NSW GOVERNMENT | Primary Industries

Northern Grains Region Trial Results Autumn 2011

RESEARCH & EXTENSION – INDEPENDENT RESEARCH FOR INDUSTRY

Editors: Loretta Serafin, Steven Simpfendorfer, Kathi Hertel, Alan Bowring and Guy McMullen

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This report has been compiled by Loretta Serafin, Steven Simpfendorfer, Alan Bowring, Kathi Hertel and Guy McMullen on behalf of the authors.

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Foreword

NSW Department of Primary Industries (NSW DPI) conducts a range of research and extension activities on a vast array of agronomic, disease, weed and insect issues related to the successful production of grains throughout the northern and central grains region. Each of these activities is targeted towards assisting growers and advisors to make improvements in the farming systems of our region.

Crop agronomy remains an integral component of successful cropping enterprises. Good crop agronomy needs to consider varietal choice, crop nutrition, weed, disease and insect management not only on an individual crop basis but needs to also account for rotational factors. Agronomic practices need to be well informed by rigorous, scientific independent research.

NSW DPI trials research and extension reported in this book are primarily conducted across the central and northern grains regions of NSW addressing a wide range of production issues in cereal, pulse and oilseed crops. This work often involves collaborative research, development and extension between NSW DPI research groups, district agronomists and external partners such as GRDC, agribusiness, private consultants and grower groups such as the Northern Grower Alliance and the Grains Orana Alliance. We would like to acknowledge the contributions of each of these people and their organisations.

This book is a collection of short papers; the second in a series, aimed at improving the awareness and accessibility of the results of the work which NSW DPI staff are involved in across the central and northern grains region. In many cases some of the papers will prompt more detailed questions and we would encourage you to discuss these with your local District Agronomist or the authors of the paper.

Finally, thankyou to all of the authors for their efforts in concisely reporting on their often extensive and complicated work. We hope you enjoy reading and utilising the information presented in this report.

The Research & Extension Team,
NSW Department of Primary Industries

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Rohan Brill[1] & Leigh Jenkins[2]

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Introduction

Trials were conducted at Trangie Agricultural Research Centre in 2009 & 2010 to determine optimum sowing dates for barley in western regions. A range of varieties with different maturities and agronomic traits have been tested in these trials, including commercially available lines and advanced breeders lines.

Site details

Location: Trangie Agricultural Research Centre (80 km NW Dubbo)

Soil type: Grey Vertosol

Results – 2009

The 2009 season started with moderate subsoil moisture and good autumn rain to allow planting to occur on time. However, after June the season turned hot and dry, with only 33 mm of rain falling from mid-June to the end of September.

Three sowing dates were trialled in 2009, being 30th April, 18th May and 18th June.

Early flowering was correlated with higher yields in 2009 (Figure 1).

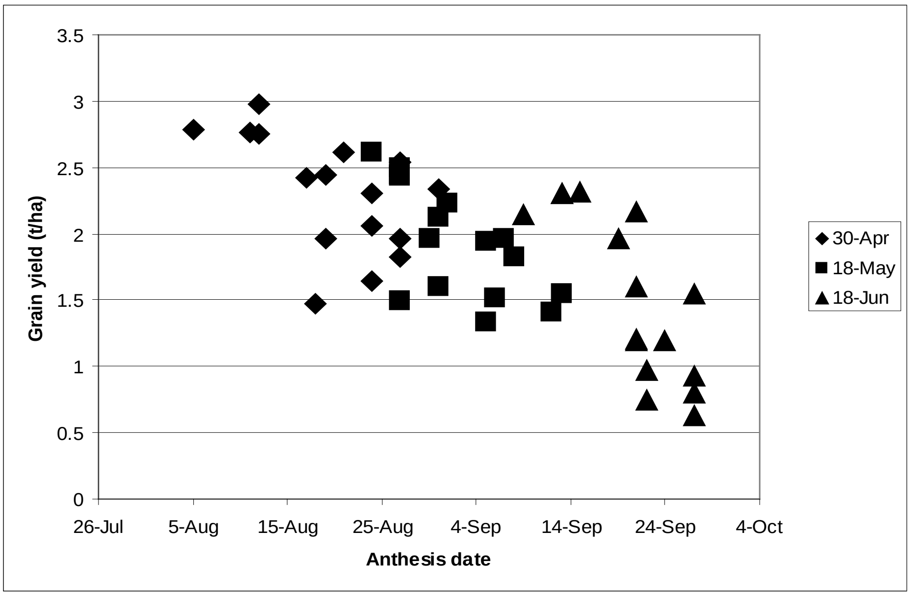

Figure 1. Relationship between anthesis date and yield of 16 barley varieties sown at 3 sow times – Trangie 2009

Similar to wheat trials at TARC in 2009, quick maturity varieties (e.g. Hindmarsh, Roe, VB0611, Grout) had higher yields than mid and late maturity varieties, even where the quick varieties flowered later (from later plantings) than the late maturity varieties (Table 1).

Table 1. Yield and anthesis date of 16 barley varieties sown at 3 sow times – Trangie 2009

Variety	Yield (t/ha) and rank within sow time						Anthesis date		
	30-Apr		18-May		18-Jun		30-Apr	18-May	18-Jun
Buloke	2.42	8	1.96	7	1.96	6	17-Aug	30-Aug	19-Sep
Capstan	2.34	9	1.82	10	0.93	13	31-Aug	8-Sep	27-Sep
Commander	1.64	15	1.33	16	1.19	11	24-Aug	5-Sep	24-Sep
Fitzroy	2.3	10	1.94	9	1.55	8	24-Aug	5-Sep	27-Sep
Fleet	1.96	12	1.6	11	1.6	7	19-Aug	31-Aug	21-Sep
Gairdner	2.06	11	1.52	13	0.75	15	24-Aug	6-Sep	22-Sep
Grout	2.76	3	2.43	4	2.31	2	11-Aug	27-Aug	13-Sep
Hindmarsh	2.98	1	2.44	3	2.31	2	12-Aug	27-Aug	13-Sep
Roe	2.78	2	2.61	1	2.15	5	5-Aug	24-Aug	9-Sep
Schooner	2.44	7	2.12	6	2.17	4	19-Aug	31-Aug	21-Sep
Shepherd	1.47	16	1.49	14	1.21	9	18-Aug	27-Aug	21-Sep
Urambie	2.54	6	1.96	7	0.63	16	27-Aug	7-Sep	27-Sep
Westminster	1.96	12	1.41	15	0.8	14	27-Aug	12-Sep	27-Sep
VB0611	2.75	4	2.5	2	2.32	1	12-Aug	27-Aug	15-Sep
WABAR2315	2.61	5	2.23	5	1.2	10	21-Aug	1-Sep	21-Sep
WI4262	1.83	14	1.55	12	0.97	12	27-Aug	13-Sep	22-Sep
Mean of sow time	2.30		1.93		1.50				
l.s.d. p = 0.05	0.475								

Results – 2010

The 2010 season started with soil profiles at field capacity at sowing, good rains in autumn to allow timely planting, and regular rainfall events through the growing season combined with mild spring temperatures.

The 2010 trial suffered from waterlogging at several stages throughout the season, with the late sowing date appearing to suffer more than the two earlier sowing dates. Fungal leaf diseases were not a significant issue, as there were several applications of tebuconazole to aid with control.

Three sowing dates were trialled in 2010, being 4th May, 22nd May and 10th June.

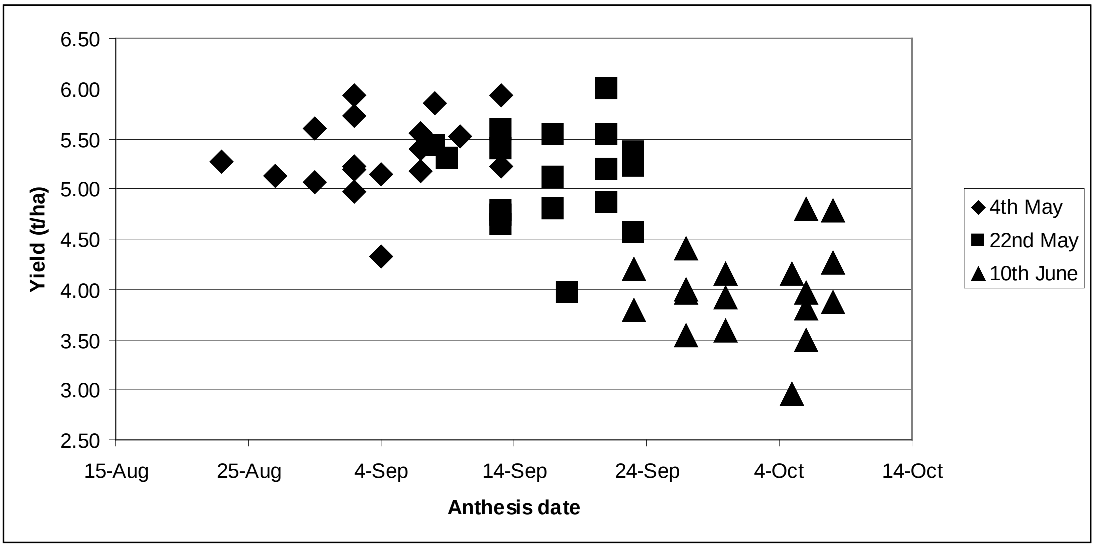

Figure 2. Relationship between anthesis date and yield of 18 barley varieties across 3 sow times – Trangie 2010

In contrast to 2009 where highest yields came from treatments that flowered in early to mid August, the highest yields in 2010 came from treatments that flowered through an extended period from early September to mid September. Yields of the 4th May and the 22nd May sowing dates were similar, and were both significantly greater than the 10th June sowing date. It is likely that yields were lower at the 10th June sowing date due to a combination of factors, including waterlogging and the associated reduced root growth.

Table 2. Yield and anthesis date of 18 barley varieties sown at 3 sow times – Trangie 2010

Variety	Yield (t/ha) and rank within sow time						Anthesis date		
	4th May		22nd May		10th June		4th May	22nd May	10th June
Buloke	4.98	17	4.79	14	3.54	16	2-Sep	13-Sep	27-Sep
Capstan	5.94	1	5.23	9	4.27	4	13-Sep	23-Sep	8-Oct
Commander	5.15	14	4.80	13	3.92	11	4-Sep	17-Sep	30-Sep
Fitzroy	5.40	8	5.19	10	3.80	13	7-Sep	21-Sep	6-Oct
Fleet	5.73	4	5.54	4	4.15	7	2-Sep	17-Sep	30-Sep
Gairdner	5.17	13	4.56	17	3.49	17	7-Sep	23-Sep	6-Oct
Grout	5.60	5	5.58	2	4.00	8	30-Aug	13-Sep	27-Sep
Hindmarsh	5.07	16	4.64	16	3.79	14	30-Aug	13-Sep	23-Sep
Oxford	5.85	3	5.54	3	4.79	2	8-Sep	21-Sep	8-Oct
Roe	5.27	9	5.43	5	4.20	5	23-Aug	8-Sep	23-Sep
Schooner	4.33	18	3.97	18	2.96	18	4-Sep	18-Sep	5-Oct
Scope	5.22	11	4.74	15	3.58	15	2-Sep	13-Sep	30-Sep
Shepherd	5.13	15	5.31	8	3.97	9	27-Aug	9-Sep	27-Sep
Urambie	5.22	10	4.87	12	4.16	6	13-Sep	21-Sep	5-Oct
VB0611	5.93	2	5.40	6	4.40	3	2-Sep	13-Sep	27-Sep
WABAR2315	5.20	12	5.12	11	3.97	10	2-Sep	17-Sep	6-Oct
Westminster	5.55	6	5.99	1	4.80	1	7-Sep	21-Sep	6-Oct
WI4262	5.53	7	5.37	7	3.87	12	10-Sep	23-Sep	8-Oct
Mean of sow time	5.35		5.12		3.98				
variety lsd (p=0.05)	0.29 t/ha								
sow time lsd (p=0.05)	0.28 t/ha								

Mean yields in 2010 were higher than mean yields in 2009 (Tables 1 and 2). In contrast to their low ranking in 2009, late maturing varieties such as Capstan and Westminster ranked much higher in yields in 2010, and had much greater yield stability across the three sow times.

Time taken from planting to anthesis was much greater in 2010 than 2009. For example Hindmarsh sown on the 22nd of May in 2010 took 114 days from planting to anthesis, compared to 99 days from planting to anthesis in 2009 from an 18th May plant.

Discussion

The 2009 and 2010 seasons both allowed for anthesis to occur earlier than what is normally accepted as very low frost pressure from mid-August and through September was experienced in both seasons. In 2009, this allowed for highest yields to be produced with early flowering dates (early to mid August), but this was not the case in 2010, with yields of the earliest flowering treatments generally being no better than the treatments that flowered through September, even though there was low frost pressure in August.

In 2009, the highest yielding treatments were quick maturity varieties sown early. The late maturity varieties had similar yields to the mid maturity varieties from the 30th April and 18th May sow times, but performed relatively poorly from the 18th of June sowing time (Figure 3).

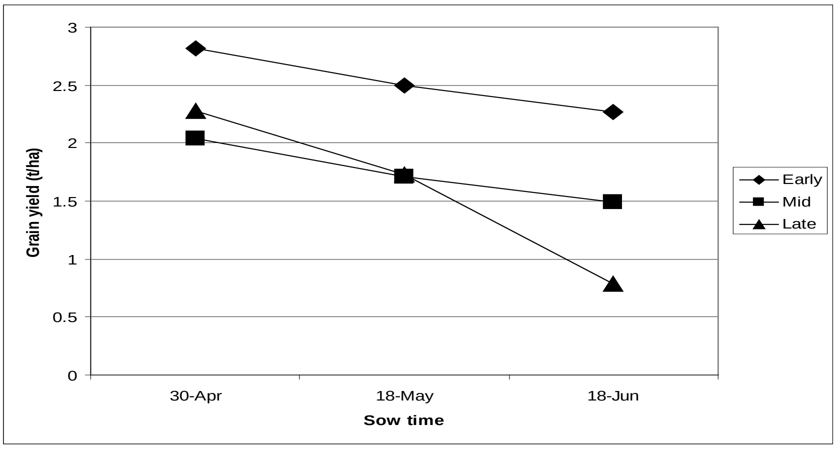

Figure 3. Yield comparison of early maturity, mid maturity and late maturity barley varieties at 3 sow times – Trangie 2009

The increased yield obtained with quick maturity varieties is likely due to them having more moisture available for utilisation at critical reproductive stages (e.g. post anthesis) than later maturity lines, which resulted in greater quantities of grain per unit of dry matter production. The proportion of grain to total dry matter at harvest is known as the 'harvest index'. A comparison of harvest index between different maturity groups is outlined in Figure 4, showing that quick maturity varieties had greater harvest index than mid and late maturity varieties at all three sow times.

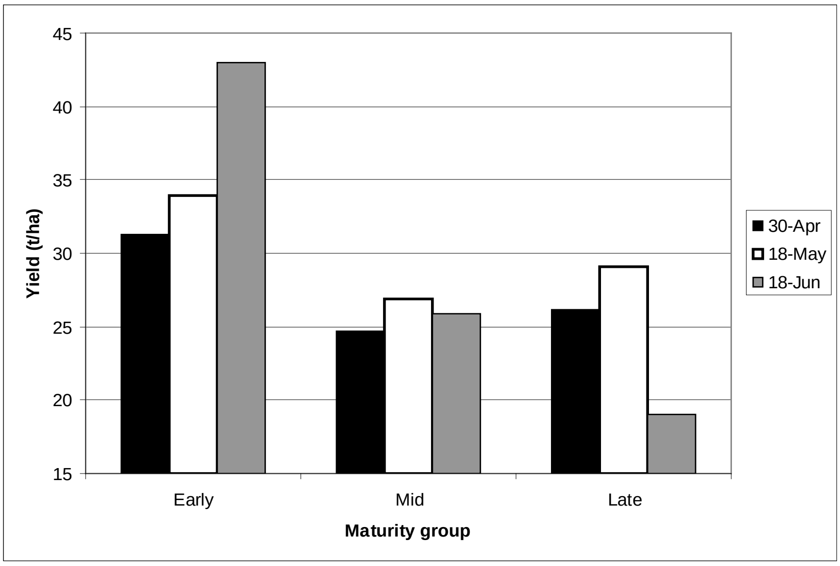

Figure 4. Harvest index comparison of early, mid and late maturity varieties at 3 sow times – Trangie 2009

In contrast to 2009, highest yields in 2010 came from the late maturity varieties at all three sow times (Figure 5). These varieties have greater yield potential than the quick maturity lines, but are only able to realise this potential in above average years and usually from early sowing.

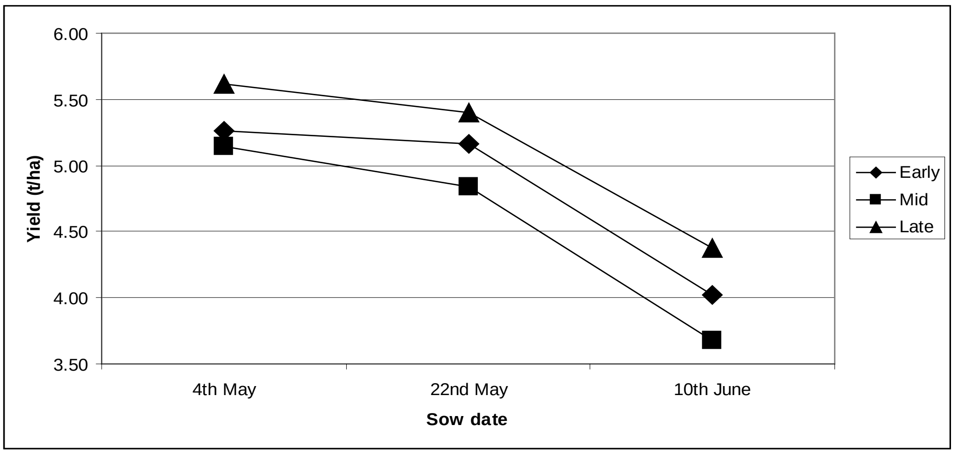

Figure 5. Yield comparison of early, mid, and late maturity varieties at 3 sow times – Trangie 2010

Hindmarsh was one of the standout varieties in 2009, but did not perform as well relative to other varieties in 2010. Hindmarsh does have the advantage of offering yield stability across sowing dates compared to late maturity varieties such as Capstan (Figure 6), and is also likely to give yield stability from season to season. Yield of Hindmarsh can be compromised by poor establishment, as it has a short coleoptile and does not establish well from deep sowing.

