Yellow Spot Management Results 2011

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Key words

Yellow spot, fungicides, EGA Gregory⚖

GRDC code

NGA00003: GRDC Grower Solutions for Northern NSW and Southern Qld

Take home messages

1. All fungicides reduced yellow spot severity – single applications, applied at GS31-33 or GS39, by ~40-50% on the top 3 leaves

2. Multiple fungicide applications provided improved disease suppression - ~70% reduction on the top 3 leaves

3. 'Similar levels' of activity were evident from a range of fungicides applied during early stem elongation (~GS31-33)

4. Yield benefits were relatively modest (mean 6% benefit across all fungicide treatments at highest pressure site, maximum 11% benefit) despite all trials being conducted on the susceptible variety EGA Gregory⚖

5. Highest return on investment was only ~$1.50 profit for every $1 spent

Background

Yellow spot, caused by the fungus *Pyrenophora tritici-repentis*, is a common wheat disease in the northern region and particularly prevalent in minimum tillage farming systems. It is a stubble-borne disease, generally favoured by wet seasons that favour frequent and effective sporulation and infection by conidia (produced on leaf lesions) or ascospores (produced in fruiting bodies on old cereal stubble).

Yellow spot is a difficult and problematic disease to manage. In most recent years there have been a number of early management concerns, particularly in yellow spot susceptible varieties such as EGA Gregory⚖ . However unless there are consistent rain events, the disease frequently does not continue to develop and the economic impact in many years appears negligible.

Data generated by DEEDI, in conducive seasons such as 1988 and 1999, showed high levels of yield benefit (~30-50%) following a single application of propiconazole (Tilt® 500 mL/ha) when yellow spot rapidly developed late in susceptible varieties. These high levels of response were in situations where >80% of the flag leaf area was affected by yellow spot during the late milk and early dough growth stages. Trial work in 1990 however only showed yield benefits of 5-9% from a single application of propiconazole where final flag leaf disease levels only reached ~40% (Colson et al 2003)

Trial activity 2011

NGA conducted four trials on the yellow spot susceptible variety EGA Gregory⚘, evaluating a common set of foliar fungicide options (Table 1). Trials were established at Wyaga (near Goondiwindi), Condamine (west of Dalby) and at two locations in the Bellata district (between Moree and Narrabri). The approach was a combination of evaluating the impact of timing or multiple applications as well as a standard product comparison. Propimax at 285 mL/ha (equivalent propiconazole loading to Tilt at 500mL/ha) was used as the benchmark product. Propimax was used in three of the trials with the Tilt formulation used instead at Condamine.

Three application times were evaluated. Timing 1 (T1) aimed to fit in with a conventional "mid tillering" herbicide timing - where a grower would not incur an additional application cost. This timing was applied when there were ~ 5 leaves on the main tiller (GS15) with 2 to 6 tillers (GS22-26), Timing 2 (T2) was at ~GS31-33 (early stem elongation) and Timing 3 (T3) was at ~GS39-45 (full flag leaf emergence to mid boot). All treatments were applied in a total volume of 70L/ha using AIXR110015 nozzles at 300 kPa.

Table 1: Treatments evaluated

Product	Rate mL/ha	Timing
Untreated	-	-
Propimax	285	T1
Propimax	285	T2
Propimax	285	T3
Propimax	285	T1 & T2 & T3
Propimax	285	T2 & T3
Group 3 (triazole)	500	T2
Group 3 & 11 (triazole and strobilurin)	500	T2
Prosaro®	150	T2
Amistar® Xtra	400	T2
Amistar Xtra	400	T3
Propimax followed by (fb) Amistar Xtra	285 fb 400	T2 fb T3

NB The two unnamed products are registered winter cereal fungicides that do NOT have a current yellow spot registration.

Disease data was assessed at each application timing and finally ~3-4 weeks after the T3 application. Crop stage at the final assessment varied between GS65 (mid flowering) and GS83 (early dough). Yield and grain quality was determined at all sites.

Aims

1. Evaluate a range of fungicide management regimes for yellow spot suppression, yield and economic return
2. Examine whether fungicide application during "mid tillering' is a sensible strategy for yellow spot management.

Disease onset and progression

All trials were initiated at ~mid-tillering (~GS15/22-26) when yellow spot was well established in the crop with disease present on more than 80% of 'leaf 3' (third from top of plant) at a severity (% leaf area affected by yellow spot) of ~7-30%. Patterns of disease suppression were similar at all four sites with data from the trial AM1103 at Bellata used to indicate relative treatment differences under the highest yellow spot severity experienced in any of these trials. Figure 1 shows the mean level of disease severity on the top 3 leaves for key timings.

