Northern stripe rust management

Background

Stripe rust management has become a more important component of wheat production in recent years due to the arrival of new pathotypes that cause disease in the majority of currently grown varieties. Plant breeding and variety choice will remain our key long term management tool, however it is likely to be a number of years before we can replace many of the currently susceptible varieties. Until that time the industry is reliant on effective and economic fungicide and cultural practices to assist disease management.

Research by both NSW DPI and NGA in 2005 and 2006 indicated foliar fungicide application during the early stages of stripe rust establishment was the key to improved disease management whilst also generating more consistent economic benefit. Additional NGA project activity in 2007 and 2008 was focused on generating more regional data and confidence comparing a range of stripe rust management strategies.

Project aims

In 2007:

1. Evaluate a stripe rust 'management matrix' of suitable seed treatment and foliar fungicide combinations
2. Generate more data on the most appropriate and economic stripe rust fungicide management practices

In 2008:

1. Assess the efficacy and economics of single versus multiple fungicide sprays for stripe rust management under high disease pressure

Results in a nutshell

Seasonal differences:

2007

- Stripe rust widespread but generally low incidence with very low severity
- Main regional disease detections from mid August onwards

2008

- Stripe rust widespread at high incidence with high severity
- Disease well established in crops ~4 weeks earlier than in 2007

Stripe rust control:

- Most effective stripe rust control in both years was from a foliar fungicide applied at or just prior to early signs of disease
- Jockey (300 mL/100 kg seed) alone did not provide sufficient disease control when stripe rust was not evident until mid September
- Two spray approach was necessary in a moderately susceptible (MS) variety when under high and prolonged disease pressure in 2008

Yield impact:

- Disease levels too low for sound conclusions in 2007 although overall means for all treatments still exceeded the Untreated yield
- Under high disease pressure in 2008, mean treatment benefit of ~400 kg/ha in a 2600 kg/ha crop. Early application still provided good yield protection

Overall:

- ***Jockey of limited value if disease onset is not until September***
- ***Reinforced benefits of early foliar fungicide application timing***
- ***Little indication of rate response to foliar application in any trial***
- ***Multiple spray provided best result in Baxter (MS) in a high disease year but a single, well timed, low rate application still provided 90% of that benefit***

Trial design

2007: NGA established seven small plot trials to evaluate a stripe rust 'management matrix'. These trials were located across a wide area from North Star to Spring Ridge and west to Cryon and Weemelah. The moderately stripe rust susceptible variety Lang was used in all trials with a combination of seed treatment (Jockey® - fluquinconazole 167 g/L) and foliar fungicide (Folicur® - tebuconazole 430 g/L) approaches.

Individual plot size was 4m x 10m with an untreated buffer area of 2m width between plots. Plots were sprayed with an ATV mounted 4m boom. DG110015 nozzles were used at 230 kPa, 12.3 km/hr and a volume of 50 L/ha. The droplet size produced at these parameters is rated as Fine/ Medium (ASAE standard S-572). The multiple application received the indicated product rate at each designated timing.

Two foliar fungicide application timings were conducted in each trial. Timing 1 (T1) was planned for when stripe rust was first detected in local area (but not yet evident in the trial) with a crop stage ~GS33 or more advanced. Timing 2 (T2) was an application delayed ~two weeks after T1 (range 12-18 days).

Treatments evaluated

Seed treatment and rate (/100 kg seed)	Foliar fungicide rate (/ha)	Foliar fungicide timing
Nil	145 mL	T1
Nil	145 mL	T2
Nil	290 mL	T2
Nil	145 mL x 2	T1 and T2
Jockey 300 mL	Nil	Nil
Jockey 300 mL	145 mL	T1
Jockey 300 mL	145 mL	T2

Foliar application dates and crop stages

Location	Timing 1			Timing 2	
	Application date	Crop stage (GS)	Days after planting	Application date	Crop stage (GS)
North Star	12/9/07	39-45	92	28/9/07	57-60
Croppa Creek	12/9/07	45-51	99	28/9/07	61
Weemelah	10/9/07	39-45	89	24/9/07	57-61
Millie	3/9/07	39-42	77	18/9/07	45-49
Cryon	23/8/07	32-33	100	10/9/07	53-59
Boggabri	8/9/07	32-33	82	21/9/07	39-41
Spring Ridge	13/9/07	31-32	80	25/9/07	37

No stripe rust was detected prior to T1 in any trial except at Boggabri where only a trace level was present (~0.1% of leaf area affected on top 3 leaves).