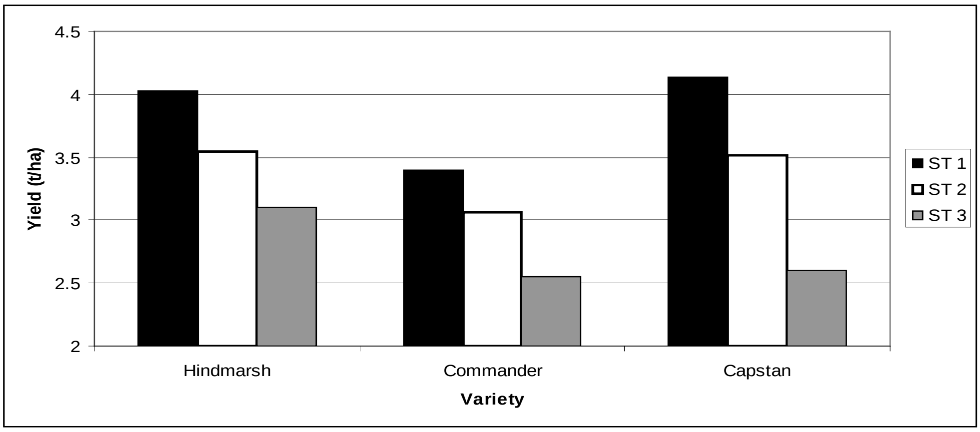

Figure 6. Average of 2009 and 2010 yields across three sow times for three varieties

Early sowing has resulted in highest yields in both 2009 and 2010, with the mid-May sowing giving similar yields to early sowing in 2010. In reality, the focus of sowing operations in the late April to early May period is generally on higher income crops of canola and hard wheat. This leaves barley to be planted later, generally from around mid-May. From this sowing and later, the best option is likely to be quick maturity varieties such as Hindmarsh and Grout. Hindmarsh offers an advantage in this quick maturity bracket, being accepted as 'food' grade at a premium to feed at some locations (providing malt specifications are met).

For growers targeting domestic malt markets with varieties such as Gairdner and Commander, it is important these varieties are planted relatively early. This early sowing is also important for growers planting late maturity varieties such as Capstan, Oxford and Westminster.

Schooner performed well relative to other malting varieties in 2009, but the 2010 trial showed that there are options available such as Buloke with improved yield over Schooner for the export malt market.

Acknowledgements

Thanks to Jayne Jenkins, Robert Pither & Gavin Melville, NSW DPI (Trangie), Bruce McCorkell, NSW DPI (Tamworth) and Neil Fettell, NSW DPI (Condobolin).

Wheat sow time – Trangie 2009 & 2010

Rohan Brill & Leigh Jenkins

NSW DPI, Coonamble & Warren

Introduction

Trials were conducted at Trangie Agricultural Research Centre in 2009 & 2010 to determine optimum sowing dates for wheat in western regions. Generally, the optimum sowing date is one which results in wheat flowering after the last frost, before heat commences and with adequate reserves of soil moisture to support grain-fill. Other agronomic factors also need to be taken into consideration, especially weed control and disease management.

Site details

Location: Trangie Agricultural Research Centre (80 km NW Dubbo)

Soil type: Grey Vertosol

2009

The 2009 season started with moderate subsoil moisture and good autumn rain to allow planting to occur on time. However, after June the season turned hot and dry, with only 33 mm of rain falling from mid-June to the end of September.

Three sowing dates were trialled in 2009:

1. 27th April,
2. 18th May and
3. 17th June.

Early flowering was correlated with higher yields in 2009 (Figure 1).

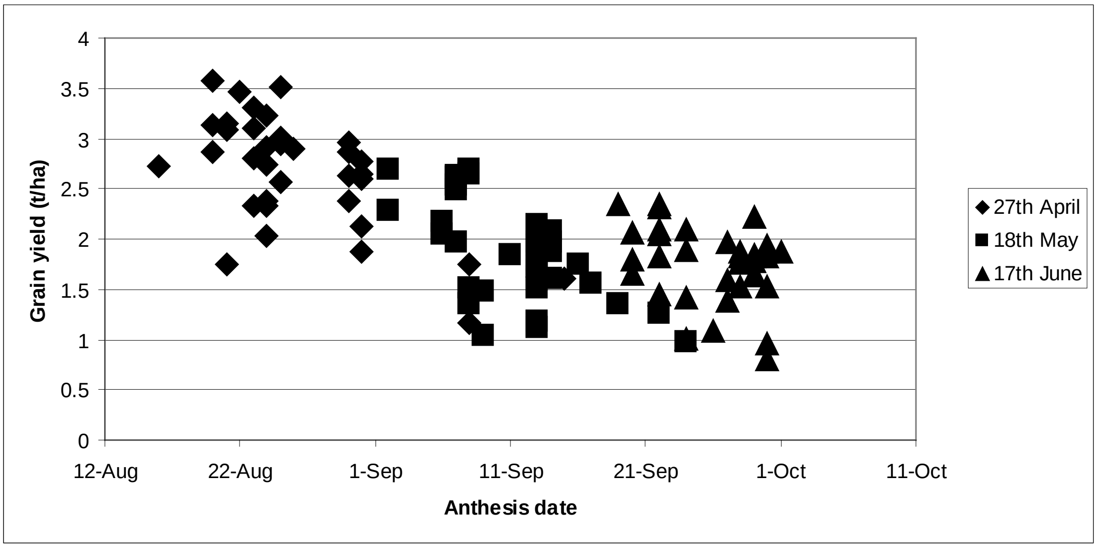

Figure 1. Relationship between anthesis date and yield of 30 wheat varieties sown at 3 sow times – Trangie 2009

Furthermore, quick maturing lines (e.g. Lincoln, Livingston, Merinda, Ventura) sown in their standard planting window (18th May) had significantly higher yields than late maturing lines (e.g. Sunzell, Strzelecki) sown in their standard planting window (27th April), even though they flowered within 1–2 days of each other (Table 1).

Table 1. Yield and anthesis date of 30 wheat varieties sown at 3 sow times – Trangie 2009

Variety	Yield (t/ha) and rank within sow time						Anthesis date		
	27th April		18th May		17th June		27th April	18th May	17th June
Axe	2.73	20	2.70	1	2.35	1	16-Aug	2-Sep	19-Sep
EGA_Bellaroi	2.34	27	1.03	35	1.01	34	24-Aug	9-Sep	24-Sep
Caparoi	2.33	28	1.48	29	1.45	30	23-Aug	9-Sep	22-Sep
Crusader	3.13	7	2.04	12	1.79	21	20-Aug	6-Sep	20-Sep
EGA_Bounty	2.65	21	1.61	24	1.64	26	31-Aug	14-Sep	29-Sep
EGA_Eaglehawk	1.61	35	1.26	32	0.96	35	15-Sep	22-Sep	30-Sep
EGA_Gregory	2.38	25	1.94	17	1.85	15	30-Aug	13-Sep	29-Sep
Lincoln	3.30	4	2.65	3	2.10	5	23-Aug	8-Sep	22-Sep
Livingston	3.15	6	2.54	6	1.83	17	21-Aug	7-Sep	22-Sep
Merinda	3.51	2	2.69	2	2.09	6	25-Aug	8-Sep	24-Sep
Strzelecki	1.75	32	1.55	26	1.88	12	8-Sep	17-Sep	1-Oct
Sunvale	2.87	15	1.96	16	1.87	14	30-Aug	14-Sep	30-Sep
Sunvex	2.13	29	1.19	33	1.53	28	31-Aug	13-Sep	30-Sep
Sunzell	1.17	36	1.35	30	1.82	19	8-Sep	19-Sep	29-Sep
Ventura	3.46	3	2.64	4	2.32	3	22-Aug	7-Sep	22-Sep
Mean of sowing time	2.64		1.86		1.75				
lsd p = 0.05	0.506								

2010

The 2010 season started with soil profiles at field capacity at sowing, good rains in autumn to allow timely planting, and regular rainfall events through the growing season combined with mild spring temperatures.

The 2010 trial suffered from waterlogging at several stages throughout the season, as well as being affected by the fungal leaf disease yellow spot.

Four sowing dates were trialled in 2010 being:

1. 20th April,
2. 3rd May,
3. 19th May and
4. 10th June.

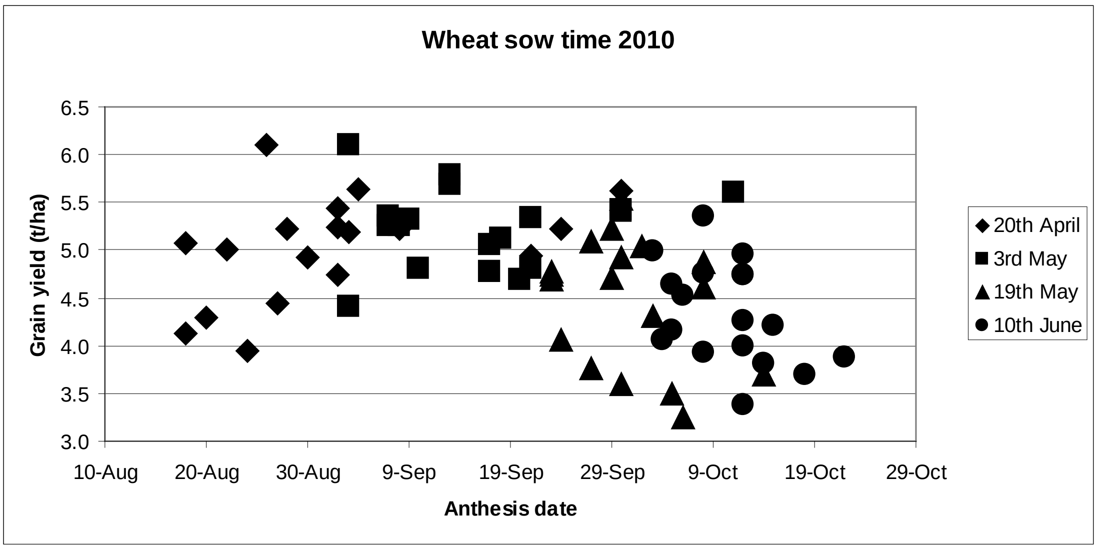

Figure 2. Relationship between anthesis date and yield of 15 wheat varieties across 4 sow times – Trangie 2010

In contrast to 2009, yield did not deteriorate rapidly with later flowering dates (Figure 2). For 2010, best yields were obtained from treatments that flowered around early September, however there was generally little yield reduction for treatments that flowered throughout September. Also in contrast to 2009, the earliest flowering dates did not result in the highest yields, even though they did not appear to be significantly frost affected.

Table 2. Yield and anthesis date of 15 wheat varieties sown at 4 sow times – Trangie 2010

Variety	Yield (t/ha) and rank within sow time								Anthesis date			
	20th April		3rd May		19th May		10th June		20th April	3rd May	19th May	10th June
Axe	4.13	14	4.41	15	4.06	10	4.06	9	18-Aug	3-Sep	24-Sep	4-Oct
EGA Bellaroi	4.93	10	5.78	1	5.53	1	4.74	3	30-Aug	13-Sep	30-Sep	12-Oct
Crusader	4.45	12	4.82	11	3.77	11	4.15	8	27-Aug	10-Sep	27-Sep	5-Oct
EGA Bounty	4.75	11	4.78	13	5.04	4	4.96	2	2-Sep	17-Sep	2-Oct	12-Oct
EGA Eaglehawk	5.63	2	5.60	2	3.70	12	3.89	12	30-Sep	11-Oct	14-Oct	22-Oct
EGA Gregory	5.20	7	4.69	14	3.59	13	3.99	10	3-Sep	20-Sep	30-Sep	12-Oct
EGA Wedgetail	5.22	5	5.40	4	4.62	8	4.21	7	24-Sep	30-Sep	8-Oct	15-Oct
Lincoln	5.01	8	5.26	8	5.10	3	5.36	1	22-Aug	7-Sep	27-Sep	8-Oct
Livingston	4.30	13	5.35	5	4.77	6	4.64	4	20-Aug	7-Sep	23-Sep	5-Oct
Merinda	5.23	4	5.33	6	5.22	2	3.93	11	28-Aug	9-Sep	29-Sep	8-Oct
Spitfire	3.94	15	5.25	9	4.75	7	4.53	5	24-Aug	8-Sep	23-Sep	6-Oct
Strzelecki	5.22	5	4.80	12	3.25	15	3.38	15	8-Sep	21-Sep	6-Oct	12-Oct
Sunvale	5.43	3	5.05	10	3.49	14	3.81	13	2-Sep	17-Sep	5-Oct	14-Oct
Sunvex	5.64	1	5.33	6	4.30	9	4.26	6	4-Sep	21-Sep	3-Oct	12-Oct
Sunzell	4.94	9	5.42	3	4.88	5	3.70	14	21-Sep	30-Sep	8-Oct	18-Oct
Mean of sow time	4.93		5.15		4.41		4.24					
lsd p = 0.05	0.77											

Mean yields in 2010 were higher than mean yields in 2009 (Tables 1 and 2). In contrast to the 2009 season, there was no evidence of quick maturing lines being higher yielding than late maturing lines when flowering at similar times in 2010.

The contrast between 2009 and 2010 with regard to the number of days from sowing to anthesis is also highlighted in Tables 1 and 2. For the mid season sowing (18th May in 2009 and 19th May 2010), the greatest difference between 2009 and 2010 seasons in the time taken to anthesis was 21 days for Axe and EGA Eaglehawk, while Livingston had the smallest difference of 15 days.

Discussion

The 2009 and 2010 seasons both allowed for anthesis to occur earlier than what is normally accepted as very low frost pressure from mid-August and through September was experienced in both seasons. In 2009, this allowed for highest yields to be produced with early flowering dates (mid-August), but this was not the case in 2010, with yields of the earliest flowering treatments generally being lower than the treatments that flowered around mid-September.

In 2009, the higher yields obtained with earlier anthesis was likely related to wheat plants having reduced exposure to high temperature and low soil moisture at critical reproductive stages. However, plant maturity type also had a significant effect, with quick maturing lines (e.g. Livingston, Ventura, Lincoln, Merinda) sown on the 18th May and the 17th June yielding significantly higher than later maturing lines (e.g. Sunzell, Sunbri, EGA Eaglehawk) sown on the 27th April. This also included where later sown quicker maturing lines flowered after the early sown late maturing lines (Figure 3).

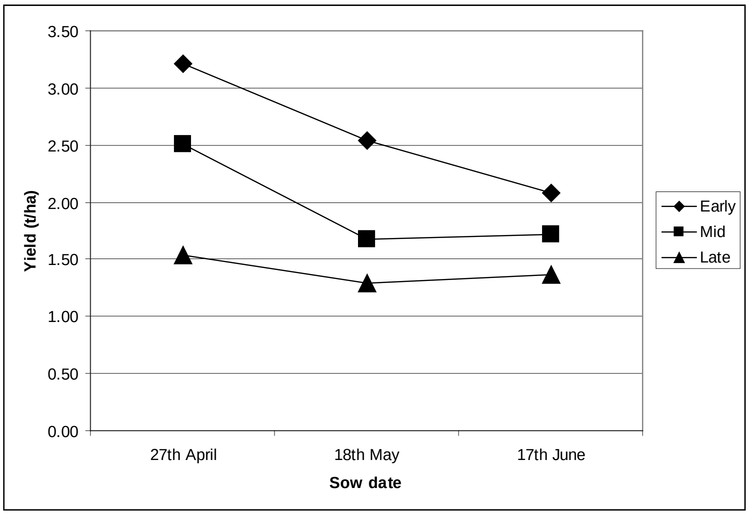

Figure 3. Yield comparison of early maturity (e.g. Livingston, Lincoln, Merinda), mid maturity (e.g. EGA Gregory, EGA_Bounty, Sunvale), and late maturity (e.g. EGA Eaglehawk, Sunzell) varieties at 3 sow times – Trangie 2009

The increased yield obtained with quicker maturing lines is likely due to them having more moisture available for utilisation at critical reproductive stages (e.g. post anthesis) than later maturity lines, which resulted in greater quantities of grain per unit of dry matter production. The proportion of grain to total dry matter at harvest is known as the 'harvest index'. A comparison of harvest index between different maturity groups is outlined in Figure 4.

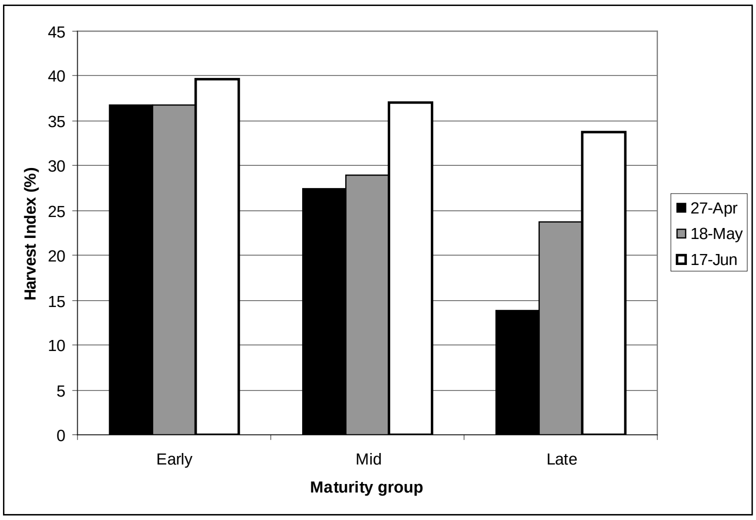

Figure 4. Harvest index comparison of early, mid and late maturity varieties at 3 sow times – Trangie 2009

In contrast to 2009, there was not a clear advantage in sowing a particular maturity group in 2010, provided a variety was sown in its optimum sowing window based on its own maturity (Figure 5).

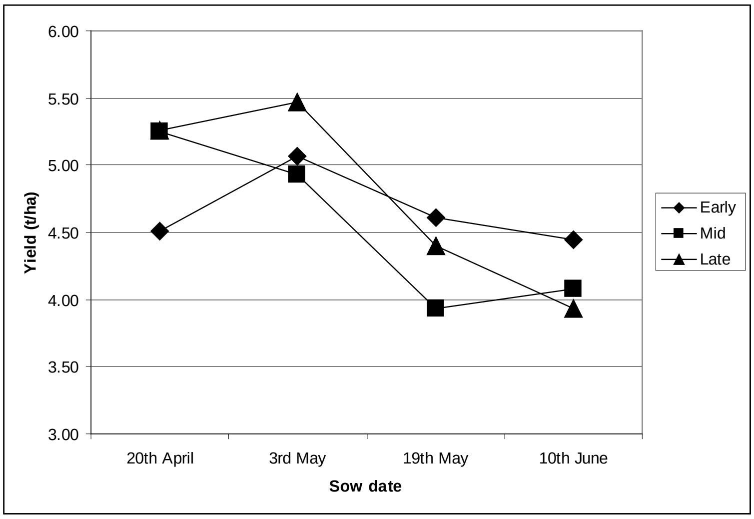

Figure 5. Yield comparison of early, mid, and late maturity varieties at 3 sow times – Trangie 2010

The 20th April sowing resulted in reduced yields compared to the 3rd May sowing for the early maturity varieties, even though frost was not a significant factor (Figure 5). One possible explanation for this is that the rapid development of these lines led to reduced yield potential being set at an early growth stage.