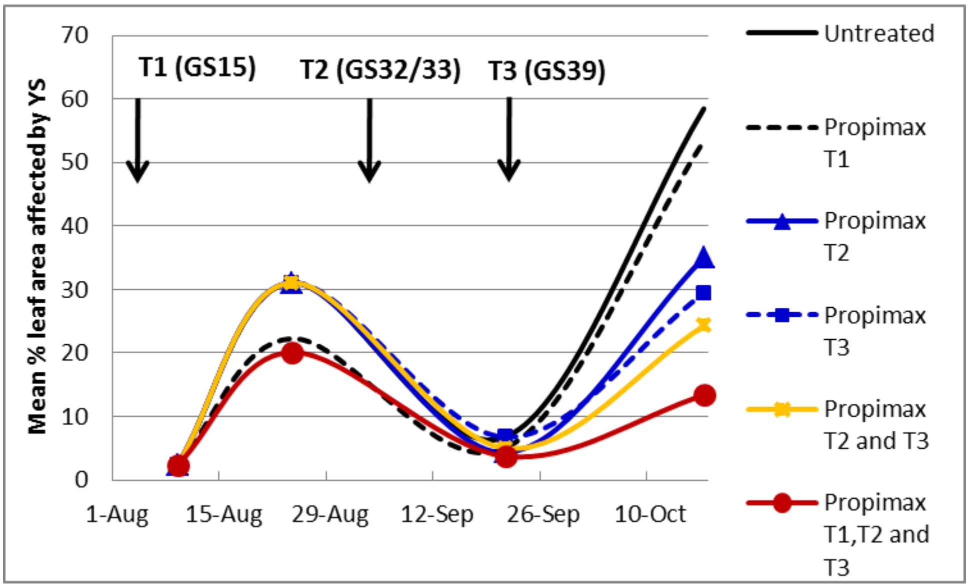


Figure 1: Disease progression from key timings and multiple applications (AM1103 Bellata)

NB the graph shows the mean leaf area affected by yellow spot lesions on the **top 3 leaves present at each assessment**. The apparent dip in disease levels from mid August to mid September is due to new leaves emerging - which at the T3 application timing only had low levels of disease present. Rainfall after the T3 application (Table 2) resulted in the increased disease severity in late September and October.

Figure 1 clearly highlights that the early application of Propimax at T1 alone (GS15/24-26) reduced disease levels in mid to late August but had negligible impact on the final disease levels on Flag, Flag-1 and Flag-2 in October.

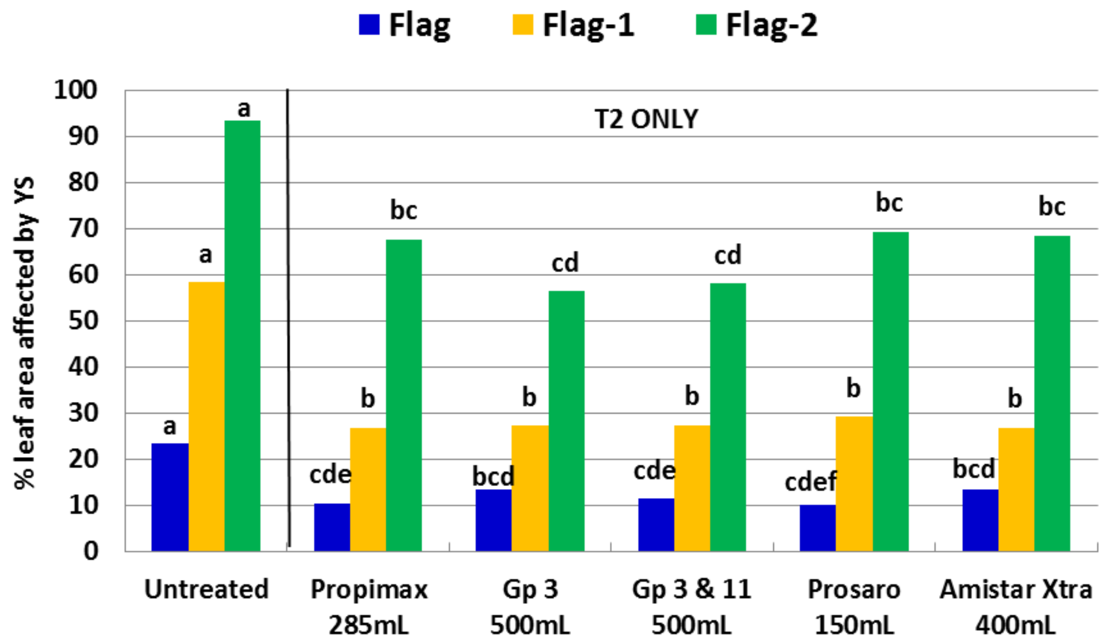
Table 2: Rainfall received (Bellata Post Office)