Assessments

1. **Crop establishment:** established plants in 2 x 2 m lengths of row
2. **Stripe rust severity:** *severity* – visual rating of % leaf area affected on top 3 leaves in 10 random main tillers/plot (*incidence* - % leaves with any stripe rust presence also determined but not presented)
3. **Yield and grain quality:** All plots were harvested by small plot header with quality analysis conducted by NSW DPI

2008: NGA established one small plot trial to further evaluate foliar stripe rust timing and benefit under higher disease pressure. The trial was located in a commercial paddock of the moderately susceptible variety Baxter near Ashley (north-west of Moree). Disease management with the foliar fungicide Folicur was evaluated at either 145 or 290 mL/ha and at two application timings. T1 was at GS32 (27/8/08) with stripe rust in area but not found in trial area, T2 was an application 15 days later (11/9/08) at GS41-49. Stripe rust incidence and severity, grain yield and quality were assessed as in 2007.

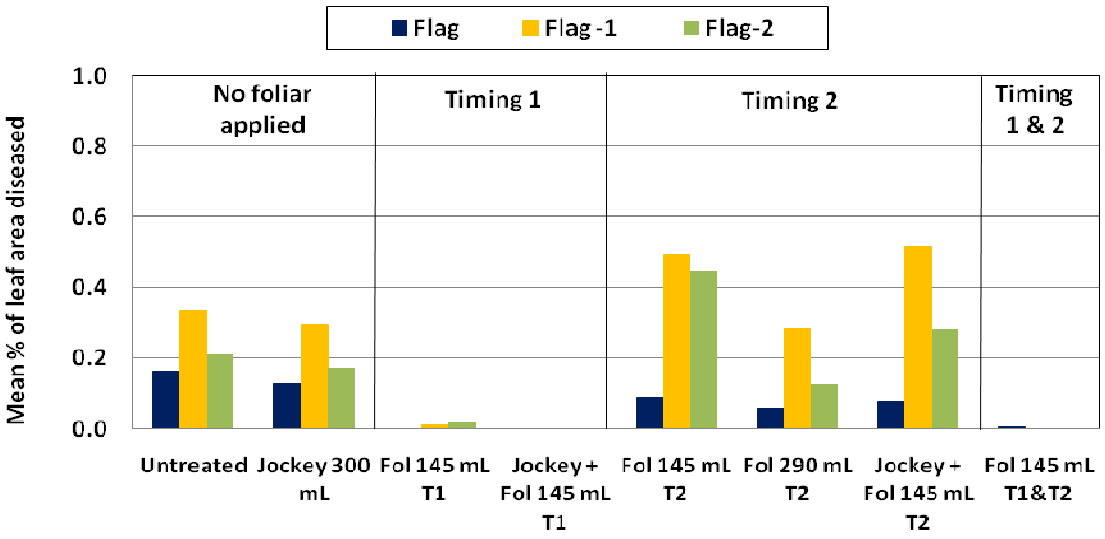
Multi-trial summary

Crop establishment

There was no impact (adverse or beneficial) from Jockey seed treatment, at 300 mL/100 kg seed, on crop establishment. This supports previous northern evaluation.