Late maturity groups performed relatively better in 2010 than 2009, but still had a sharp drop off in yield after the 3rd May sow date (Figure 5), highlighting the need for these varieties to be planted early.

These trials have been conducted over two vastly different seasons where frost was not a significant factor. For an 'average' season where there would likely be at least one frost event from mid-August to mid-September, the results would likely look different, especially for treatments that resulted in very early flowering.

Acknowledgements

Thanks to Jayne Jenkins, Robert Pither & Gavin Melville, NSW DPI (Trangie), Bruce McCorkell, NSW DPI (Tamworth) and Neil Fettell, NSW DPI (Condobolin).

Canola row space – Coonamble 2009

Rohan Brill

NSW DPI, Coonamble

Introduction

Canola is generally considered a risky crop in north-western areas with hot and dry springs common. Growers are looking at ways at reducing the risk of the crop, especially by trying to 'meter' moisture through the season, as is done successfully with sorghum. A trial was conducted in cooperation with local farmer James Nalder to look at the effect of 2 row spacings (40 cm and 80 cm) on canola establishment and yield. The trial was sown with a Daybreak disc seeder on 40 cm row spacings, with 2 hoses running to one unit for the 80 cm treatment.

Site details

Location:	Coonamble
Sowing Date:	12th May 2009
Variety:	44C79
Sowing rate:	2.2 kg/ha
Fertiliser:	Nil
Soil:	Grey Vertosol
Moisture:	40 mm PAW at sowing (estimate) plus 170 mm in-crop rain

Establishment

Although the sowing rate was the same for both row spacings, the 80 cm rows had significantly fewer plants establish than the 40 cm rows.

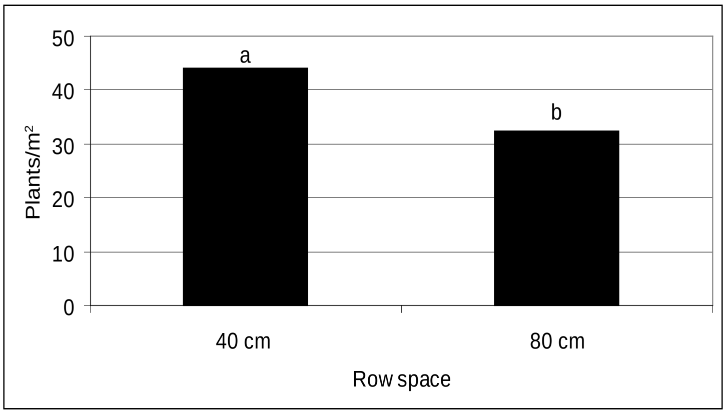

Figure 1. Effect of row spacing on establishment

Yield

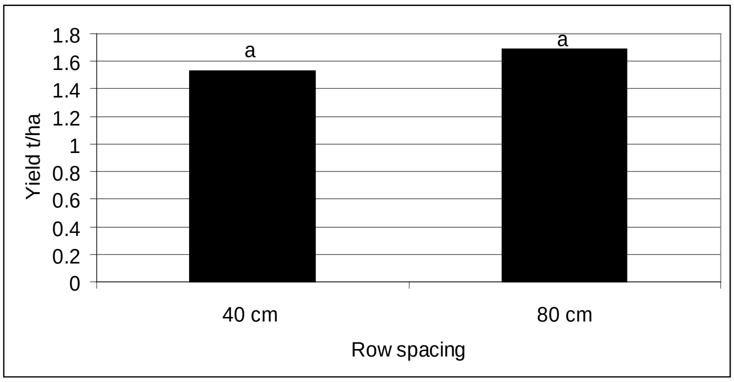

Figure 2 . Effect of row spacing on yield

There was no significant difference in yield between the 40 cm and 80 cm row spacings.

Summary

In the slightly above average year of 2009, this trial showed no penalty for row spacing out to 80 cm compared to 40 cm. Where real farming system benefits can be obtained (e.g. improved trash management, inter-row sowing), this trial suggests that growers can plant canola on wide rows without a major yield loss. Further trials in drier years will determine if there is any yield improvement on wider rows due to more efficient use of stored moisture.

This trial did highlight that for a consistent seed rate, establishment will be reduced when moving out to wider rows. Effectively, the more seeds placed in a given length of row, then the lower the establishment percentage. This was also the case for wheat at Coonamble in 2009, but not for chickpeas.

Acknowledgements

Thanks to James Nalder for trial cooperation. Thanks also to Gavin Melville, Robert Pither and Jayne Jenkins, NSW Department of Primary Industries, Trangie.

Chickpea inoculant trials – 2008–2010

Rohan Brill[1], Leigh Jenkins[2] & Lawrie Price[3]

[1]NSW DPI, Coonamble
[2]NSW DPI, Warren
[3]Northern Grower Alliance

Introduction

There have been several recent developments in the use of granular inoculants and direct injection of inoculants into the seed furrow. Trials since 2008 have tested some of these treatments and compared them with the standard practice of applying the inoculant directly to the seed prior to sowing.

Trial details

Four trials have been carried out in the past three years. The treatments have included:

- Nodulaid™ – standard peat slurry applied to seed prior to sowing (PS)
- Nodulaid™ water inject – peat slurry injected into the seed furrow with water @ 100 L/ha (PS WI)
- EasyRhiz® – freeze dried rhizobia mixed into a slurry and applied to seed prior to sowing (FD)
- EasyRhiz® water inject – freeze dried rhizobia mixed into a slurry and injected into the seed furrow with water @ 100 L/ha(FD WI)
- Nodulator™ – attapulgite clay granules mixed with seed in furrow @ 6 kg/ha(ACG)
- Alosca® – bentonite clay granules mixed with seed in furrow @ 10 kg/ha (BCG)
- N-Prove/TagTeam® – peat granules mixed with seed in furrow @ 3.5 kg/ha (PG)
  The trials have also looked at the effect of seed applied fungicides on nodulation.

2008

The scoring for this trial was based on a standard scoring system that allocates one score from zero to five based on nodulation around the crown and beyond the crown.

There was no significant yield response in this trial; however there were significant responses to nodulation (Figure 1). Peat granules had a high level of nodulation around the crown as well as moderate nodulation beyond the crown, with nodules on all plants. Peat and freeze dried slurry also had nodules on all plants, with a high level of nodulation around the crown, but little nodulation beyond the crown. Attapulgite clay granules and bentonite clay granules had nodules present on only 67% of plants (30 plants scored per treatment).

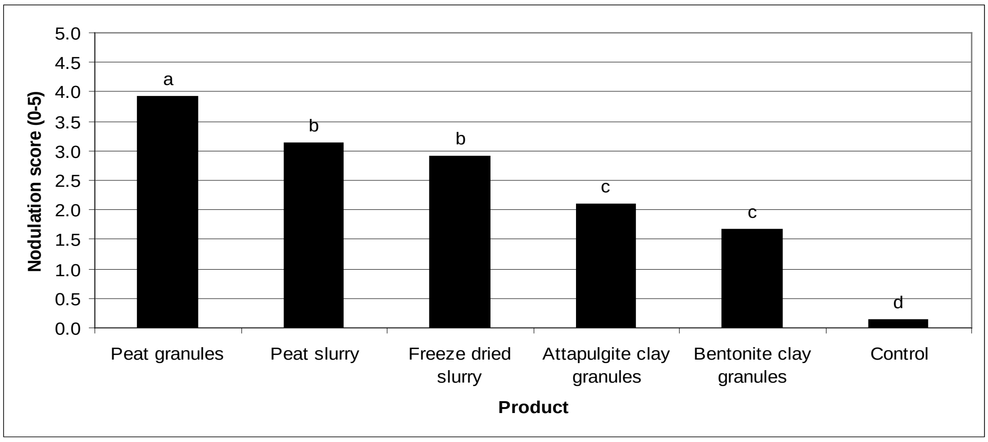

Figure 1. Effect of inoculant treatment on nodulation of chickpeas – Narromine 2008

2009

The scoring system was updated for this trial, with a separate score from zero to ten given for nodulation around the crown and beyond the crown.

All treatments resulted in nodulation levels around the crown and beyond the crown greater than the untreated control (Nil treatment) (Figure 2). Nodulation around the crown from using peat slurry (PS) was greater than all other treatments. Application of the three granular treatments (Attapulgite clay granules, Bentonite clay granules and peat granules) as well as the freeze dried slurry resulted in similar nodulation levels, being significantly less than the peat slurry (PS) but greater than the Nil treatment. There was no significant difference between products on nodulation beyond the crown area, with all being greater than the untreated control (Nil treatment).

The use of fungicide (thiram + thiabendazole) significantly reduced nodulation from both of the slurry treatments (PS & FD), with the freeze dried treatment (FD) having the greatest reduction in nodulation (data not presented).

There was no significant difference in yield response from the treatments in this trial (data not presented).

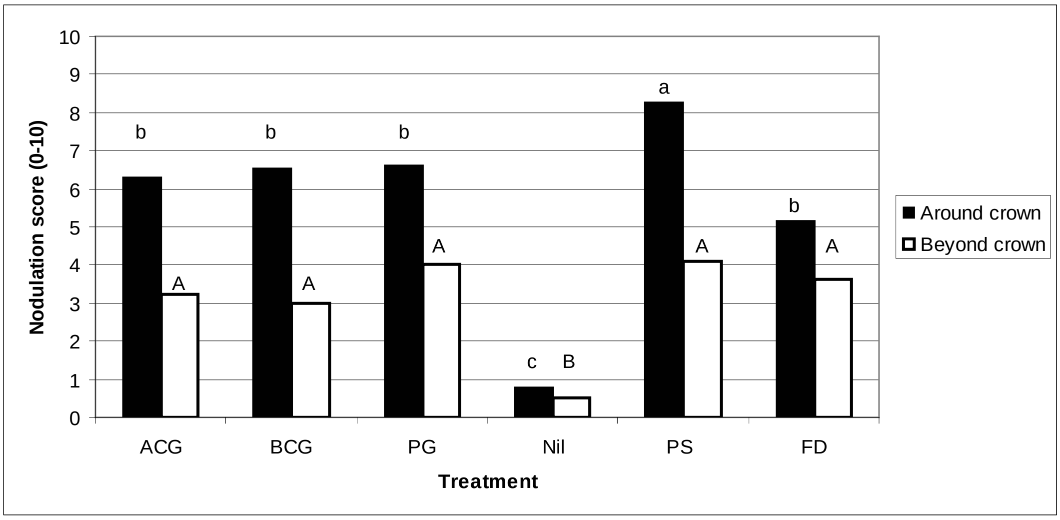

Figure 2. Effect of inoculant treatment and seed applied fungicide (thiram + thiabendazole) on nodulation of chickpeas – Trangie 2009

2010

Two trials were conducted in 2010 (Argyle and The Clump Rd), in the Edgeroi/Bellata districts.

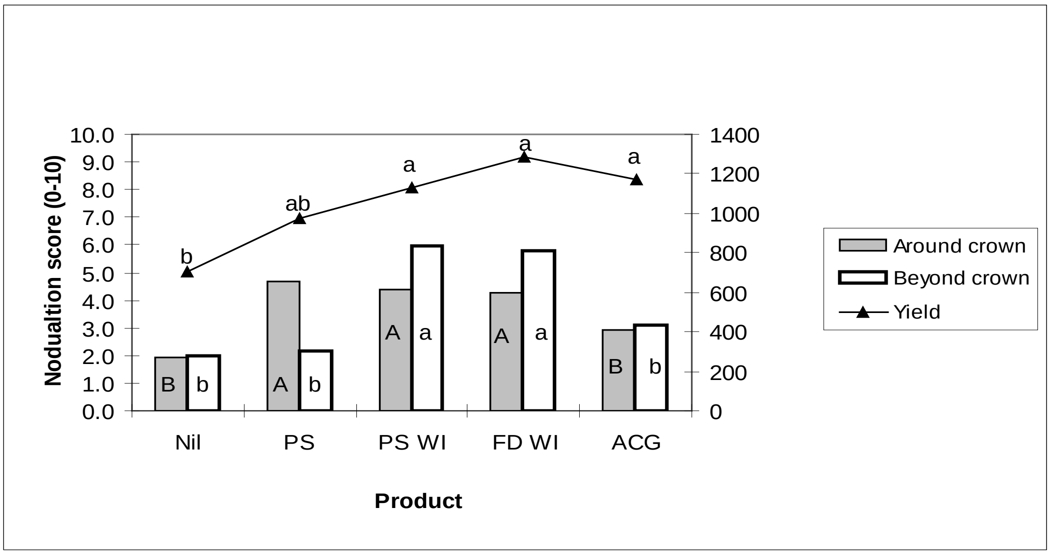

Figure 3. Effect of inoculant treatment on nodulation of chickpeas and chickpea yield – Argyle, Edgeroi 2010

Peat slurry, peat slurry water inject and freeze dried water inject resulted in significantly greater nodulation around the crown than nil treatment and the attapulgite clay granules. The two water inject treatments resulted in significantly greater nodulation beyond the crown than all other treatments. Yield of the water inject treatments and attapulgite clay granules were significantly greater than the nil treatment. There was no significant effect of fungicide on yield or nodulation (data not presented).

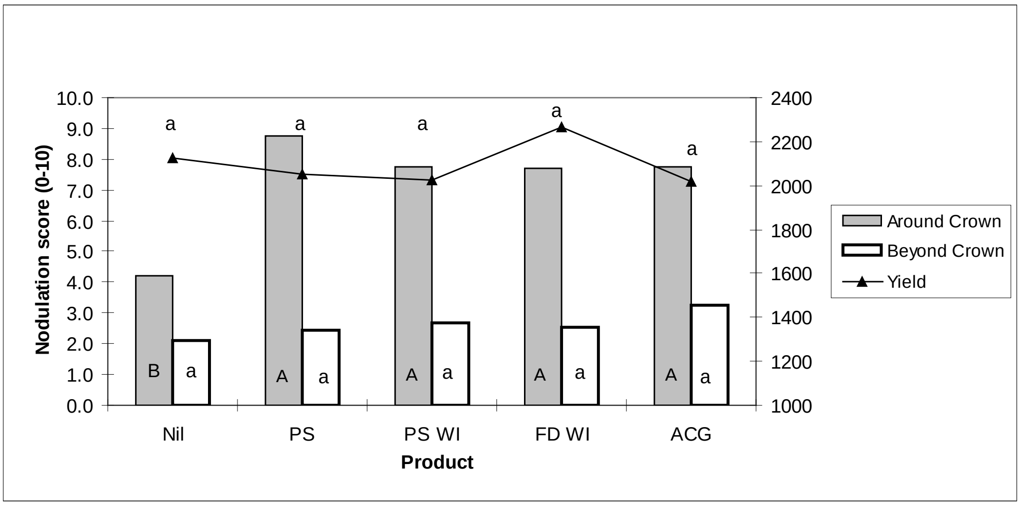

Figure 4. Effect of inoculant treatment on nodulation of chickpea roots and chickpea yield – The Clump Rd, Bellata 2010

All treatments resulted in significantly greater nodulation around the crown than the nil treatment. There was no significant effect of treatment on nodulation beyond the crown or on yield. There was also no significant effect of fungicide on yield or nodulation (data not presented).

Conclusion

The most effective of the new technologies appears to be with the application of rhizobia 'in-furrow' with water (water inject). This will reduce the need to mix and apply slurry to the seed, but will require the need for large volumes of water being available at sowing, as well as a liquid tank and plumbing to be incorporated into the seeder.

Clay granules (attapulgite and bentonite) have often resulted in less nodulation than the standard slurry treatments. This has also been found in southern NSW, in work carried out by Denton *et al.* (2009). However, where chickpeas are a regular crop in the rotation, the reduced efficacy provided by the clay granules compared to the standard slurry treatment is likely to be less pronounced. Granules can reduce labour and downtime at sowing, so would only be recommended where real efficiency gains can be made.

Peat granules resulted in nodulation levels greater than the clay granules in one of two trials.

The use of standard slurry treatments (peat slurry) still appears to be a reliable method of application. In some cases nodulation may be less than with the 'water inject', but this needs to be balanced with the extra machinery cost of liquid injection.

Reference/further reading

Denton, M.D., *et al.*, A multi-site field evaluation of granular inoculants for legume nodulation, *Soil Biology and Biochemistry* (2009).

Acknowledgements

Thanks to Gavin Melville, Jayne Jenkins & Robert Pither, NSW DPI (Trangie), Rebecca Byrne, NSW DPI (Moree) and Claire Felton-Taylor,Northern Grower Alliance. This project was funded by NSW DPI and GRDC through NGA00003: Grower solutions for northern New South Wales and southern Queensland.

Faba bean sowing time – Trangie 2009 & 2010

Rohan Brill[1] & Leigh Jenkins[2]

[1] NSW DPI, Coonamble

[2] NSW DPI, Warren

Introduction

Trials have been conducted at the Trangie Agricultural Research Centre in 2009 and 2010 to determine optimum sowing dates for faba beans in western regions.

Site details

Location: Trangie Agricultural Research Centre

Varieties: Doza, Cairo & 4 advanced breeding lines.