Period	Quantity (mm)	Number of rain days
Between T1 and T2	58	10
Between T2 and T3	48	2
Between T3 and final assessment	100	7

Rainfall in August was 58mm (170% of mean), in September 116mm (330% of mean) and in October 88 mm (180% of mean)

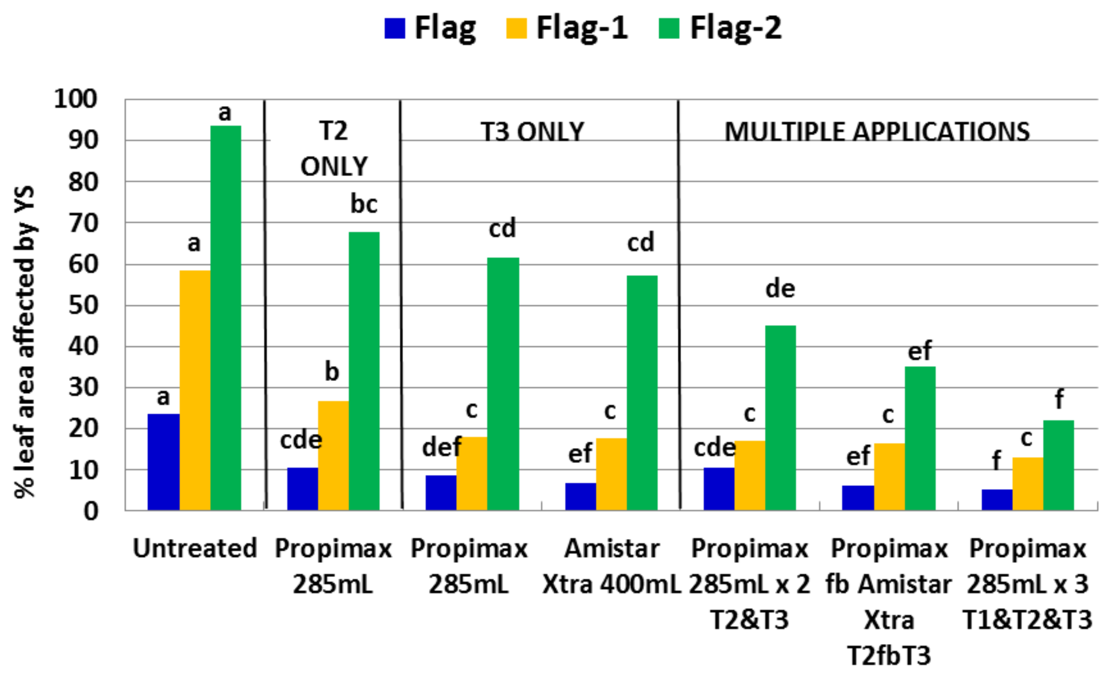
Disease Suppression

Yellow spot causes necrotic (dead) lesions on the leaf. Available fungicides appear to suppress yellow spot development by protective activity only and provide little, if any, curative or eradicant activity. Figure 2 shows the performance of the range of fungicide treatments when applied at T2 (GS32-33) on disease levels assessed at GS75-83 (milk to soft dough). This interval was 42 days. Figure 3 shows the performance of the stand-alone T3 treatments (applied at GS39) together with the multiple application regimes.



All fungicides significantly reduced YS severity compared to Untreated on all leaves
NSD between **any** fungicide on any leaf

Figure 2: Disease levels at AM1103 (Bellata) on 17/10/11 – treatments applied at T2, 42 days earlier



Clearest treatment differences between T3 and multiple applications were seen on Flag-2

Figure 3: Disease levels at AM1103 (Bellata) on 17/10/11 – T1 applied 75 days earlier, T2 applied 42 days earlier, T3 applied 26 days earlier