Disease levels

Stripe rust severity 2007 - % leaf area diseased at ~28 DAA1/ 13 DAA2

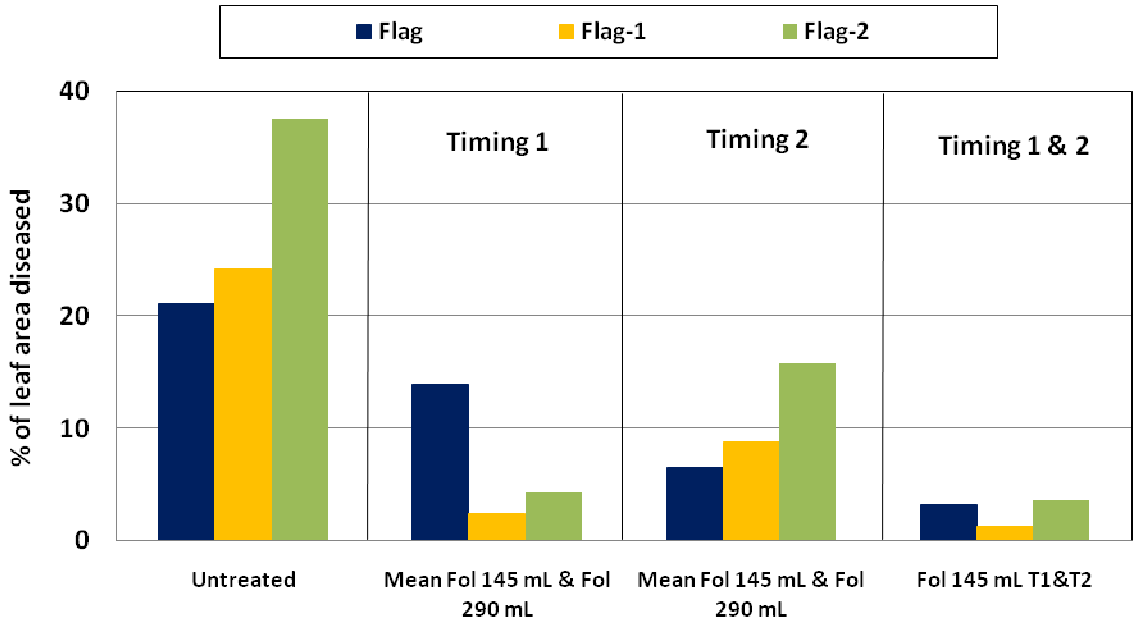


DAA1 = days after application Timing 1, DAA2 = days after application Timing 2
Graph shows the mean result over all 7 trials, Fol 145 mL = Folicur at 145 mL/ha

Key messages – stripe rust severity 2007

- **Only trace or very low levels of stripe rust established at any site**
- **Even in a very moisture stressed season, stripe rust was present at all sites**
- **T1 application clearly resulted in lowest disease levels**
- **T2 clearly too late on Flag-1 and Flag-2**
- **Jockey alone provided ~50% disease suppression at 15 DAA1 (data not presented) but was ineffective by 28 DAA1 assessment**

Stripe rust severity 2008 - % leaf area diseased at 27 DAA1/ 12 DAA2



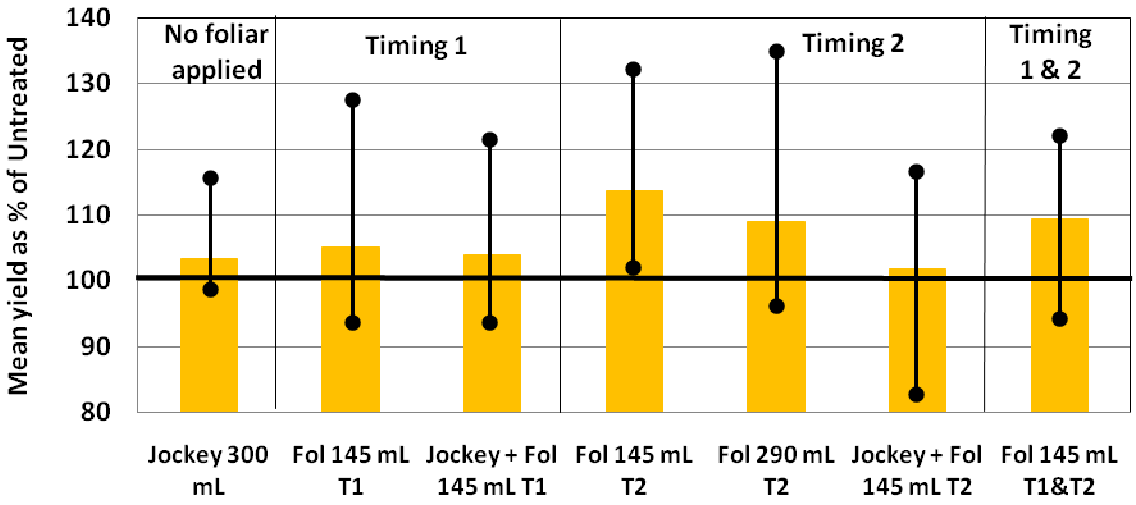
DAA1 = days after application Timing 1, DAA2 = days after application Timing 2
Disease level at T2 application: 0% on Flag, 0.2% on Flag-1, 1.8% on Flag-2
Fol 145 mL = Folicur at 145 mL/ha
Mean of Folicur 145 and 290 mL/ha results used for T1 and T2 alone
Timing 1 & 2 approach used Folicur 145 mL/ha on both dates

Key messages – stripe rust severity 2008

- **Moderate to severe epidemic with disease levels rapidly developing in the 12 days after T2 applied**
- **No clear dose response at either application timing**
- **Clear difference in pattern of disease suppression between T1 and T2**
- **T1 (GS32) very effective on Flag-1 and Flag-2, less effective on Flag**
- **T2 (GS41-49) less effective on Flag-1 and Flag-2, more effective on Flag**
- **Two spray approach clearly provided best disease management**