2009 Results

Three sowing dates were trialled in 2009:

1. 30th March
2. 20th April
3. 11th May

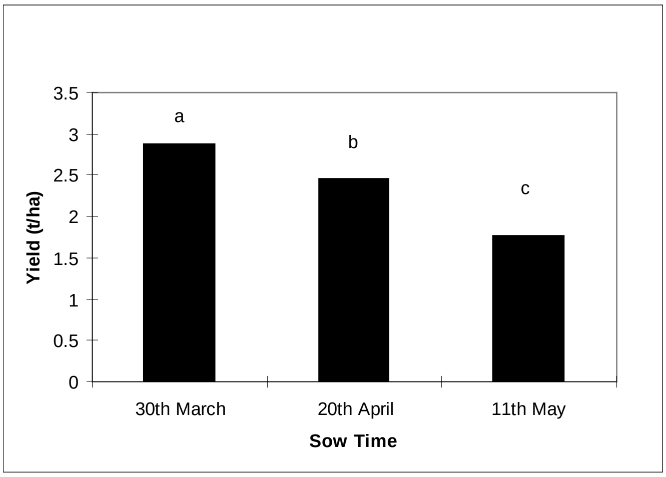

Figure 1. Effect of sowing time on yield of 6 faba bean varieties – Trangie 2009

Yield was maximised by sowing earlier than is generally recommended. The 30th March planting was 17% higher yielding than the 20th April sow time, and 66% higher yielding than the 11th May sow time (Figure 1). A similar trend was also observed for wheat, barley and brassica trials at Trangie in 2009.

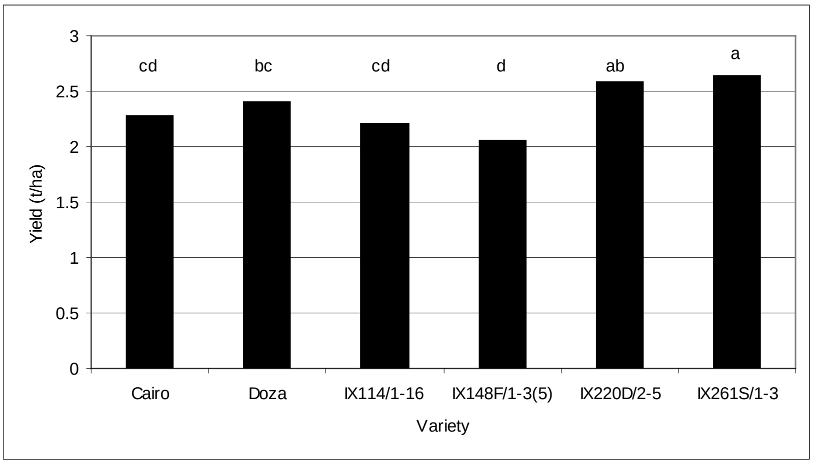

Figure 2. Yield of faba bean varieties averaged across 3 sow times – Trangie 2009

The highest yield came from the unreleased faba bean line IX261S/1–3, being significantly higher yielding than all lines with the exception of IX220D/2–5. IX261S/1–3 was 10% higher yielding than the current industry benchmark variety Doza (Figure 2).

2010 Results

Four sowing dates were trialled in 2010, being:

1. 23rd March
2. 29th March
3. 19th April
4. 10th May

In contrast to 2009, yield was maximised by the 2 later sowing dates, with the 19th April planting and the 10th May planting being on average 50% higher yielding than the average of the 23rd March and 29th March plantings (Figure 3).

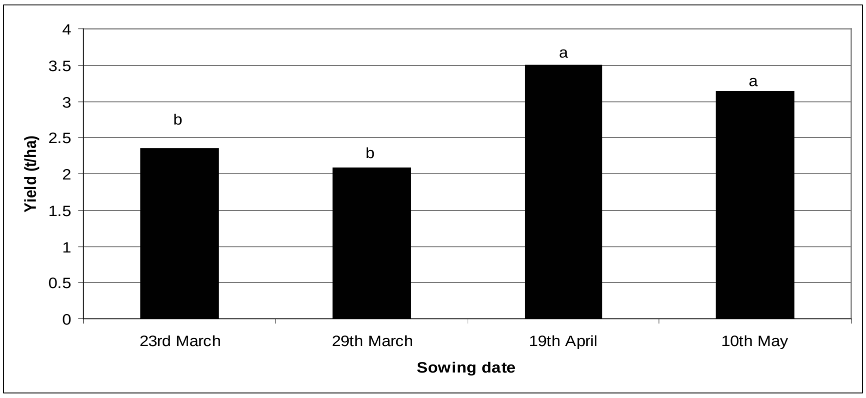

Figure 3. Effect of sow time on yield of 6 faba bean varieties – Trangie 2010

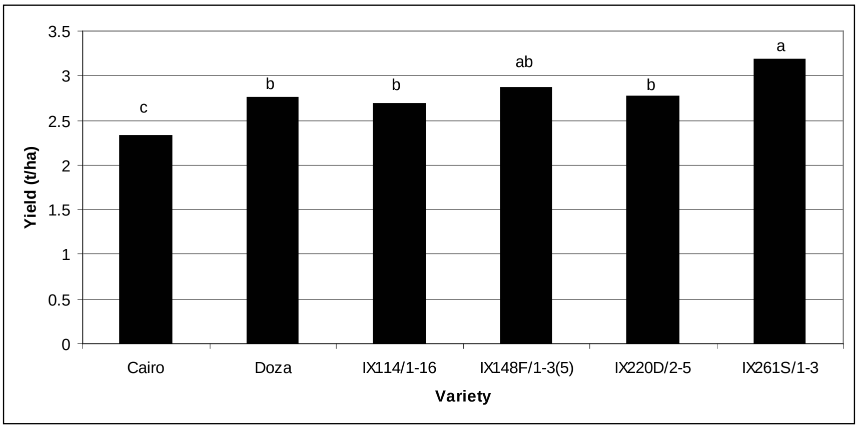

Figure 4. Yield of faba bean varieties averaged across 4 sow times – Trangie 2010

Similar to 2009, the highest yield came from the line IX261S/1–3, being 16% higher yielding than Doza (Figure 4), while Doza was 19% higher yielding than Cairo. There was no significant difference between the line IX261S/1–3 and another experimental line IX148F/1–3(5).

Discussion

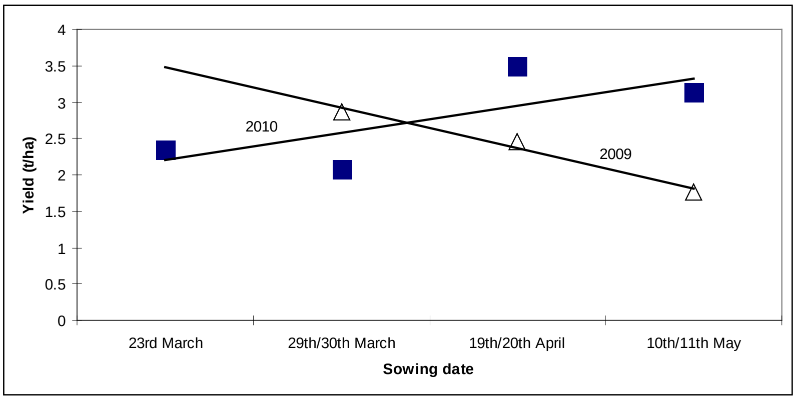

Figure 5. Comparison of 2009 & 2010 faba bean yields from several sowing dates – Trangie

Sowing date

The 2009 and 2010 seasons were contrasting years in terms of rainfall and temperature, and resulted in contrasting yield trends from similar sowing dates (Figure 5).

In 2009, soil moisture was moderate at sowing; however, only 33 mm of rain fell from June 10th until harvest in early October. In contrast, soil profiles were at field capacity at sowing in 2010, with 187 mm of rain falling from June to September inclusive.

The low rainfall in 2009 meant that disease was not a major issue. There were also no significant frosts at Trangie through August and early September, so the main limit to yield was the increasing temperatures through late August and September.

The primary limit to yield (although not scored) at Trangie in 2010 appeared to be disease, primarily chocolate spot. The first application of mancozeb @ 1 kg/ha was applied on the 21st May (6 weeks after the emergence of the March plantings). Fungicide application was then sub-optimal in the season, as site access at critical application times became difficult, with 1 L/ha chlorothalonil applied in July and 2 kg/ha mancozeb applied in September. Chocolate spot developed earlier and was more prevalent in the early plantings. The canopies of the early plantings were also much heavier, providing an ideal environment for chocolate spot development.

The intercept of the lines in figure 5 occurs approximately around the 7th of April. In effect, that intercept is indicating that the optimum sowing date at Trangie for the last 2 years combined would have been in the period of 5–10th April.

Variety choice

The northern faba bean breeding program released Cairo in 2003, which was a significant improvement on old varieties. Doza was released in 2008, with the 2010 trial showing a significant yield improvement over Cairo, likely to be due to its improved disease resistance. Doza is currently the benchmark and recommended variety for northern areas; however, the 2009 & 2010 trials show that there may be further improvement to come with the experimental line IX261S/1–3 being higher yielding than Doza in both 2009 and 2010.

Acknowledgements

Thanks to Jayne Jenkins, Robert Pither & Gavin Melville, NSW DPI (Trangie) and Bruce McCorkell and Joop van Leur, NSW DPI (Tamworth) for assistance with the conduct of these trials. Funding for this trial was provided by NSW DPI and GRDC through the Australian Faba Bean Breeding Program (UA00097).

Yellow leaf spot management trial – Trangie 2010

Rohan Brill[1]*, Maurie Street*[2] *and Julie Monroe*[2]

[1]NSW DPI, Coonamble

[2]Grain Orana Alliance

Introduction

Yellow leaf spot (YLS) has traditionally been a significant disease in western crops, occurring on average two years in ten. Spores survive on stubble from previous wheat crops, and infection is driven by wet conditions and mild temperatures.

The wet conditions in August 2010 and a large area planted of the susceptible variety EGA Gregory instigated the conduct of this trial at Trangie Agricultural Research Centre. The trial was established in a high disease pressure commercial crop of EGA Gregory that was sown into the stubble of a 2009 EGA Gregory crop. The aim was to evaluate the effect of various commercial fungicides against yellow leaf spot at key growth stages.

Site details

Location: Trangie Agricultural Research Centre

Sowing Date: 5th May 2009

Variety: EGA Gregory

Spray time 1 (T1): 2nd September 2010 (Z49)

Spray time 2 (T2): 22nd September 2010 (Z69)

Treatments

The treatments used in this trial included:

1. T1 – Tilt® @ 500 mL/ha
2. T2 – Tilt® @ 500 mL/ha
3. T1 + T2 – Tilt® @ 500 mL/ha
4. T1 – Folicur® @ 290 mL/ha
5. T2 – Folicur® @ 290 mL/ha
6. T1 + T2 – Folicur® @ 290 mL/ha
7. T1 – Amistar Xtra® @ 400 mL/ha
8. T2 – Amistar Xtra® @ 400 mL/ha
9. T1 + T2 – Amistar Xtra® @ 400 mL/ha
10. Untreated Control

Leaf area measurement

Leaf area was measured for the flag and flag –1 leaves on the 22nd of September.

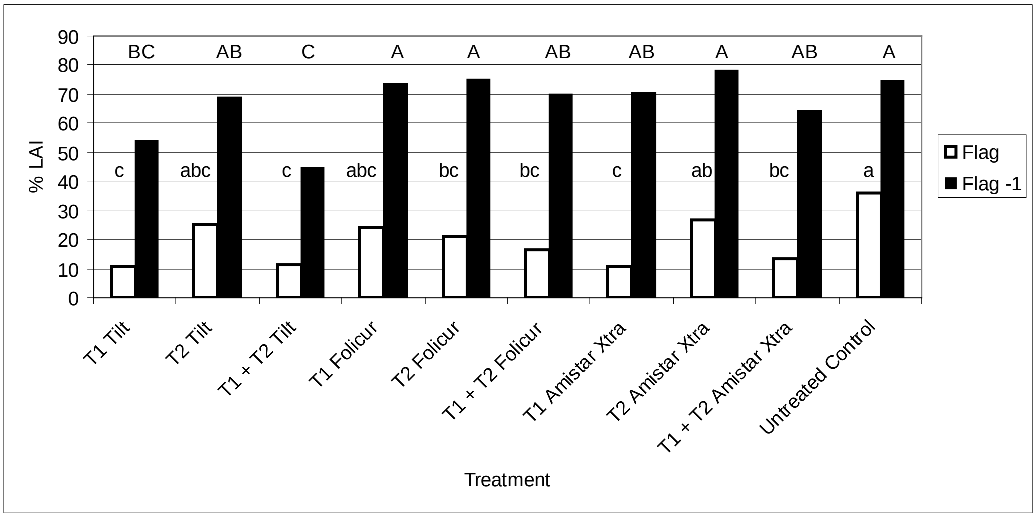

Figure 1. Percentage flag and flag – 1 leaf area infected by YLS on 22nd Sept

All treatments applied at the T1 stage with the exception of T1 Folicur® significantly reduced the loss of leaf area by YLS on the flag leaf compared to the untreated control (Figure 1).

Tilt® applied at the T1 stage or T1 + T2 was the only fungicide to reduce leaf area loss to YLS on flag –1 compared to the untreated control. The T1 timing appears the more important with Tilt® as T2 alone did not significantly reduce disease levels on either the flag or flag–1. An additional T2 spray (i.e. T1 + T2) did not provide any added benefit over the T1 only application of Tilt® on either of the top two leaves.

Leaf area was again assessed on the 22nd of October. Only the T1 + T2 Tilt® treatment, the T2 Folicur® treatment and the T1 + T2 Amistar Xtra® treatment resulted in reduced leaf area loss from YLS on the flag leaf compared to the untreated control (data not shown).

Yield

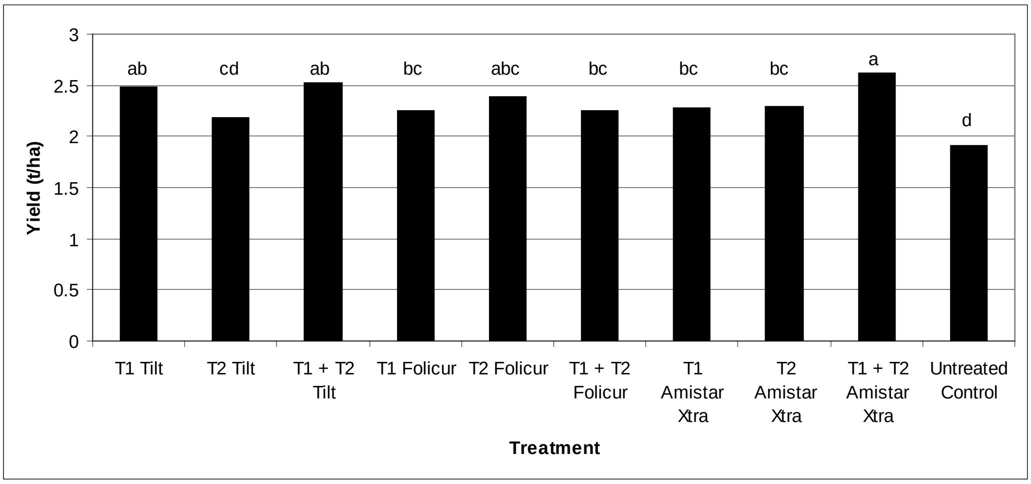

Figure 2. Resulting wheat yield from various fungicide treatments

All fungicide treatments, except for the T2 Tilt®, provided a significant yield benefit compared to the untreated control (Figure 2).

The T1 Tilt® treatment provided a similar yield response to the T1 + T2 Tilt® treatment (approx. 30% yield increase compared to untreated), and was superior to the T2 Tilt® timing. The different timings (single or multiple) of Folicur® did not significantly impact on yield outcomes, with the average yield increase from Folicur® being approx. 20% over the untreated control. The T1 + T2 Amistar Xtra® treatment resulted in a significant yield increase of 14% compared to either of the T1 or T2 Amistar Xtra® treatments alone, however, the two applications of Amistar Xtra® only gave similar control to the single T1 application of Tilt®.

Discussion

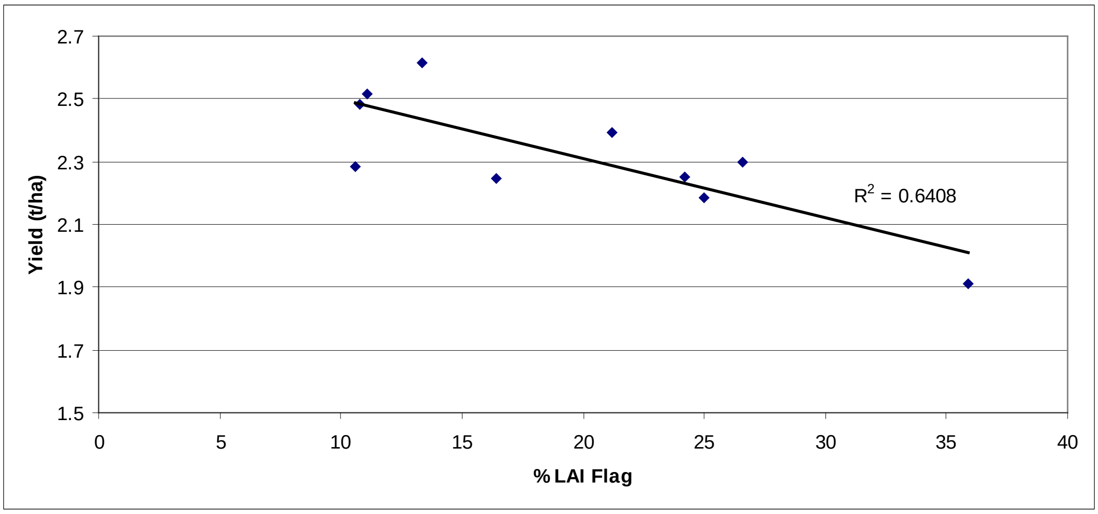

Figure 3. Effect of flag leaf area infection of YLS (measured 22nd September) on grain yield

Nearly 2/3 of the variation in yield in this trial could be attributed to the amount of flag leaf area infected by YLS (on the 22nd September; Figure 3). This highlights the need to minimise infection levels on the flag leaf to reduce yield loss from YLS.

There are a combination of three main factors that will need to occur to place YLS pressure on wheat paddocks in 2011. These are high carry-over of YLS inoculum on wheat stubble, sowing of YLS susceptible varieties and wet mild growing season conditions. Growers can reduce the likelihood of losing yield to YLS in 2011 by:

1. Avoiding sowing wheat directly into 2010 wheat stubble, especially where the 2010 variety was susceptible to YLS.
2. Monitoring weather conditions and applying fungicides when the forecast is for extended periods of wet and mild weather.
3. Sowing relatively resistant varieties, e.g. Crusader, Sunvex, Ellison. This should only be done if wheat on wheat is a necessity and where YLS is the primary disease concern, as these varieties have their own pitfalls (e.g. stripe rust, low tolerance to RLN, lower yield potential).

Acknowledgements

This trial was funded by NSW DPI and Grain Orana Alliance through GRDC code GOA00002.