Yield

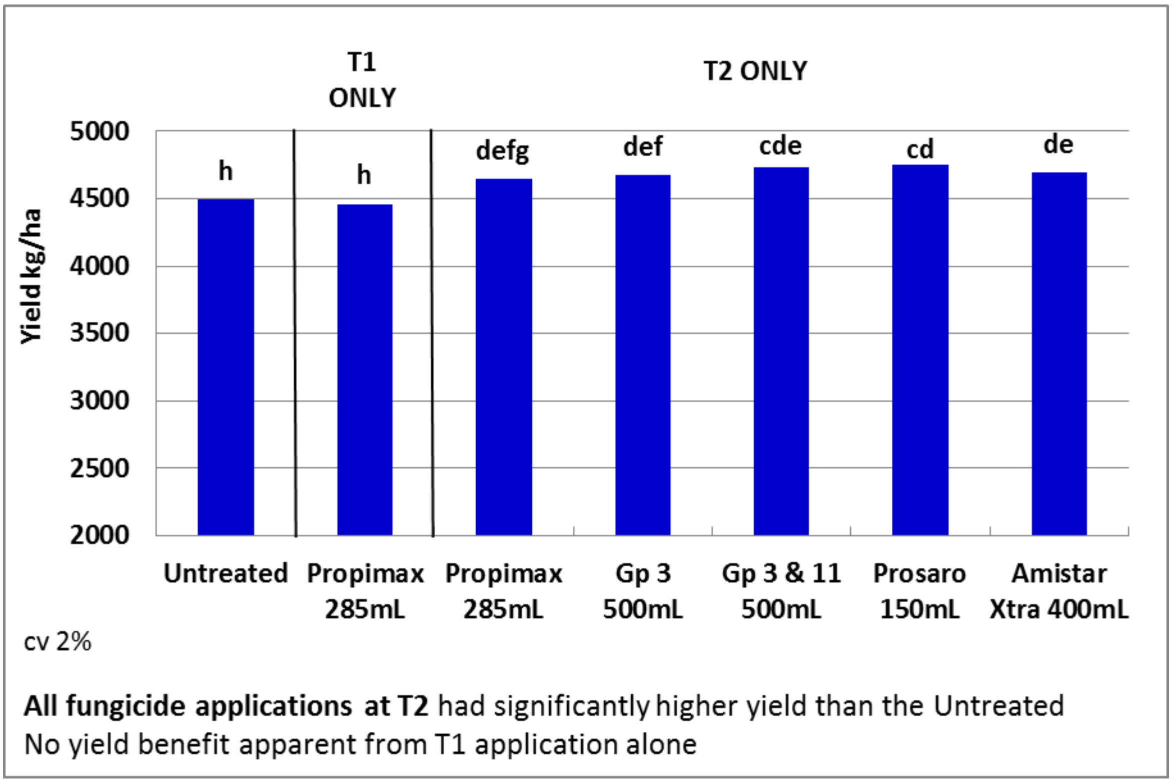


Figure 4: Yield from individual fungicide treatments applied at T1 (GS15/24-26) or T2 (GS32-33), AM1103 (Bellata)