Yield impact

Grain yield 2007 – mean % of Untreated yield

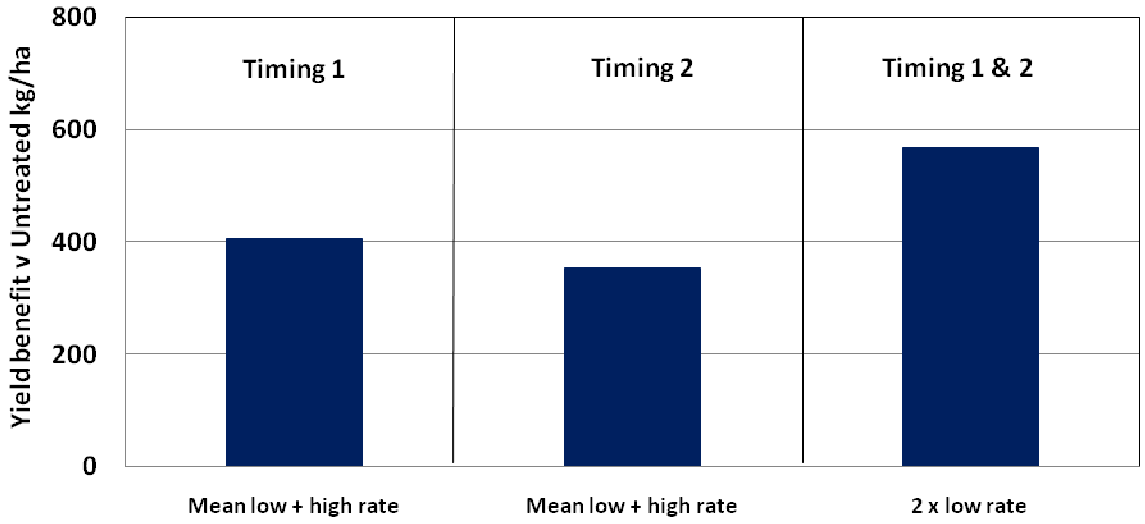


Range bars show best to worst result recorded as % of Untreated yield
Fol 145 mL = Folicur at 145 mL/ha, graph shows the mean % of Untreated yield over all 7 trials

Key messages – yield 2007

- **Untreated yield at 6 of 7 sites was between 600 and 1600 kg/ha**
- **Under very low stripe rust pressure, there was no significant difference in yield in 6 of the 7 trials**
- **However all treatments averaged higher yield than the Untreated over the entire trial series (2-14% mean benefit v Untreated)**
- **T2 fungicide application appeared to provide most consistent yield despite poor levels of stripe rust control**
- **Consequently any apparent yield effect could NOT be attributed to stripe rust control**
- **Jockey treatments recorded lowest level of benefit**

Grain yield 2008 – actual yield benefit compared to Untreated



Untreated 2600 kg/ha, no significant difference in yield between any treatment

Severe crop lodging occurred shortly before harvest.

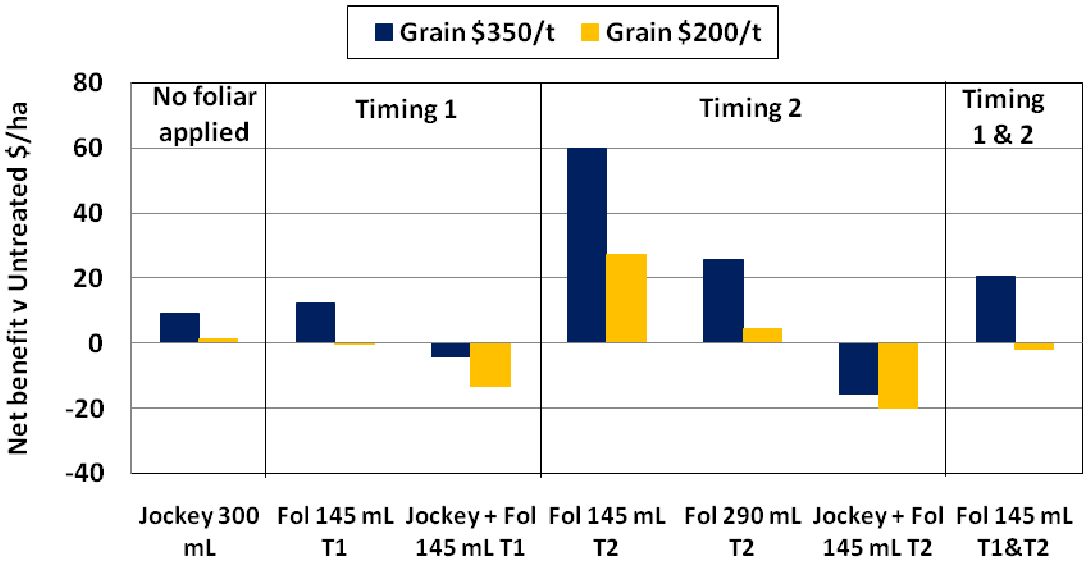
Key messages – yield 2008

- **Under moderate to high stripe rust pressure, there was no significant difference in yield but a clear trend to benefit from all fungicide treatments**
- **Similar results from either T1 or T2 applications alone**
- **Two spray approach recorded highest yield**
- **Fungicide treatment resulted in a mean 16% yield benefit compared to the Untreated (range 8-22%)**