Brassica juncea agronomy 2010

Rohan Brill[1] & Rod Bambach[2]

[1]NSW DPI, Coonamble

[2]NSW DPI, Tamworth

Introduction

The 2010 trials were a continuation of several years of research on best management practices for Brassica juncea production in the northern region. Brassicas (canola and juncea) are good break crops for winter cereal diseases such as crown rot and provide opportunity for alternative control of common grass weeds.

Site details

Location: 25 km NW of Coonamble

Sowing date: 11 May 2010

Harvest date: 9 November 2010

Fertiliser: 110 kg/ha Single Super

65 kg/ha Urea (except N rate trial)

Trial details

Nitrogen nutrition – application of 0, 30, 60 & 90 kg/ha N (as urea) at sowing to varieties Oasis CL, Sahara CL and canola line 44C79.

Seeding rate: 1, 2, 4, 6 and 8 kg/ha of varieties Oasis CL and Sahara CL.

Row spacing: 30, 45 and 60 cm rows in varieties Oasis CL and Sahara CL.

Nutrition

There was a response to nitrogen application, with the 30N, 60N and 90N treatments all being significantly higher yielding than the 0N treatment but with no significant difference between N rates from 30 kg/ha and above (Figure 1).

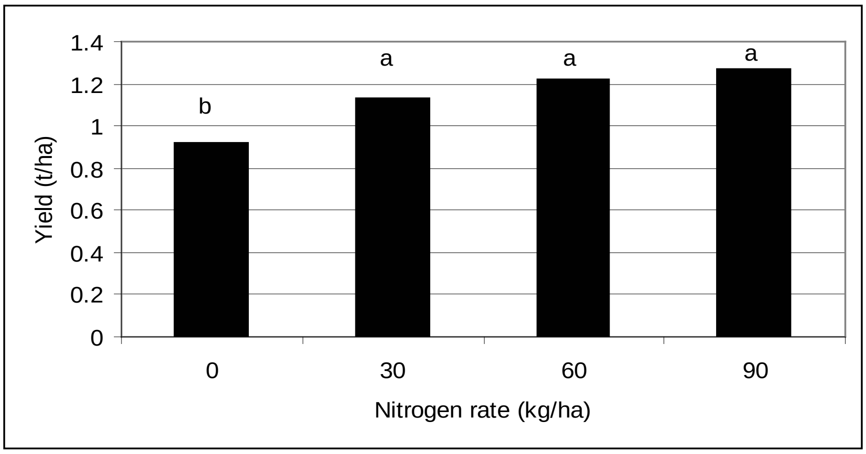

Figure 1. Effect of nitrogen rate on grain yield – Coonamble 2010 (average of three varieties)

Oasis CL was the highest yielding variety in this trial, being around 20% higher yielding than both Sahara CL and 44C79 (Figure 2).

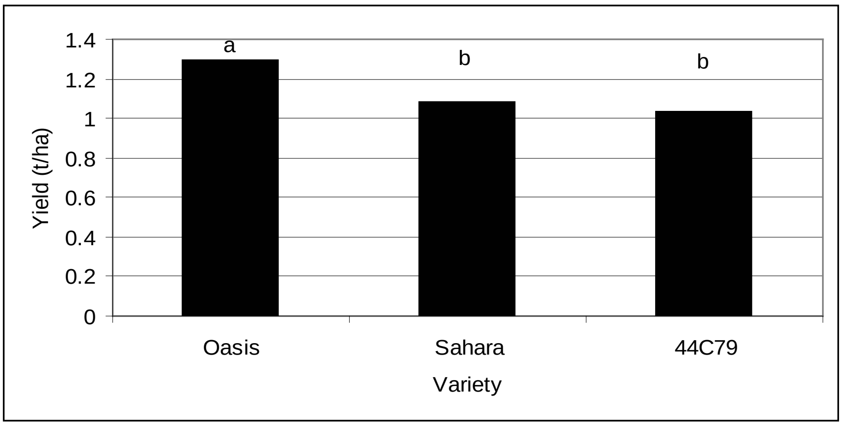

Figure 2. Grain yield of two Juncea canola varieties and 44C79 – Coonamble 2010

Seeding rate

There was no significant effect of seeding rate on yield of either Oasis CL or Sahara CL. However, Oasis CL was again significantly higher yielding than Sahara CL (Figure 3).

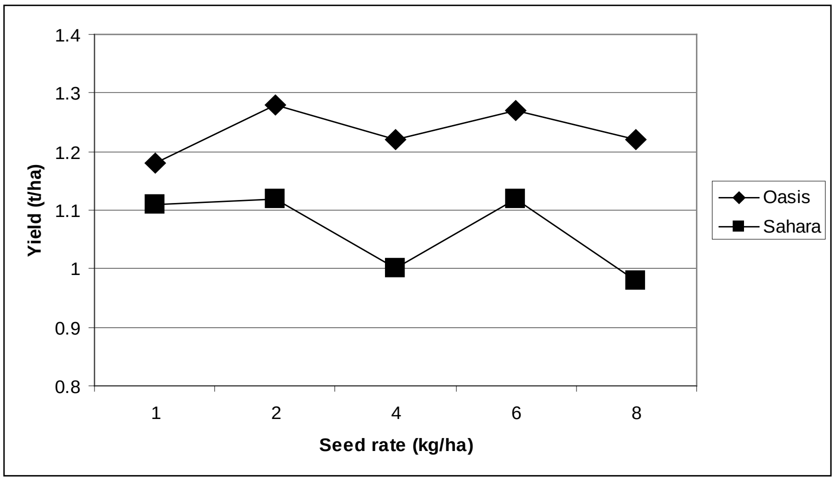

Figure 3. Effect of seed rate on yield of Juncea canola – Coonamble 2010

Row spacing

The 30 cm and 45 cm row spacings were significantly higher yielding than the 60 cm row spacing (Figure 4). As with the nutrition and seed rate trials, Oasis CL was significantly higher yielding than Sahara CL.

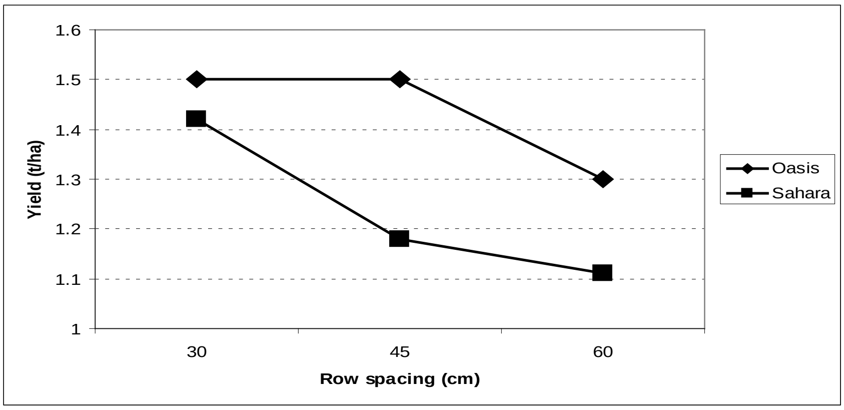

Figure 4. Effect of row spacing on yield of Juncea canola – Coonamble 2010

Summary

Oasis CL was consistently the highest yielding line across the three trials, which is similar to results obtained in 2009.

There was a yield penalty in 2010 from wide row spacing (60 cm), which is similar to the results in 2009. The 2009 trials were sown later than in 2010, so the effect has been observed both with an early and a late sowing and under different seasonal conditions.

There was a response to applied nitrogen in 2010, which is in contrast to the results from 2009. The response was similar for the Juncea canola lines and 44C79, suggesting that nitrogen application for Juncea canola should be similar to standard canola production.

There was no response to different seed rates in either 2009 or 2010, suggesting that seed rate should be determined by the need for competition with weeds and knowledge of sowing machinery.

Acknowledgements

Thanks to Jayne Jenkins & Robert Pither , NSW DPI Trangie, Bruce McCorkell , NSW DPI Tamworth and Don McCaffery , NSW DPI Orange. This project is funded by NSW DPI and GRDC under the Brassica Juncea (DAN000119) Agronomy project. Thanks to Guy McMullen for project assistance.

Performance of elite durum lines in NSW (2008–2010)

Bert Collard and David Gulliford

NSW DPI, Tamworth

Introduction

Breeding new varieties is an endless task for plant breeders. The challenge for breeding programs is to develop new breeding lines that outperform current varieties for yield, quality, disease resistance and/or other traits. Each year in a breeding program, thousands of lines are evaluated and compared against check varieties. Check varieties are selected on their suitability to the environment that the breeding material is being evaluated in; check varieties are also those cultivars that are commonly grown commercially in surrounding cropping area. Lines that perform below check varieties are culled, whereas lines that perform on par with or above check varieties are retained for subsequent years of testing.

A key determinant of whether an elite breeding line will become a future variety is yield. It is essential that elite lines are tested at multiple sites across a number of years to assess whether lines perform against this parameter in different seasons and in different locations.

The Australian durum wheat improvement program (ADWIP) conducts numerous field trials in NSW, SA and WA. This article reports on a selection of elite NSW durum breeding lines and summarises yield performance from 2008–2010 in Northern NSW field trials.

Field trial details

Advanced yield trials (AYT) are conducted every season at multiple sites. These consist of 32 entries including 3 check varieties. The list of entries will change from year to year because lines that perform poorly are culled, and lines that perform well in previous stage trials are promoted. As a general rule, elite lines should be tested for at least 3 years prior to being released as a new variety. This time frame allows the breeding program to not only assess a line's suitability for release but allows for the collection of data for presentation to NVT and national classification committees for release as a new cultivar.

Locations:	Sites around Northern NSW. Between 2008 and 2010, field trial sites for AYTs were located at North Star, Moree, Edgeroi, Tamworth, Currabubula and Biniguy.
Sowing Date Target:	Commence 1st week of June
Harvest Date:	November to December
Plot size:	10 x 1.2 metres
Experimental design:	row/column design with 4 replications for each line

Yield performance of elite durum wheat lines

Varietal yield performance varies across sites within a single year and from season to season. Hence it is critical that all new promising elite durum lines are thoroughly tested across sites and years. A summary of yield performance for 3 NSW check varieties and a selection of 7 elite breeding lines is presented in Table 1. A good example of how yield performance may vary between years is indicated by EGA Bellaroi which has been either the highest or lowest yielder in different years. This clearly highlights the importance of testing lines across multiple years. In contrast, Caparoi appears to be a more consistent yield performer. Of the promising elite lines, 234194 and 241046 appear to be the most consistent across sites and years. These lines have also been evaluated thoroughly for quality and are on par or better than check varieties.

Table 1. Yield data from field trials across multiple sites from 2008 to 2010. OSMY = Overall site mean yield (i.e. yield of line compared to the mean performance of all lines at site. The site mean yield is 100% by definition). Lines equal to or exceeding the site mean yield are unshaded, whereas those performing below the site mean yield are indicated in grey. All lines (except 241046) have been included in NVT in recent years. Due to wet conditions in 2010, only 3 out of 6 AYTs could be harvested.

	2008 (7 trials)		2009 (5 trials)		2010 (3 trials)	
Line	OSMY	RANK	OSMY	RANK	OSMY	RANK
EGA BELLAROI	98	9	97	10	110	1
JANDAROI	105	3	104	5	97	6
CAPAROI	106	2	106	4	107	2
230173	100	8	101	9	93	10
230604	103	4	102	8	96	7
230726	97	10	108	3	98	5
231008	106	1	103	7	96	8
231041	102	6	103	6	96	9
234194	103	5	110	1	104	3
241046	101	7	110	2	103	4

Further work

Considerable further work is required to continue to evaluate the most promising lines and decide about which lines should be retained or culled. Firstly, quality data needs to be combined with yield data in order to make the best selections. Secondly, the field data from all ADWIP field trials (i.e. in SA and WA) and National Variety Trials can be used to evaluate performance. Thirdly, additional trait data regarding agronomy, crown rot tolerance, water-use efficiency traits, abiotic stress tolerance (e.g. chloride deficiency) must be compiled to assist in making selection decisions. Finally, data will be analysed by NSW DPI biometricians using the latest statistical methods to increase the precision of the analysis.

One of the benefits of ADWIP is that new breeding lines are now routinely tested across multiple states so that a large amount of data is generated, and all promising lines are thoroughly tested across sites and years. Currently, there are several promising new breeding lines from NSW and SA that will be tested from 2011 onwards.

Summary

The development of new varieties is an ongoing process, and is dependent on rigorous testing of promising lines at different sites, over multiple years. Yield, although an important trait is only one of many that must be combined within a new variety to make it a suitable candidate for release as a complete package to address the needs of growers. Currently there are some promising NSW lines in the pipeline.

Acknowledgements

This project is funded by NSW DPI and GRDC (DAN00118). Thanks to technical assistance of Lyn O'Brien, Pamela Boreham, Brent Johnson and Richard Morphett for the preparation, sowing, maintenance and harvesting of field trials every year. A special thanks to all of our co-operators for the use of their land for ADWIP field trials.

Glasshouse screening for crown rot resistance in durum wheat

Bert Collard, Chitra Raghavan and Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

Crown rot, caused by the fungus Fusarium pseudograminearum (Fp), is one of the most important diseases of durum wheat. All current durum varieties are highly susceptible compared to bread wheat. The disease is difficult to screen for due to the large influence of environmental conditions on disease expression. Historically in bread wheat, crown rot screening has been largely based on evaluating basal browning symptoms in glasshouse trials. The advantages of glasshouse screening are that:

1. Screening is performed in controlled environment conditions to produce more repeatable results,
2. Larger numbers of entries can be evaluated and
3. Off-season screening may be permitted.

Despite the importance of crown rot, there is limited information regarding the extent of genetic variation for resistance and/or tolerance to crown rot in durum breeding material. It has generally been assumed that all durum wheat varieties are equally susceptible to crown rot, although some differences between varieties and breeding lines has been observed in field trials.

The aim of this research was to adapt a pot-based method that could be used for screening durum breeding material in glasshouse trials, and evaluate the extent of variation for crown rot resistance with an emphasis on elite durum material.

Glasshouse trial details

Location: Durum wheat glasshouse facility, Tamworth Agricultural Institute

Sowing Date: Experiment 1: 14 July 2010; Experiment 2: 12 November 2010

An individual plant in each pot was inoculated 10 days after sowing by placing approximately 4.5 g of non-viable seed inoculated with 5 aggressive isolates of Fp around the base of each plant. Infection was initiated by regularly wetting the inoculum for 48 to 72 hours. Seedling symptoms (i.e. basal browning) were assessed 4 weeks after inoculation.

Three components of basal browning were measured:

1. Circumference of basal browning: the extent of basal browning around the base of the plant;
2. Coverage of basal browning: the extent of basal browning around the bottom 3 cm of the base of the plant; and
3. Maximum vertical length of basal browning: a quantitative measurement in which the highest length of basal browning is measured from the soil surface.

The first and second components were scored using a 5 class scale (1 = 1–10%, 3 = 11–25%, 5 = 26–50%, 7 = 51–75%, 9 = 76–100%). All three components were multiplied together to give an overall score. All lines tested were then given relative susceptibility values, calculated as a percentage of EGA Bellaroi (a susceptible control) which was defined as 100%. The names of all lines were coded in order to prevent bias during evaluation.

Plant material

The same 36 entries were tested in both experiments. Durum varieties included Caparoi, Jandaroi, EGA Bellaroi, Wollaroi, Yallaroi, Tamaroi, Kalka, Hyperno and the new variety Tjikuri (WID801). Eight elite numbered lines evaluated in recent years in national variety trials were also included. Seven bread wheat lines were tested as controls which included partially resistant checks (2–49, Sunco and EGA Wylie), intermediate checks (EGA Gregory and Sunvale) and susceptible check (Puseas). The experimental design was a complete randomised block design with 8 replications.

Evaluation of durum and bread wheat lines

The results indicated that there were genetic differences between the durum lines tested. This suggests that there is potential to improve the level of resistance in the breeding program in the medium term, and is interesting because the durum material had not been specifically bred for tolerance or resistance to crown rot.

The results were generally consistent with limited previous data on durum wheat. One possible exception was Jandaroi, which had relatively low disease scores based on basal browning, but this variety has not been observed to produce higher yields in the presence of crown rot in field trials. Of the durum varieties, Wollaroi, Kalka and the new variety Tjilkuri (WID801) had the lowest levels of symptom expression (Figure 1).

Of the elite durum breeding lines, WID902 (SA) and 230726 (NSW) had the lowest levels of basal browning. Unfortunately both lines possess some undesirable attributes compared to common durum varieties, but may be used as parents for crossing, to develop new potentially more resistant populations.

The partially resistant and intermediate bread wheat lines clearly had the least severe symptom development. Sunco and 2–49 were the most resistant while the susceptible bread wheat check, Puseas had much higher symptom development. This is consistent with well established crown rot reactions based on both extensive field and glasshouse (seedling) evaluation of these varieties. However, Puseas still had a lower level of symptom development compared to the highly susceptible durum varieties EGA Bellaroi and Tamaroi.

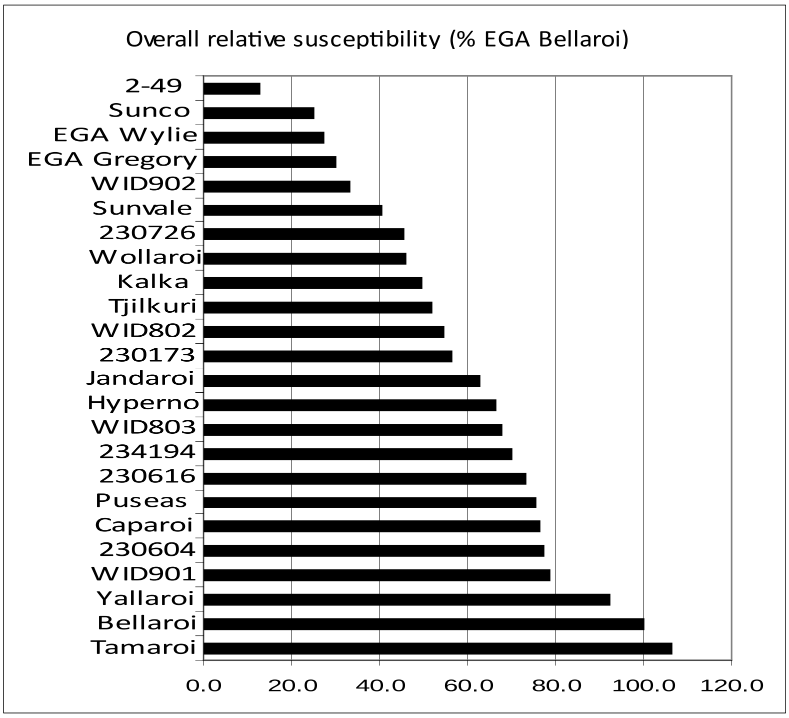

Figure 1. Crown rot ratings for 24 lines including durum varieties, recent National Variety Trial (NVT) lines and bread wheat controls. Mean scores from 2 experiments.

