

Preparing for rust in 2010

By Colin Wellings¹

Economic 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.

CONTROL OPTIONS FOR 2010

Variety choice

The revised response of Australian commercial wheats to pathotypes of stripe rust



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

was distributed in December 2009 and is available at 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 providing protection. Should one gene fail, we can expect that the remaining varieties will be resistant.

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 benefited 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.

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.

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
Total	1	64	139	146	170	31	1	552

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
Totals	38	168	64	9	24	5	14	80	51
		270 (60%)			38 (8%)			145 (32%)	

- 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 convenient so that results can be reported in a timely manner.

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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.

<v...PREPARING FOR RUST IN 2010

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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Don't skimp on sowing rate for canola hybrids

By Felicity Pritchard, *Better Oilseeds*

Hybrid canola seed is in hot demand this season, and some growers are looking to reduce seeding rates to cut the cost of growing the crop. At around \$22 a kilogram, hybrid canola seed can be more than double the price of traditional open-pollinated seed.

But hybrid canola growers, who may be cutting back on rates a little, should be mindful not to go overboard as low plant densities can severely cut yields, especially in favourable seasons.

Pioneer Hi-Bred Australia sales manager Kevin Morthorpe points out that sowing equipment needs to be calibrated to match seed size of individual seed lots and seedbed conditions, rather than a 'one sowing rate fits all approach'.

Kevin believes the trend to reducing sowing rates over recent years is partly due to increased seed costs and partly due to good commercial practice, where leading growers can obtain excellent establishment of their crops, with up to 80 to 90 per cent of seeds becoming viable plants.

Sowing rate factors

A number of factors need to be considered when calculating sowing rates for all crops. These include seed size, anticipated establishment percentage, average rainfall and row spacing.

Hybrid canola seeds are generally much bigger than open pollinated varieties, so each kilogram contains less seeds. Some hybrid seed is twice the size of some open pollinated varieties.

With larger seed, a higher sowing rate is generally needed as you get a lot less seeds for each kilogram. But a major positive with hybrids is that the percentage of plants establishing may be better due to the large seed and the hybrid vigour.

In one *Better Oilseeds* trial held on South Australia's Eyre Peninsula last year, only two-thirds of the seeds of the triazine tolerant, or TT, variety grew into plants, whereas nearly nine of every 10 hybrid seeds established as plants. The figure was eight in 10 for a conventional open pollinated variety.

The minimum percentage of commercial hybrid seeds germinating in laboratory tests is 85, although it may be higher and varies between seed companies.

Soil moisture at sowing

Good establishment of canola in a paddock may be compromised by a number of factors, in particular, dry conditions.

Moisture plays a critical role in establishment of canola. In some of our trials in recent years, average canola establishment has been around 40 to 50 per cent due to poor seedbed moisture.

In trials conducted by Pacific Seeds in 2009 over a wide range of environments, an average 68 per cent of seeds established into plants.

Where conditions are dry at sowing, growers should work on 30 to 50 per cent of seeds establishing as a rule of thumb, and 60 to 80 per cent under optimal conditions.

CALCULATING CANOLA SOWING RATES

$$\text{Sowing rate in kg/ha} = \frac{(\text{target plants/m}^2 \times 1,000,000)}{\div (\text{seeds/kg} \times \text{expected establishment \%})}$$

Eg: Hybrid with 195,000 seeds/kg in a high rainfall zone with good seedbed moisture:

$$\begin{aligned} \text{Sowing rate} &= (60 \text{ plants/m}^2 \times 1,000,000) \\ &\div (195,000 \text{ seeds/kg} \times 80\% \text{ establishment}) \\ &= 3.8 \text{ kg/ha} \end{aligned}$$

Eg: Open pollinated variety with 300,000 seeds/kg in a high rainfall zone with good seedbed moisture:

$$\begin{aligned} \text{Sowing rate} &= (70 \text{ plants/m}^2 \times 1,000,000) \\ &\div (300,000 \text{ seeds/kg} \times 70\% \text{ establishment}) \\ &= 3.3 \text{ kg/ha} \end{aligned}$$