Economic impact

Grain prices in 2007 were exceptionally high with $350/t or more often achieved. The graph below shows the net result using the 2007 grain price but also shows the net benefit with the same yield results if the grain price had been a more realistic $200/t.

Economic impact 2007 – net benefit compared to Untreated

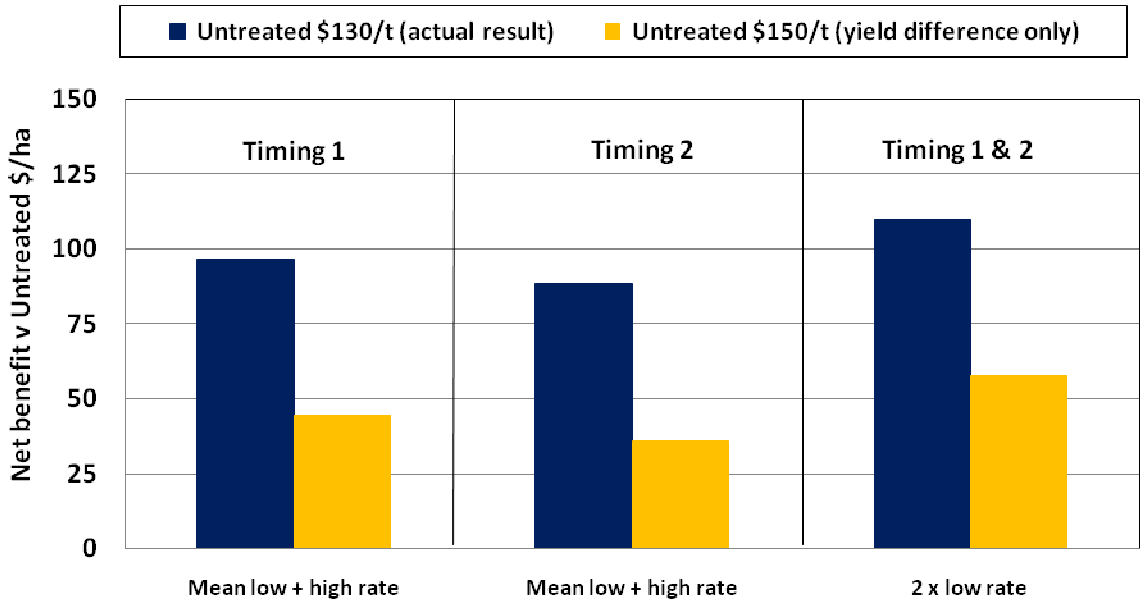


Assuming Folicur $55/L, foliar application $8/ha, Jockey $63/L, 40 kg/ha sowing rate, seed treatment application $50/t, Fol 145 mL = Folicur at 145 mL/ha

Key messages – net benefit 2007

- **Trials conducted under low yielding, low stripe rust pressure conditions**
- **At $200/t grain price there was no net benefit (or cost) over all treatments**
- **Although not significant, there was a mean $14/ha net return over all treatments at 2007 grain prices**
- **Although questionable whether this 'apparent' benefit is real, it was clear that across these seven trials there was no net economic loss**

Economic impact 2008 – net benefit compared to Untreated



Assuming Folicur $40/L, foliar application $8/ha, all fungicide treatments GP quality at $150/t

Grain prices in 2008 were substantially lower than in 2007 with frequent quality downgrading due to a wet harvest. Although this trial was harvested on November 10 (before the worst rain events) test weights were already low. Untreated grain was only eligible for feed receival (67 kg/hL) whilst all fungicide treatments were eligible for GP (69-71 kg/hL). The graph below shows the actual results with the Untreated at $130/t ($20/t discount) but also if the Untreated was not discounted and all grain was sold at equivalent $150/t.

Key messages – net benefit 2008

- **Trial conducted under high disease pressure with low grain price**
- **Mean $96/ha net return from fungicide programs at 2008 grain prices based on actual grain quality results**
- **Ignoring grain quality difference, mean $44/ha net return at $150/t grain price**