Further work

Considerable further research is required. Data from additional on and off season glasshouse trials need to be analysed to estimate the reliability of this new screening method. Most importantly, these results need to be compared with results from field experiments, to confirm the usefulness of the screening method. Previous research in durum wheat conducted by Industry and Investment NSW suggests that basal browning assessment during the seedling stage may explain 41 to 62% of yield loss, depending on the season.

Summary

Genetic differences in the reaction of durum lines to crown rot were observed in glasshouse trials based on this new method for screening. Although further work is required to validate preliminary findings, the genetic variation and this new method offer great potential for improving the level of resistance to crown rot in durum wheat.

Acknowledgements

This project is funded by NSW DPI and GRDC (DAN00118). Thanks to Lyn O'Brien, Pam Boreham, Richard Morphett and Brent Johnson for excellent technical assistance.

Yield stability of winter cereals across sowing dates – Coonamble 2010

Guy McMullen[1], Rod Bambach[1], Alan Bowring[1], Rohan Brill[2] and Steven Simpfendorfer[1].

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Introduction

Sowing time is one of the critical components of optimising crop production. Timely sowing improves water use efficiency, nutrient uptake and reduces the likelihood of poor grain quality. Earlier sowing may also change the impact of a range of diseases such as crown rot and stripe rust. Sowing varieties in their appropriate window will reduce the chance of frost damage and also the impact of heat and moisture stress during flowering and grain filling. The yield stability of varieties across sowing windows would also provide growers with flexibility in sowing operations in an area of increasing climatic variability.

Site details

Location: Coonamble

Cooperator: George Lefebvre

Sowing Date: 10th May and 6th June

Treatments

- 2 sowing dates as above.
- 5 durum, 4 bread wheat and 6 barley varieties.
- All varieties sown targeting 80 plants/m^2. Two additional treatments of Commander and Hindmarsh barley were sown at 120 plants/m^2.
- Plus or minus crown rot at sowing.

Lodging

- Lodging was more severe across barley varieties compared to wheat and durum varieties.
- Durum varieties showed significant differences in the severity of lodging with Hyperno having twice the lodging of other durum varieties. The newly released Tjilkuri showed less lodging compared to Hyperno but was worse affected then other commercially established lines.
- There were no significant differences between the bread wheat lines that were tested.
- There was also little difference between barley varieties in lodging resistance. One exception was Shepherd which showed reduced lodging compared to all varieties except Grout at the first sowing date. Higher plant populations in Commander and Hindmarsh had no effect on lodging severity at either sowing date.
- When comparing between sowing dates Tjilkuri, Hyperno, EGA Wylie, Grout and Shepherd had greater lodging at the second sowing.

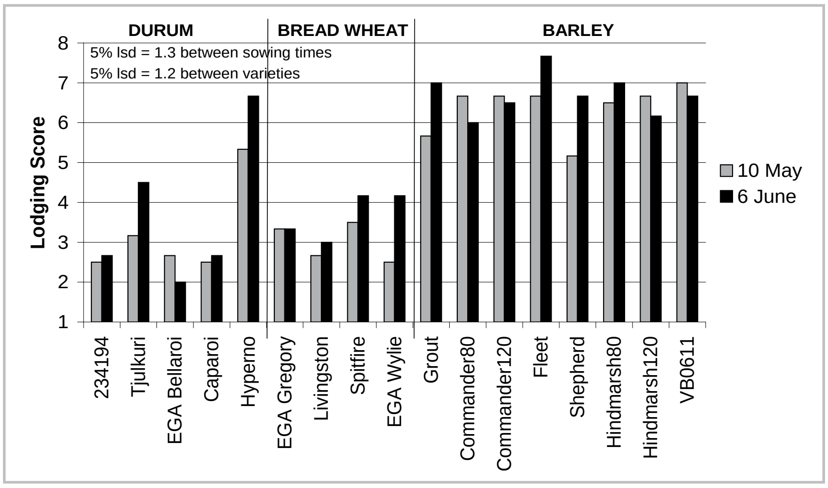


Figure 1. Lodging scores (1 = standing, 9 = flat) across sowing date and variety.

Grain yield

- There was no significant effect of crown rot on yield, due to the high rainfall and low temperatures during the season.
- There were significantly higher yields from the 10th May sowing than the 6th June sowing in 15 of the 17 cereal varieties. The average yield penalty for sowing late across all durums was 1.7 t/ha, 1.4 t/ha for bread wheat and 0.9 t/ha for barley. Grout, Shepherd and VB0611 barley varieties had no significant yield penalty at the later sowing date.

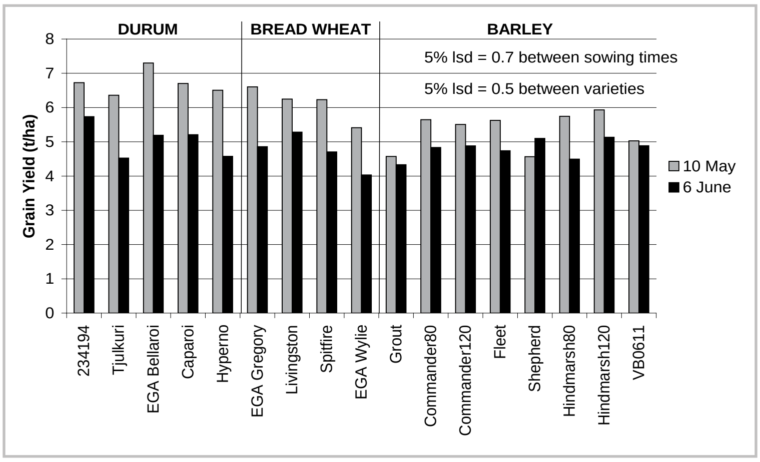


Figure 2. Grain yields of 17 wheat, durum and barley varieties at two sowing dates.

Summary

Earlier sowing clearly outperformed the later sown crops in 2010, regardless of variety maturity. It appears that across all the durum lines there was a greater penalty for delayed sowing compared to wheat and barley.

Although 10th May would be considered slightly early for varieties such as Livingston and Spitfire due to frost risk, there was no frost damage evident in this trial. Frost risk at flowering should always be considered when deciding on the appropriate sowing date for a selected variety.

Although Grout, Shepherd and VB06011 had greater yield stability across sowing dates they also were relatively lower yielding at this site.

It is well established that the expression of crown rot is favoured by moisture stress during grain-fill. Frequent rainfall and low temperatures were experienced during grain-fill in 2010 which minimised crown rot expression hence no yield differences were evident.

Grain quality and pathology assessments are still to be conducted and may reveal further impacts of sowing date and variety choice.

Acknowledgements

This project is funded by NSW DPI and GRDC under Variety Specific Management Packages (DAN00129), Northern Barley Agronomy Project (DAN00131) and Northern Grains Pathology Project (DAN00143). Thanks to Jayne Jenkins and Rob Pither for technical assistance.

Matching sorghum genotype and agronomy to environment – Walgett

Guy McMullen[1], Loretta Serafin[1], Alan Bowring[1], Rod Bambach[1], Trevor Philp[2] and Steven Simpfendorfer[1].

[1]NSW DPI, Tamworth
[2]Pacific Seeds, Toowoomba

Background

Sorghum is a reliable summer crop in eastern areas of northern NSW. However there is a need to improve the reliability of sorghum in western cropping areas. The introduction of hybrids with increasing levels of Stay-green, or using a combination of tillering, plant population and row configuration may help improve the reliability of sorghum yields in these western environments.

In the eastern zone there has been a reasonable amount of work evaluating population and row spacing. Modelling work has suggested that sorghum can be a reliable component of western cropping systems but this work needs applied research to verify the modelling and give growers confidence to incorporate sorghum into their rotations.

In northern NSW crown rot, a stubble-borne fungal pathogen continues to be the most prevalent and damaging disease affecting winter cereals. Sorghum is recommended as a break crop but the success is dictated by the amount of breakdown of the winter cereal stubble. Although altering row configuration and population may improve the reliability of sorghum it may also reduce the rate of decomposition of cereal stubble and reduce water accumulation during the fallow period and the break crop benefits.

The trial outlined below aims to answer some of these questions plus provide data for use in modelling the trial outcomes over long term climatic data sets.

Site details

Co-operator: Dave Denyer

Property: "Wattle Plains", Cryon

Sowing Date: 14 & 15th September, 2009

Sowing Details: Monosem double disc with leading tyne

Treatment details

Hybrids

- MR43
- PAC2436 (an experimental pacific seeds hybrid with low tillering and high stay-green)
- PAC2437 (now MR Bazley; a hybrid with high tillering)

Row Configuration

- Solid on 1 m spacings
- Single skip
- Double Skip
- Super Wide (1.5 m spacings)

Populations

Populations were targeted using germination % for each hybrid and an estimated establishment of 80%.
3 populations were targeted for each of the row configurations

30,000 plants/ha

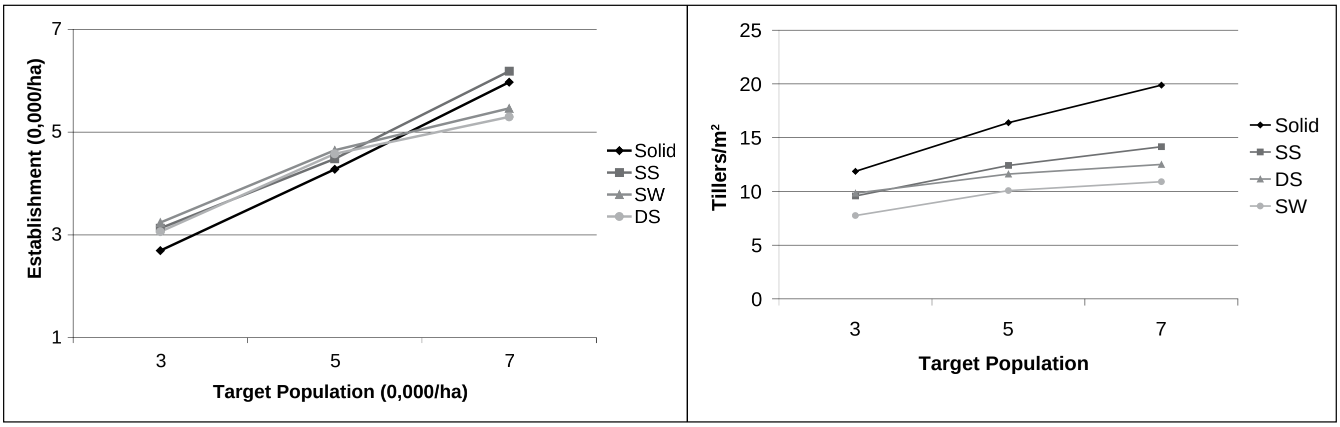
50,000 plants/ha

70,000 plants/ha

Establishment and tillers

Establishment counts were taken for each plot. Results showed that there was no difference in established populations between the hybrids.

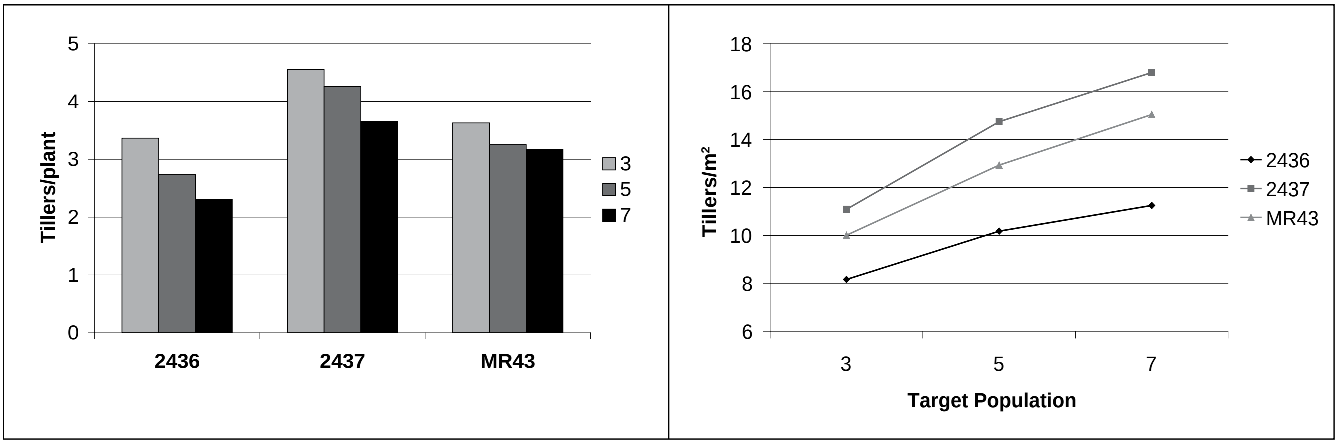
There were differences in the established populations due to the sowing configuration. There was no difference between the solid, single skip and double skip at any of the target populations. Populations were significantly lower at the 50,000 and 70,000 plants/ha target populations for the super wide row configuration.



Figures 1 & 2. Effect of population and row configuration on plant establishment (LH) and tiller density (RH).

Tiller count results showed greater tiller density across all hybrids on the solid configuration with the super wide rows having the lowest number of tillers/m^2.

The 3 hybrids differed in their tiller production. PAC2436 produced the lowest density of tillers and tillers per plant across all sowing configurations, while PAC2437 had the highest.



Figures 3 & 4. Effect of population and hybrid on tiller density per m^2 and per plant.

Dry matter production

Crop dry matter was assessed across all treatments at flowering. Dry matter production was unaffected by plant population and hybrid. Sowing configuration showed a trend for lower dry matter as the effective row spacing increased.

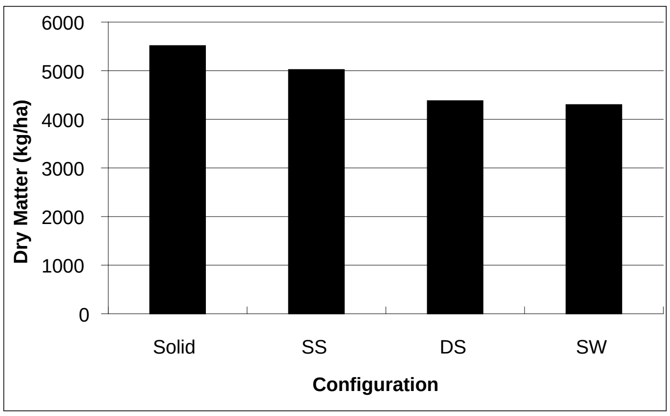


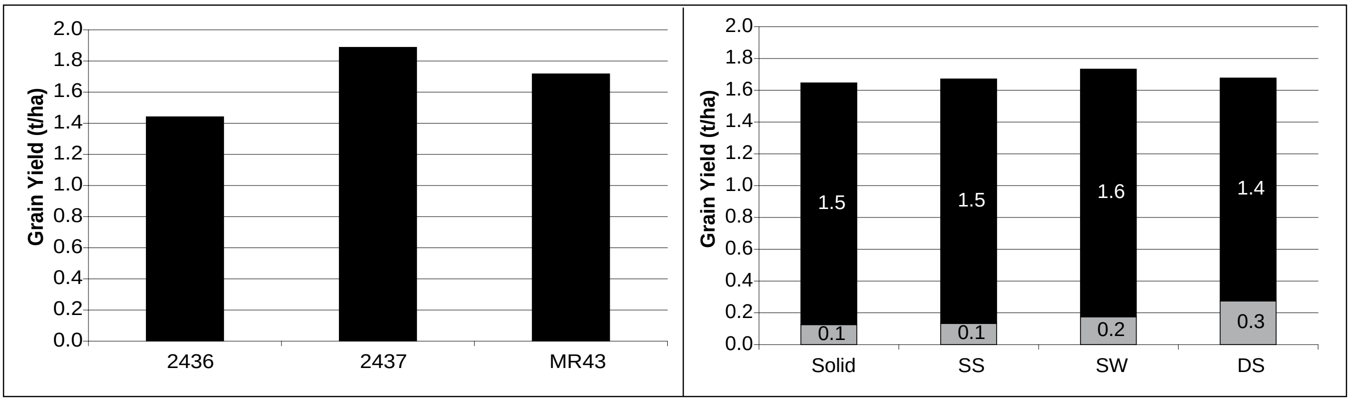
Figure 5. Effect of row configuration on crop dry matter production.

Grain yield

As the crop approached flowering, there was significant pre-flowering stress caused by high temperatures and low plant available water in the soil profile. This stress was relieved by significant rainfall over the New Year period, which also resulted in additional tillering and head production.

Prior to the rain, many treatments had extremely low head numbers, for example in the solid configurations there was less than one viable head per m^2 and the overall yield expectation was poor. In an attempt to capture the two scenarios, heads were tagged and labelled as primary (produced prior to New Year's rain) or secondary (produced post New Year rain). These heads were hand harvested and yield from each generation determined.

The maximum yield from the primary heads would have been around 0.2 t/ha (Figure 6) from MR43 and 0.3 t/ha from the double skip configuration (Figure 7).



Figures 6 & 7. Effect of hybrid and configuration on grain yield (dark bar = secondary heads, light bar = primary heads)

The secondary heads produced much higher yields with obvious differences between hybrids, 1.9 t/ha from PAC2437 down to 1.4 t/ha from PAC2436. There was little difference in the yield from the different configurations, ranging from 1.4–1.6 t/ha.

Summary

The 2009/10 summer season was extremely unusual due to the higher than average spring rainfall combined with conditions of significant heat stress prior to and during the flowering period in December. The relieving of this stress in early January resulted in effectively two crops in one season; a primary crop which was ready for harvest and a secondary crop which contained the bulk of the yield.

In this season's trial several observations were made:

- A hybrid such as PAC2436 which has a low tillering ability is unable to compensate for these extreme conditions as a hybrid with moderate – high tillering.
- Stay-green as a trait is only of benefit when the stress occurs post flowering.

Double skip was the most reliable configuration under stressed conditions, producing three times the yield of solid plant and single skip. However, the resultant yield from the primary heads alone would still have been uneconomic. is season confirmed that sorghum research of this nature needs to be carried out over a range of seasons to allow for the often extreme environmental conditions experienced in the western zone.