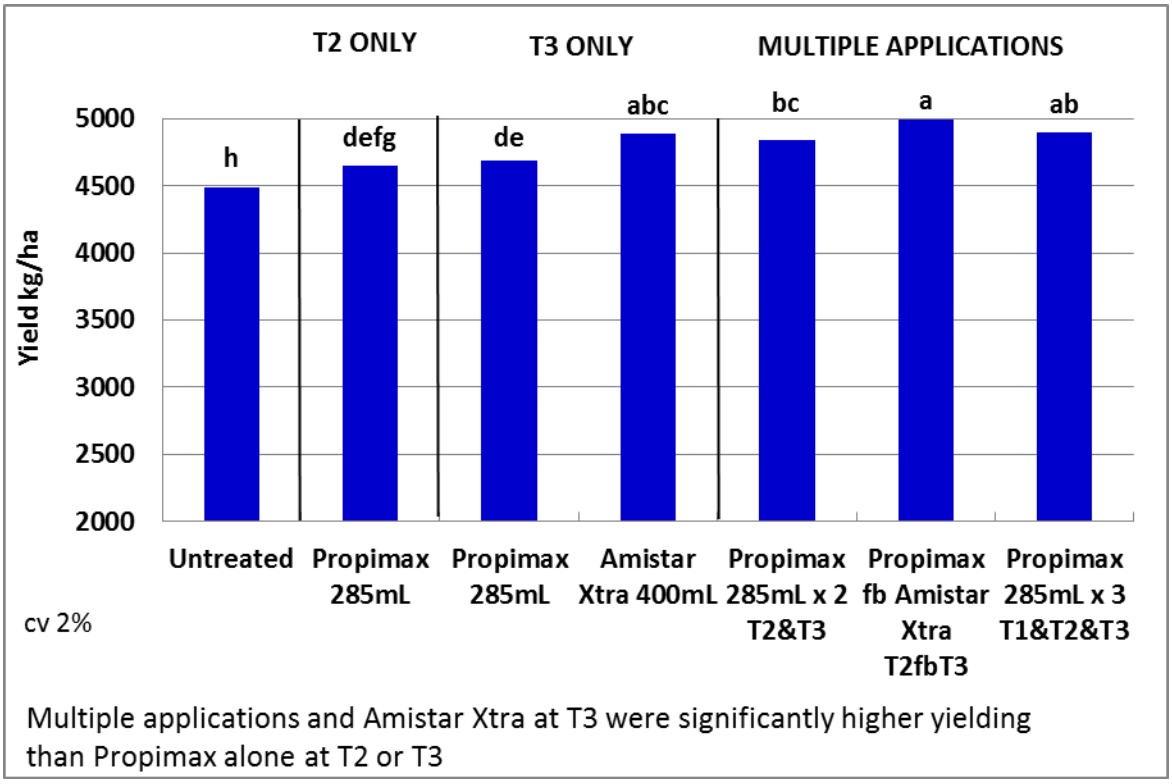


Figure 5: Yield from individual fungicide treatments applied at T3 (GS39) or multiple applications, AM1103 (Bellata)

Grain quality

Test weight of grain from Untreated plots ranged from 71-76 kg/hL across the sites. There was **no significant difference** in test weight from any fungicide treatment in any trial. Screenings in grain from the Untreated plots ranged from 2-6%. The multiple application of Propimax at T1&T2&T3 significantly reduced screenings at AM1104 Bellata, down from 6 to 3%. However in general there was negligible impact of fungicide treatment on screenings. There was no significant impact from any treatment on protein levels at any site.

Grain classification would have been APW at three sites (AM1103 Bellata, AM1104 Bellata and RD1122 Condamine) due to low protein and AUH2 at RH1115 Wyaga due to test weight. The negligible impact from fungicides on grain quality resulted in no clear impact on receival classification class.

Economics

Figures 6 and 7 show the net benefit derived from each treatment at the Bellata site AM1103, which had the highest pressure from yellow spot infection but also the overall mean across the trial series.

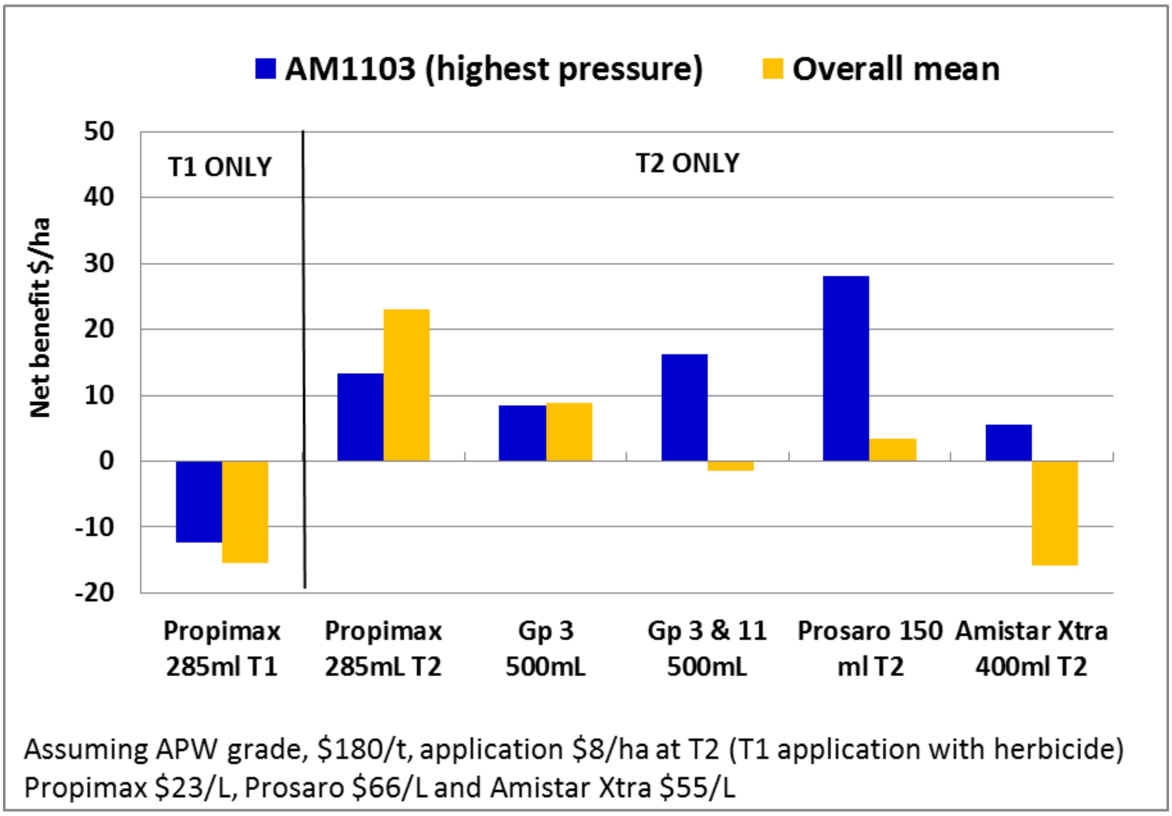


Figure 6: Net benefit from individual fungicide treatments at T1 (~GS15) or T2 (~GS31-33)

