce the risk. The best way to avoid the development of herbicide resistance is develop and implement an Integrated Weed Management (IWM) plan.

The following principles are important considerations in an IWM plan.

- Keep accurate paddock records.
- Scout fields before and after herbicide or weed control operations.
- Start with a clean field by practicing good fallow and whole farm management.
- Use the right herbicide product at the right time at the right rate.
- Use multiple herbicide modes of action in the weed control system.
- Control weeds when they are small.

### Control escapes

- Prevention of weed seed set is vitally important to stop resistance developing.
- Ensure good farm hygiene – clean equipment before moving from field to field.
- Use non-herbicide farming practices such as strategic cultivation and crop rotation.

### What do you do if you suspect you have glyphosate resistance?

#### Evaluate

We encourage growers to report suspected cases of resistance promptly to their Monsanto or Nufarm representative. In situations where glyphosate resistance is suspected, farmers and agronomists should first consider the following:

- Whether the application timing and rate was appropriate for the weed species and growth stage was spray coverage adequate – or did stubble cover prevent the herbicide from reaching the target?
- Were plants stressed? Moisture stress is a common factor in poor control of grasses, especially liverseed grass, when the translocation of glyphosate to the roots is significantly impeded.
- Glyphosate antagonism may occur due to tank-mixes/additives, or to field conditions such as stubble cover or dust that can reduce the efficacy of glyphosate.
- Did the suspect weed emerge before or after herbicide application?
- Has glyphosate been the main method of fallow weed control over the past 10 or more years?

#### Response

If glyphosate resistance is still suspected, farmers should:

- Consider an alternative method of weed control rather than risking the failure of a second application of glyphosate.
  - Report suspected cases of resistance promptly to a Monsanto or Nufarm representative.
  - Collect samples and send for testing
  - Remove surviving plants from the field to limit the amount of seed going into the soil seed bank
  - Develop a management plan for continued monitoring of the sites and the use of alternative weed control strategies
- Farmers are encouraged to be vigilant and are urged to adopt an IWM strategy and monitor closely for evidence of weed survivors following an application of glyphosate. ■