Acknowledgements

This project was funded by NSW DPI and Pacific Seeds. Thanks to Patrick Mortell, Jim Perfrement, Daniel McCulloch and Jan Hosking for technical assistance. Thanks to Myles Parker for assistance with the site. Thanks to Maree Crawford, Pacific Seeds for assistance with co-ordination of the trials in 2010. Thanks to Dave and Fiona Denyer for hosting the trial.

Matching sorghum genotype and agronomy to environment – Tamworth

Loretta Serafin[1], Guy McMullen[1], Alan Bowring[1], Rod Bambach[1], Trevor Philp[2] and Steven Simpfendorfer[1]

[1]NSW DPI, Tamworth
[2]Pacific Seeds, Toowoomba

Background

Sorghum is a reliable summer crop in eastern areas of northern NSW. However there is a need to improve the reliability of sorghum in western cropping areas and to assess strategies that will allow growers to adapt to increasingly variable seasonal conditions across the whole region. The introduction of hybrids with increasing levels of Stay-green, or using a combination of tillering, plant population and row configuration may help improve the reliability of sorghum yields.

In the eastern zone there has been a reasonable amount of work evaluating population and row spacing. Modelling work has suggested that sorghum can be a reliable component of western cropping systems but this work needs applied research to verify the modelling and give growers confidence to incorporate sorghum into their rotations.

In northern NSW crown rot, a stubble-borne fungal pathogen continues to be the most prevalent and damaging disease affecting winter cereals. Sorghum is recommended as a break crop but the success is dictated by the amount of breakdown of the winter cereal stubble. Although altering row configuration and population may improve the reliability of sorghum it may also reduce the rate of decomposition of cereal stubble and reduce water accumulation during the fallow period and the break crop benefits.

The trial outlined below aims to answer some of these questions and provide data for use in modelling the trial outcomes over long term climatic data sets.

Site details

Co-operator: Richard and Mark Walters

Property: "Glen Allen", Winton

Sowing Date: 18th & 19th November, 2009

Sowing Details: Monosem double disc precision planter

Treatment details

Hybrids

- MR43
- PAC2436 (an experimental pacific seeds hybrid with low tillering and high stay-green)
- PAC2437 (now MR Bazley; a hybrid with high tillering)

Row Configuration

- Solid on 1 m spacings
- Single skip
- Double Skip

Populations

Populations were targeted using germination % for each hybrid and an estimated establishment of 80%.
3 populations were targeted in each of the row configurations:

- 30,000 plants/ha
- 50,000 plants/ha
- 70,000 plants/ha

Establishment and tillers

Establishment counts were taken for each plot. Results showed that there was no difference in established populations between the hybrids or the row configurations. Overall, the populations that were achieved were lower than the target population.

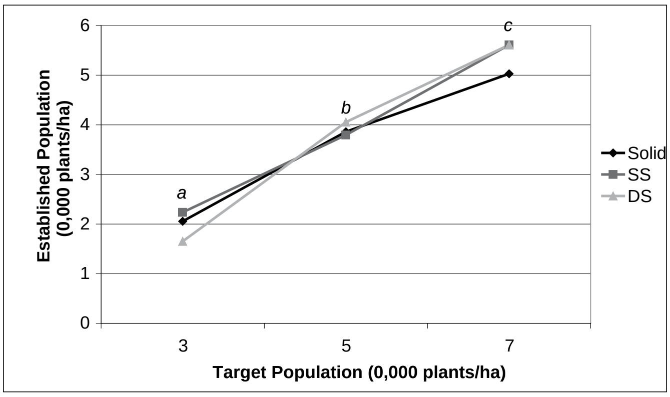
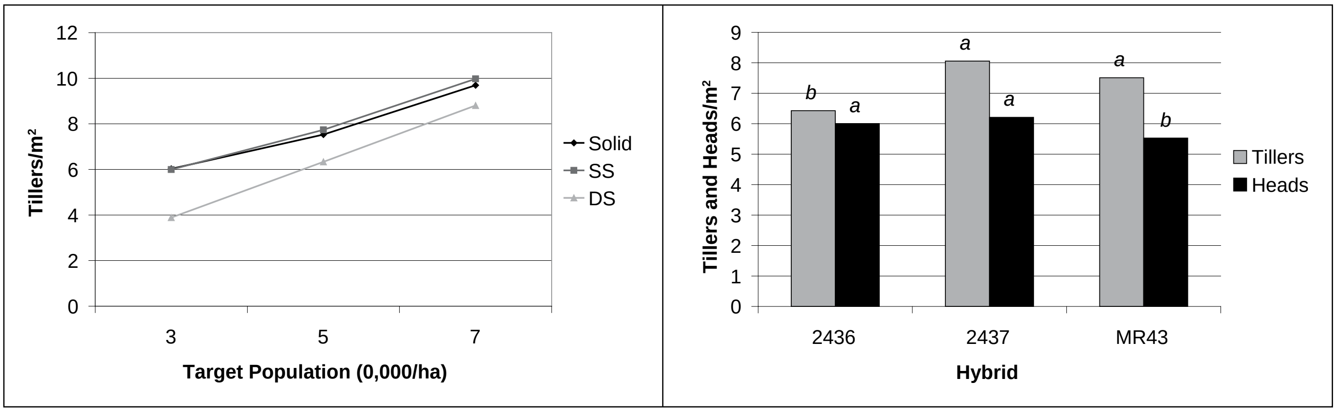


Figure 1. Effect of population and row configuration on plant establishment.

Tiller counts have also been done on all plots. Results showed greater tiller density across all hybrids on the solid and single skip configurations with the double skip having the lowest number of tillers/m² at all populations.



Figures 2 & 3. Effect of population, row configuration and hybrid on tiller density.

The 3 hybrids differed in their tiller and head production. PAC2436 produced the lowest density of tillers but appears to have retained more of these tillers through to heads. In contrast MR43 had a high tiller density but appears to have lost a greater proportion resulting in the lowest number of heads of the 3 hybrids. PAC2437 had the highest tiller and head density.

Dry matter production

Crop dry matter was also assessed across all treatments at flowering. Sowing configuration has had a significant impact on dry matter production with solid > SS > DS. Higher plant populations also showed a trend for high crop dry matter production while hybrid had no impact.

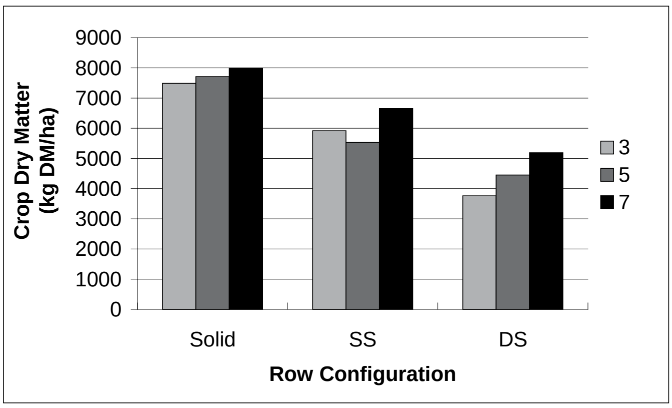


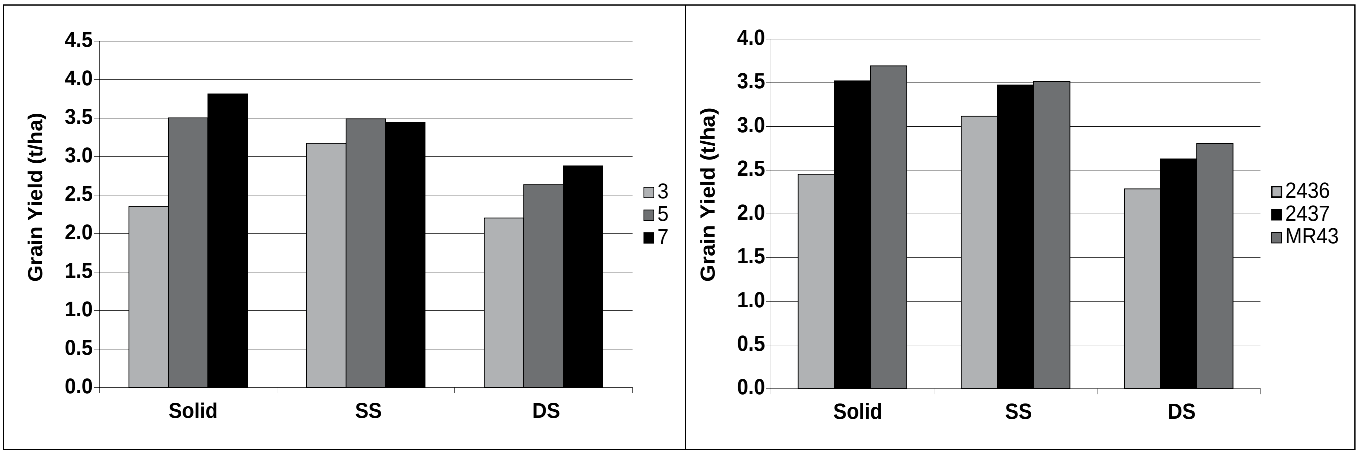
Figure 4. Effect of row configuration and population on crop dry matter production.

Yield

There were significant differences in grain yield across the configurations and populations. Solid plant (3.2 t/ha) and single skip (3.3 t/ha) yielded significantly better than the double skip (2.5 t/ha). Similarly there was no difference between the two higher populations of 50 and 70,000 plants/ha but 30,000 plants/ha yielded significantly less.

There were also significant differences between the hybrids performance, with MR43 and 2437 yielding significantly better than 2436. This suggests that the low tillering hybrid was somewhat yield limited this season.

When comparing across configuration and population, there was no significant difference between solid plant at 50 and 70,000 or single skip at 50,000 (Figure 5). Across genotypes and configuration, it can be seen in Figure 6 that there was no difference between MR43 and 2437 in the solid and single skip treatments, but that double skip resulted in a reduction in yield. 2436 yielded less in all configurations and all populations.



Figures 5 & 6. Grain yield across row configurations when using different plant populations and hybrids.

Summary

Solid plant sorghum is the traditional configuration used in the eastern zone. However this data has suggested there may be opportunity to include single skip configurations without sacrificing yield. Single skip configurations may be a viable option in soils with less water holding capacity, such as the red soils.

This data also supports previous work which has shown double skip sorghum to be limiting potential yield.

In the 2009/10 season the benefits of hybrids with some degree of tillering were also demonstrated. The low tillering hybrid 2436 yielded significantly less in all configurations and populations.

Acknowledgements

This project was funded by NSW DPI and Pacific Seeds. Thanks to Patrick Mortell, Jim Perfrement, Daniel McCulloch and Jan Hosking for technical assistance. Thanks to Mark & Richard Walters for hosting the site. Thanks to Maree Crawford, Pacific Seeds for assistance with co-ordination of the trials in 2010.

Irrigation Scheduling Demonstration – ACRI Narrabri 2010

Verity Gett

NSW DPI, Narrabri

Background

The Irrigated Grains in Cotton Farming Systems project aims to generate best practice recommendations for the establishment, management and irrigation of wheat in northern cotton growing regions. There are potential benefits for both wheat and cotton profitability to be gained from researching wheat management recommendations that produce consistent high yields.

One part of the project in 2010 aimed to investigate the varietal performance of 11 varieties under 3 irrigation regimes i.e. full/frequent water timing, a limited/stretched irrigation schedule and a rainfed/dry land treatment. This paper focuses on the scheduling component of this work.

The results will help the project team to fine tune irrigation timing recommendations for irrigated wheat depending on water availability and highlight the practices which achieve the best return per megalitre. It will also help to pinpoint differences in the way each variety performed under the three different irrigation scenarios.

Site details

Location:	ACRI Myall Vale Narrabri
Sowing Date:	8th June 2010 planted into moisture – it was planned to irrigate once emerged but it kept raining.
Sowing rate:	Target plant population was to establish 160 plants/m^2
In season rainfall:	384 mm
Nitrogen:	160 kg N/ha applied as urea preplant drilled in with a planter.
	8th September, 50 kg N/ha spread as urea prior to the first irrigation.
Fungicides:	Tilt® @ 125 mL/ha applied 21st August
	Tilt® @ 125 mL/ha applied 1st Sept
Growth Stages:	Z31–32 on 20th August Flowering – Jandaroi 22nd Sept (earliest variety) Sunlin 1st Oct (latest variety)
Harvest Date:	23rd November, 2010

Treatments

1. 'Full irrigation': 3 in crop irrigations – 14th September; 1st October; 21st 0ctober.
2. 'Limited Water': 2 in crop irrigations – 14th September, 21st October.
3. 'Rain fed': No irrigations applied.

Discussion

The field was planted into reasonable sowing moisture following the removal of the previous cotton crop and subsequent pupae destruction. Soil tests were undertaken indicating a very low nitrogen status field, less than 30 kg N available following cotton.

Urea was incorporated at a rate of 360 kg/ha while the paddock was being hilled up prior to sowing. This pre-plant application amounted to 60% of the crops total nitogen requirements with the remaining 40% applied later in-crop according to crop progress.

Managing nitrogen is key in setting up irrigated cereals for high yield potential.

The aim is to promote a plant structure that is able to handle a number of spring irrigations without lodging by restricting early tillering, whilst also maximising N uptake at critical growth stages such as late tillering through to post flowering. The split application method allows for nitrogen budgeting based on soil reserves, crop potential and seasonal conditions.

Seed was planted with a target plant population of 160 plants/m^2; establishment averaged 75%.

Plant, tiller and head counts as well as biomass cuts were taken throughout the season. Tiller production appeared to vary significantly according to variety and water availability. Tiller production was monitored over time for each variety under each irrigation regime.

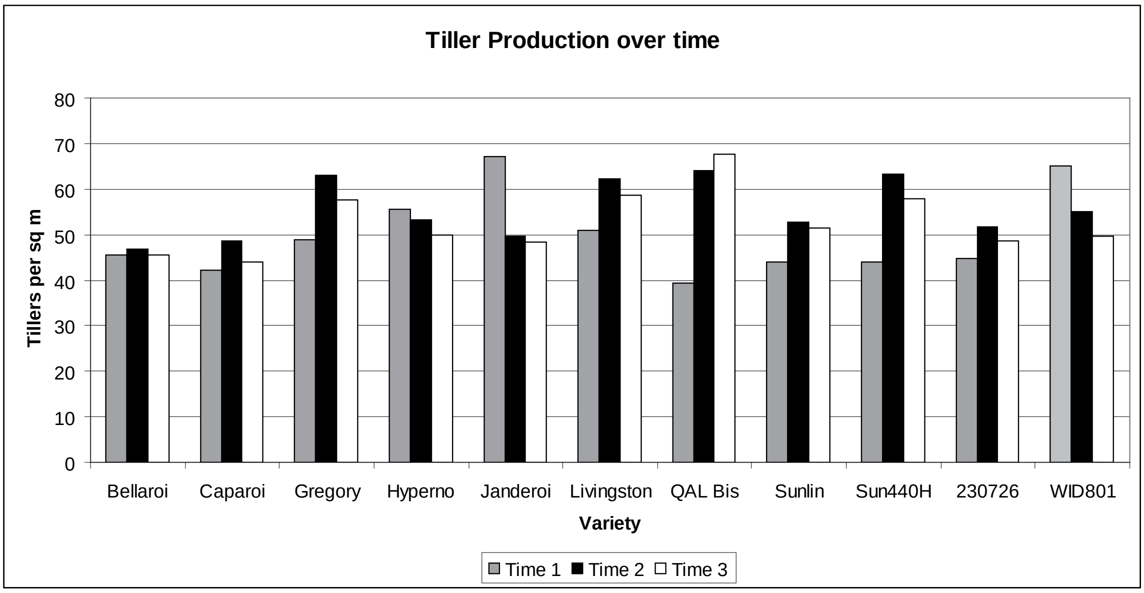


Figure 1. Tiller production over time for 11 varieties under 3 irrigation regimes.

Tiller production was influenced by irrigation frequency but not in all varieties. EGA Gregory tiller production increased significantly with increased water inputs. For EGA Gregory this followed through into more yield in the frequently irrigated treatment compared to rainfed. EGA Bellaroi, Caparoi and WID 801 also responded positively to increased water availability, though not significantly.

Head counts were analysed and showed significant varietal differences. There were no differences in head count due to water treatment and no strong relationship between head count and yield.

Water use analysis

Water use was analysed in two varieties; Jandaroi (the quickest maturity) and Sunlin (the longest maturity) over the three irrigation treatments. Neutron probe readings were taken in each replicate of each treatment once to twice weekly throughout the season.

Table 1. Mean water applied, yield and water use for three irrigation timings.

Treatment	No. of irrigations	T/ ML Applied Irrigation Water	T/ ML Water (Incl. irrigation, rainfall and soil moisture reserves)	Yield (t/ha)
Jandaroi W1	3	5.75	1.93	5.80
Jandaroi W2	2	5.79	1.98	6.40
Jandaroi W3	0	n/a	1.75	4.70
Sunlin W1	3	6.28	1.87	5.90
Sunlin W2	2	7.28	1.97	5.80
Sunlin W3	0	n/a	2.05	5.70

In the 2010 season in terms of tonnes of grain produced per ML of water applied, the Sunlin rainfed treatment was the most efficient, producing 2.05 tonnes of grain per ML water applied. However, overall there was no real significant gain from applying irrigation to the Sunlin variety with yields ranging from 5.9 t/ha in the fully irrigated treatment to 5.7 t/ha rainfed. Results in other varieties showed some good responses to increasing irrigation frequencies.

In a similar trial, conducted in 2009; a drier season with high lodging the best return per megalitre was from Sunlin with 1 in-crop irrigation at flowering resulting in 2.0 tonne grain/ML.

It is evident irrigation efficiency will be very much dependent on seasonal conditions; such as rainfall and irrigation timing, so this issue in regards to varietal performance will continue to be investigated.

Yield

There were significant effects of variety and of water but no interaction between the two.

EGA Bellaroi yielded significantly higher than all other varieties in the fully irrigated treatment. Hyperno yielded significantly higher in the irrigation treatment 2, suggesting some impacts of waterlogging in the fully irrigated trial. Note Hyperno was by the far the variety most affected by lodging, in all three water treatments, though it did not affect yield in 2010.

For all varieties, except Sunlin, the rainfed treatment yielded significantly lower than the two irrigation treatments.

However there was little or no difference in yield for some varieties under the full irrigation or limited irrigation treatments. Figure 2 demonstrates this effect in EGA Bellaroi, EGA Gregory and Livingston.