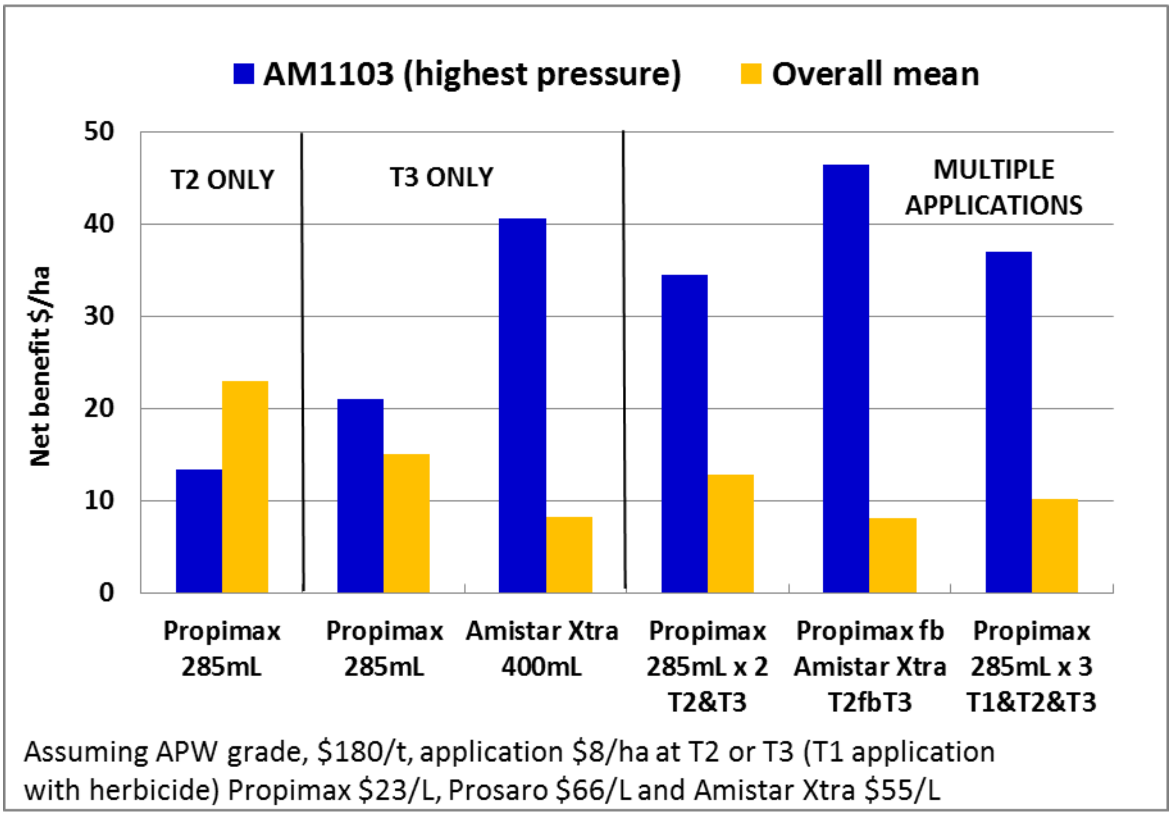


Figure 7: Net benefit from individual fungicide treatments at T3 (~GS39) or multiple applications

Clearly at Bellata (AM1103) the most consistent net returns came from either the T3 alone applications (applied at full flag leaf emergence) or from the multiple application approaches. Both these approaches also generated the most consistent net benefit across the trial series.

Net benefit is a useful measure but the multiple application treatments involve higher outlays. Figures 8 and 9 show the Return on Investment (net return – cost/cost) from fungicide management in these trials. These graphs show the $ net profit generated from each $ spent.

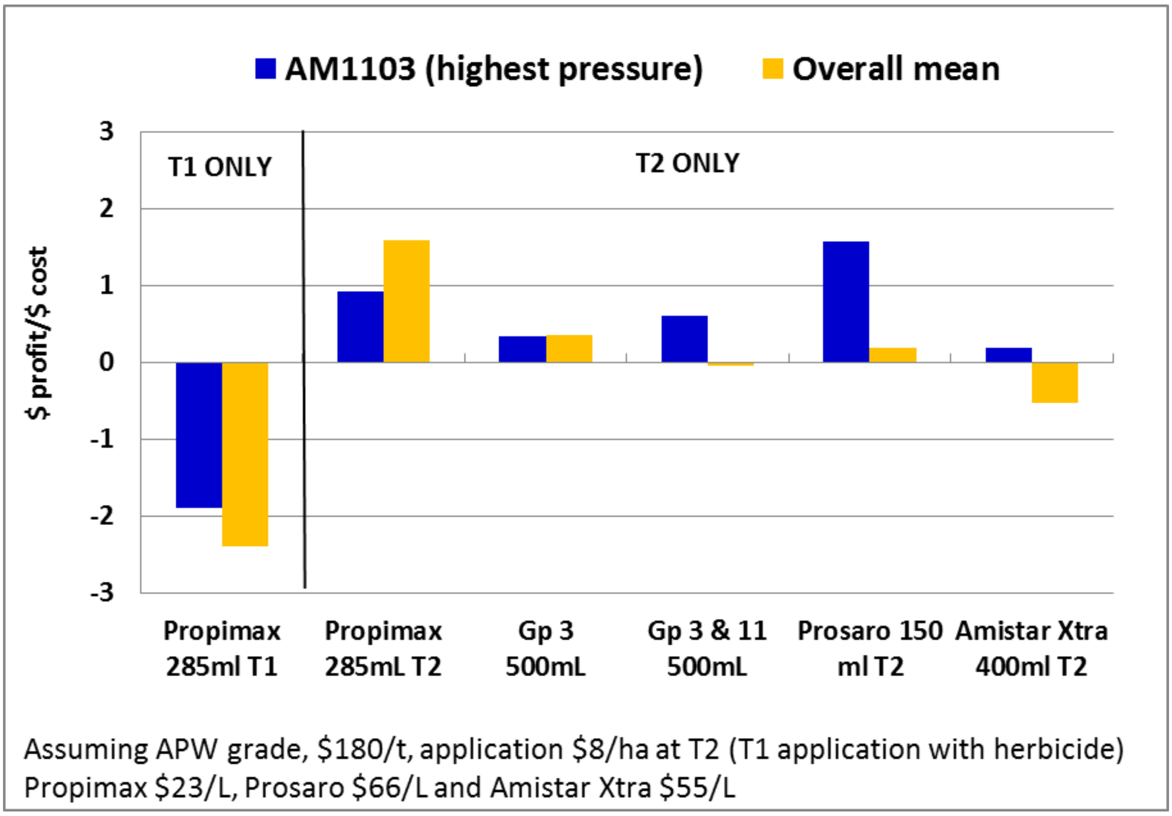


Figure 8: Return on Investment from individual fungicide treatments at T1 (~GS15) or T2 (~GS31-33)

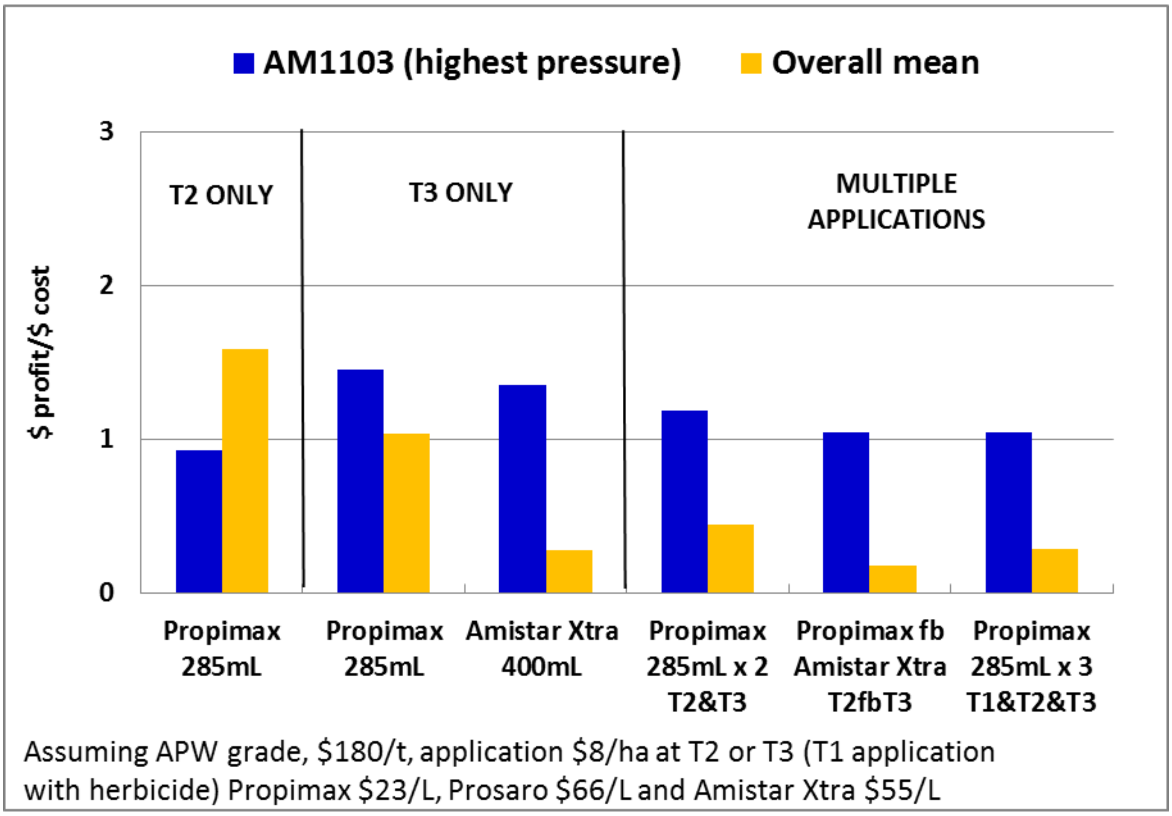


Figure 9: Return on Investment from individual fungicide treatments at T3 (~GS39) or multiple applications

Despite all trials being conducted on the yellow spot susceptible variety EGA Gregory, the yield and economic benefits obtained in these trials in 2011 were only modest. Even at the highest pressure site at Bellata (AM1103) the 'best' two individual treatments only returned ~$1.50 profit for every $1 cost. One was a single application at T2 (GS32-33) and the other a single application at T3 (GS39).

Conclusions

The tested range of fungicides all provided yellow spot suppression but only to a maximum level of impact from an individual treatment of ~50% reduction on the top 3 leaves with the highest level of suppression ~70% from multiple applications. At the rates tested, there were no clear or consistent differences in disease suppression between the fungicides evaluated.

The very early T1 application (~GS15) provided useful initial disease suppression but had negligible impact on the final disease levels assessed at the late milk to early dough stages. This timing had no value as a stand-alone treatment but did provide some additional disease suppression when part of a multiple application approach.

Of the stand-alone timings, T3 (full flag leaf emergence) provided the most consistent final disease suppression and economic performance.

Yield benefits at the two highest disease pressure sites averaged ~6% across all fungicide treatments with the best treatment resulting in an 11% benefit at both sites. **However even with this level of yield benefit the economic returns were relatively modest.** The most economic treatments at the highest pressure site provided ~$1.50 profit for every $1 of cost with the average return across all fungicide treatments ~$1 profit for every $1 of cost.

Why were the benefits so low? NGA has conducted a total of seven trials (six on EGA Gregory and one on Lang) over the 2008, 2010 and 2011 seasons with moderate levels of yellow spot infection. Clear disease suppression patterns from fungicide applications were evident at all sites. The Bellata trial (AM1103) in 2011 was the first site to provide a significant yield benefit but also had the highest level of damage to the flag leaf with ~25% affected by yellow spot lesions at late milk/ early dough. In all other trials, the level of flag leaf damage from yellow spot infection in the Untreated, at mid flowering to early dough, only ranged from ~ 1-18%. This contrasts with flag leaf disease levels of >80% in DEEDI trials where higher levels of yield benefit from fungicide applications have been reported.

Key points

Benefits from fungicide management of yellow spot are most likely to be seen in a year where frequent rain events during head emergence and grain fill result in high levels of flag leaf damage on susceptible varieties. Multiple fungicide application (at ~GS32 and GS39) is likely to provide the best disease management but may only provide good economic benefits where conditions favour disease development from stem elongation onwards. Fungicide application during mid-tillering only (~GS15), which is compatible with an in-crop herbicide application, will suppress disease levels for a short period but are unlikely to carry through to a later disease, yield or economic benefit. Single applications (close to GS39) will provide good levels of disease suppression but will need to be applied **before** significant levels of yellow spot infection have been established on the flag leaf. Previous recommendations of "applying after flag leaf emergence, when yellow spot is already colonising leaves below the flag and the forecast is for frequent rain events" are supported by these trials.

Acknowledgments

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Reference

Colson ES, Platz GJ and Usher TR (2003) Fungicidal control of Pyrenophora tritici-repentis in wheat. Australasian Plant Pathology, 32, 241 – 246.

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