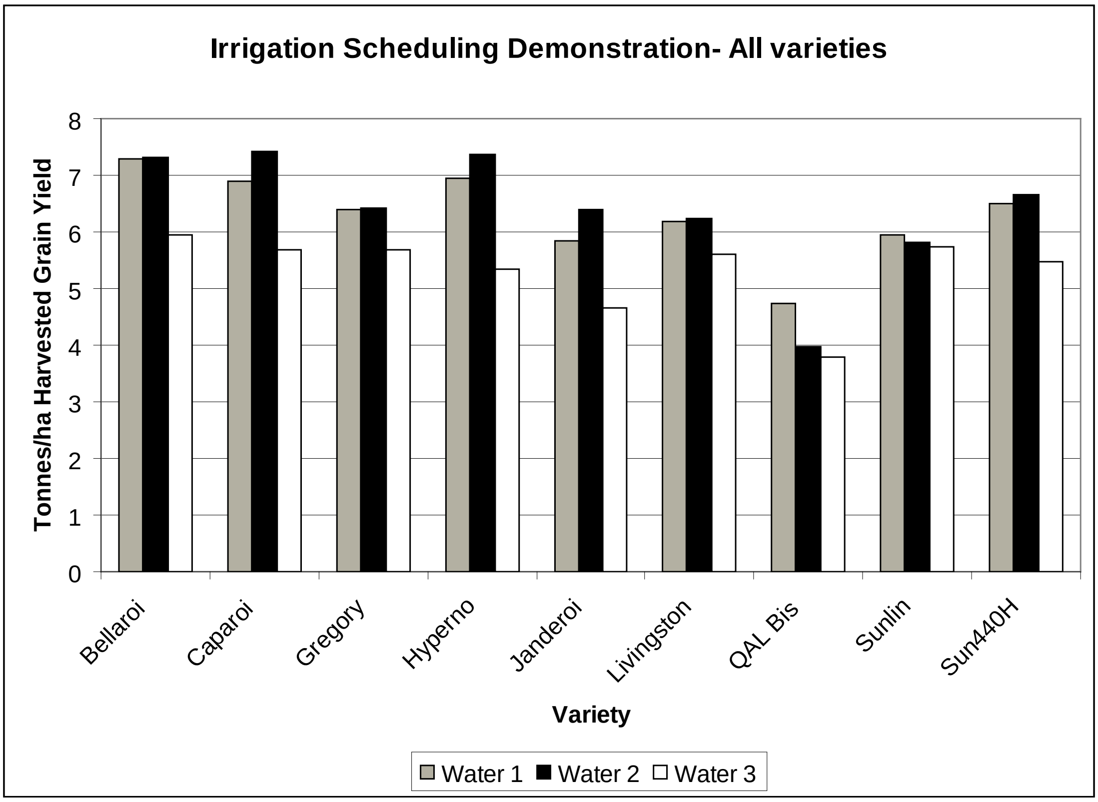


Figure 2. Tonnes/ha Grain Harvested for all varieties in 3 Water Treatments, ACRI 2010.

Conclusion

The 2010 saw a distinct change in the weather pattern from previous seasons, it rained consistently in the late winter and spring; a total of 384 mm of in crop rainfall was recorded. Often rain would follow irrigation treatments resulting in some waterlogging/inefficiencies in the irrigated treatments. Other than the rainfed treatment of Sunlin, the 2 in-crop irrigation treatment produced the best return per ML/water applied for Jandaroi and Sunlin. This was further demonstrated by the performance of a number of varieties (Caparoi, Hyperno and Sun440 H) in responding significantly better to two irrigations than three.

Overall varieties response to irrigations varied, but overall a significant increase in yield by applying irrigation inputs was seen.

The High Yielding Grains in Cotton Farming Systems project will continue to investigate the scheduling of irrigations in both a full and limited water situation.

Acknowledgements

GRDC Project : CCC 00004 High Yielding Grains in Cotton Farming Systems.

Thank you to John Sykes and Rod Jackson for help in writing up the results. Thank you to technical staff, Carolyn Palmer and Kris Bogdanoff for assistance in collecting field data and starting irrigation pipes.

Irrigated Grains in Cotton Farming Systems – Variety Trial 2010

Verity Gett

NSW DPI, Narrabri

Background

Cotton grown in rotation with wheat is a common practice in the northern region. In a survey of NSW cotton growers, over 70% used a wheat rotation, either 1:1 or 2:1 cotton: wheat (Hickman *et al.*,1998; Cooper, 1999). Despite this, the majority of wheat crops have low or inconsistent yields. There is concern amongst growers that wheat is not delivering the rotational benefits and subsequent increase in profitability that is needed.

This project aims to generate best practice recommendations for the establishment, management and irrigation of wheat in northern cotton growing regions. There are potential benefits for both wheat and cotton profitability to be gained through improved wheat management recommendations that produce higher and more consistent yields.

Site details

Location:	ACRI Myall Vale Narrabri
Sowing Date:	8th June 2010 planted into marginal moisture. Aim was to waterup but it just kept raining.
Sowing rate:	The aim was to establish 160 plants/m^2 so the sowing rate was based on seed size for each variety.
In crop rainfall:	384 mm
Irrigations:	3 in crop irrigations, on 14th September; 1st October and 21st 0ctober.
Nitrogen:	Pre-plant – 160 kg N/ha supplied as urea drilled in with the planter.
	Post plant – 8th September 50 kg N/ha prior to the first irrigation – spread as urea.
Fungicides:	Tilt® @ 125 mL/ha 21st August
	Tilt® @ 125 mL/ha 1st Sept
Growth Stages:	Z31–32 on 20th August
Flowering dates:	Jandaroi – 22nd Sept (earliest variety) and Sunlin – 1st Oct (latest variety)
Harvest Date:	23rd November, 2010

Background

As part of the investigation into irrigated wheat in cotton farming systems, an irrigated variety trial was planted at Narrabri on June 8, 2010. The field trial consisted of 11 varieties-; 6 durum and 5 bread wheats. The field was treated as a 'full/frequent' irrigation scheduling demonstration, as part of a larger irrigation scheduling demonstration. The aim was to gather information on how the different varieties performed under full irrigation in respect to plant establishment, tillering and ultimately yield.

The field was planted following the removal of the previous cotton crop and subsequent pupae destruction. Rain provided enough moisture to plant and germinate the seed. Soil tests were undertaken indicating a very low N status field with less than 30 kg N/ha available following cotton. Urea was incorporated at 360 kg/ha while the paddock was being hilled up prior to sowing. This amounted to 60% of the crops N requirement at planting with the remaining 40% applied in crop.

Managing nitrogen is critical in setting up irrigated cereals for high yield potential. The aim is to promote a plant structure that is able to handle a number of spring irrigations without lodging by restricting early tillering, whilst also maximising N uptake at critical growth periods such as late tillering through to post flowering. The split application method allows for nitrogen budgeting based on soil reserves, crop potential and seasonal conditions.

Plant establishment

Seed was planted with a target of 160 plants/m^2 . Basically half of the varieties achieved this target plant population or better. Overall establishment across the trial averaged 75%.

Plant, tiller and head counts as well as biomass cuts were taken throughout the season.

Table 1. Field data for Field 2 Irrigated Wheat Variety Trial 2010 including plant, tiller, head counts and grain yield.

Variety	Emergence – plants/m^2	% Established	Tillers/m^2 (taken at Z31)	Heads/m^2	Yield (t/ha)
EGA Bellaroi	139	66%	332	350	7.4
Caparoi	153	73%	346	346	6.9
EGA Gregory	156	74%	467	372	6.4
Hyperno	134	64%	360	314	6.9
Jandaroi	130	62%	362	327	5.8
Livingston	166	79%	446	414	6.2
QAL Bis	170	81%	454	366	4.7
Sun440H	168	80%	350	348	6.4
Sunlin	161	77%	482	364	5.9
230726	160	76%	357	338	6.3
WID801	190	90%	404	330	7.1

Tillers and head counts

Tiller counts were taken in all replicates of each variety at Z31.

Jandaroi, Livingston, Sun 440H and Sunlin were found to produce significantly higher tillers per square metre than the other varieties. However, this did not lead to these varieties producing higher yields.

Head counts were taken in each of the replicates for each of the varieties. There was no strong relationship between heads per square metre and yield.

Yield

There were significant differences between varieties for yield . In this fully irrigated trial EGA Bellaroi yielded significantly higher than the other varieties at 7.4 tonnes per hectare harvested yield. In the particularly wet winter season (384 mm rain in crop) of 2010, the durum wheat varieties performed better than the bread wheat varieties included in this trial.

Lodging scores were recorded on all varieties at mid tillering and harvest. Hyperno had the highest lodging score followed by Jandaroi, with other varieties not really being affected by lodging in this season.

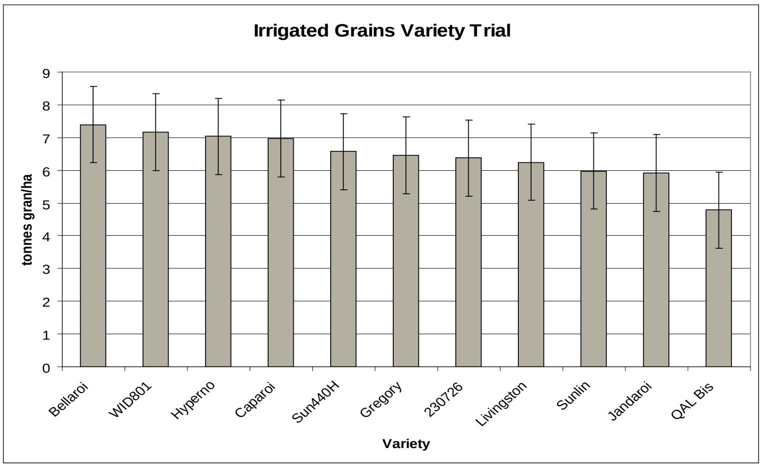


Figure 1. Yield across grain varieties

Conclusions

In the 2010 winter season under 'full' irrigation the top four varieties were: EGA Bellaroi (7.4 t/ha), WID 801 (7.1 t/ha), Hyperno (6.9t/ha) and Caparoi (6.9 t/ha). The durum wheat varieties out performed the bread wheat varieties averaging 1 tonne /ha higher in harvested grain yield. Lodging was not an issue in this trial.

Much progress has been made into developing irrigated wheat agronomy for the northern system. Plans for 2011 are to validate northern management recommendations on-farm. This will be done in conjunction with finalising research work in the field at both ACRI and the Breeza Research Station. A similar trial to this one is planned for 2011 to help build and validate the northern region agronomy package.

Acknowledgements

A big thank you to Technical staff – Carolyn Palmer and Kris Bogdanoff, for all their hard work collecting data.
GRDC Project: CCC00004, High Yielding Grains in Cotton Farming Systems.

Chloride deficiency in durum wheat – can breeding help?

Graeme Schwenke and Bert Collard

NSW DPI, Tamworth

Introduction

Leaf-spotting symptoms of chloride deficiency were observed in many durum crops across northwest NSW in the wet 2010 winter cropping season. The worst leaf-spotting symptoms were observed in Jandaroi crops (Figures 1 & 2), but spotting was also noticed on other commercial varieties. While chloride deficiency symptoms have been seen sporadically in Jandaroi crops grown on low chloride soils in previous years, the wetter than usual 2010 winter meant that durum roots were confined to the surface soil where many soils are typically low in chloride concentration. In drier years, the crop's root systems quickly grow deep into the subsoil where chloride concentrations are typically higher. The high rainfall in 2010 may also have leached chloride from the surface soil down below the root zone.

Figure 1. Close-up of Jandaroi leaves showing; top = healthy leaf, middle = moderate chloride-deficiency leaf-spotting, and bottom = extreme leaf spotting (Photo: Graeme Schwenke)

Figure 2. Chloride deficiency in commercial crop of Jandaroi (Photo: Steven Simpfendorfer).

Field trials at low soil chloride sites on the Liverpool Plains in 2008 and 2009 showed no yield response to additions of chloride fertiliser, probably because the plant roots explored the whole soil profile and were able to extract sufficient chloride from deep in the profile. However, we demonstrated that adding chloride fertiliser raised the plant's chloride concentration from borderline-deficient to sufficient and reduced leaf spotting.

Overseas research and local observations have shown that chloride deficiency in durum wheat is highly variety-specific, with some varieties very sensitive to low chloride concentrations. Other varieties can tolerate low chloride concentration in the soil without showing any leaf-spotting symptoms. By chance, the wet 2010 winter season provided a good opportunity for the NSW DPI durum breeding team, based at Tamworth, to experience first-hand the differences in tolerance to chloride deficiency in a range of NSW and SA-sourced elite durum wheat breeding material. Symptoms of severe chloride deficiency were observed at two of the six 2010 durum breeding trials in northwest NSW; Tamworth and Currabubula.

Site details

Location:	Tamworth Agricultural Institute	Currabubula (Newhaven)
Sowing Date:	1st July	17th June
Leaf spotting rated:	8th October	12th October
Plant tissue sampled:	5th November	not done
Grain Harvested:	7th December	not harvested (rain)

Treatments and measurements

At each site there were 4 replicated plots each of 32 durum varieties, including 3 commercial NSW varieties (Caparoi, Jandaroi, EGA Bellaroi) plus the newly released SA variety Tjilkuri (formerly WID801), 16 NSW breeder's elite lines, and 12 SA breeder's elite lines.

All plots at the two sites were scored for leaf-spotting damage at flowering. Scores were; 1 = 1–10% symptoms on leaf area (good); 3 = 11–25% symptoms on leaf area (minor); 5 = 26–50% symptoms on leaf area (moderate); 7 = 51–75% symptoms on leaf area (severe); 9 = 76–100% symptoms on leaf area (extreme). Digital photographs of all plots at Tamworth were analysed for greenness using computer software. We also used a Greenseeker to obtain a Normalized Difference Vegetation Index (NDVI) for 2 of the 4 reps of each variety. At flowering, whole plant samples were collected from 3 of the 4 reps of all varieties at the Tamworth site, then analysed for chloride concentration by a NATA-accredited lab (NSW DPI, Wollongbar). Grain yield at Tamworth was measured using a small plot harvester. The Currabubula site was not harvested due to rain.

Leaf-spotting scores

There were significant variety differences in leaf-spotting scores (Figure 1) at both trial sites. As expected, spotting severity in the commercial varieties was in the order Jandaroi (worst) > Caparoi > EGA Bellaroi (best). The elite lines gave a wide range of responses, with some as bad as Jandaroi, but others much better. There was also some variation in the severity of leaf-spotting for some varieties when compared across the two trial sites. For example, 8 of the 16 NSW elite lines scored worse at the Currabubula site than at the Tamworth site, while the other 8 lines scored similarly between sites. Past soil test and trial experience suggests that the Currabubula soil would likely have been more chloride deficient than at Tamworth.

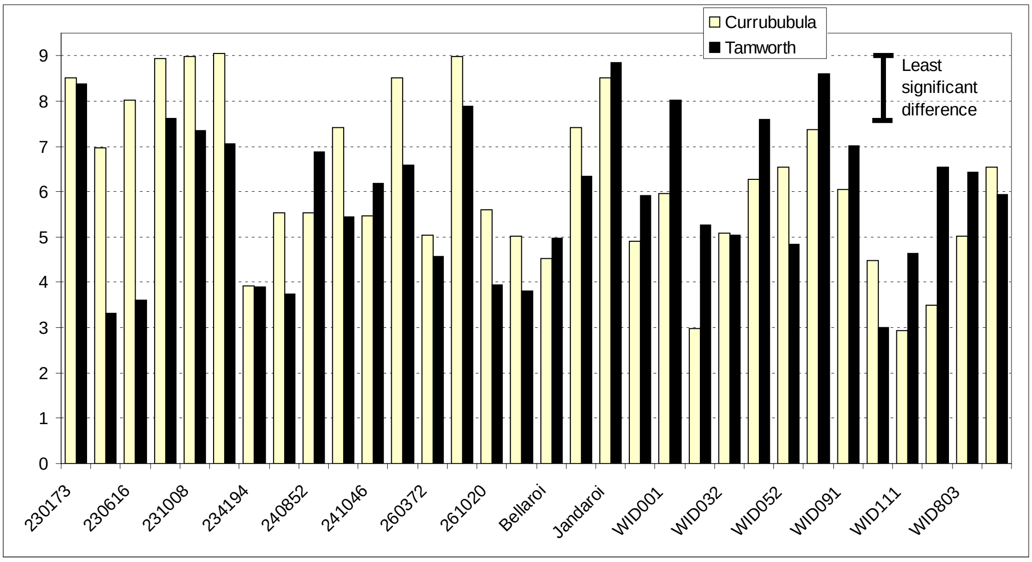


Figure 1. Leaf-spotting scores (left bar for each variety is the score at Currabubula, right bar is the score at Tamworth). Scores: 1 = Nil (leaf-spotting); 3 = Minor; 5 = Moderate; 7 = Severe; 9 = Extreme. The first 19 varieties are NSW-lines; the rest are all SA lines.

Leaf greenness analysis

As expected, leaf-spotting reduced the green leaf area of the affected plants. We found that the higher the leaf score (worse symptoms), the lower the amount of greenness in the digital photo image and lower NDVI. Both digital photo greenness and NDVI results were significantly affected by the variety grown with variety rankings mostly opposite to the leaf-spotting scores.

Plant chloride concentration

The mean chloride concentration in plants at flowering was 0.14% (range: 0.05–0.29% Cl). There was no statistical difference between varieties. The average concentration was only just above the US critical level of 0.1% for severe leaf spotting in sensitive durum varieties, and is well within the 0.4% Cl level below which sensitive US varieties may suffer yield loss. In summary, all varieties had a similar but very low chloride concentration, supporting chloride deficiency as the cause of the leaf spotting symptoms we observed.

Grain yields

There were significant variety differences in grain yields at the Tamworth trial (Figure 2) with SA9096 yielding 0.67 t/ha higher than any other variety. Overall, there was no direct relationship between grain yield and measures of chloride deficiency (leaf-spotting scores, chloride concentration, digital photo greenness, NDVI). However, a separate regression analysis of the SA varieties on their own showed stronger links between grain yield and leaf score ($r^2 = 0.34$), digital photo greenness ($r^2 = 0.39$) and NDVI ($r^2 = 0.49$). No such links were found in separate analysis of NSW elite lines.

It is worth noting that the line SA9096 not only yielded well above other entries but also had the lowest leaf-spotting score and highest digital photo greenness and NDVI score. In terms of low chloride tolerance, 240578 was the most promising NSW durum line as it yielded near the top and had a very low leaf-spotting score. Of the other NSW lines, only 241046 and 260295 yielded higher than Jandaroi and scored lower than Jandaroi for leaf-spots.

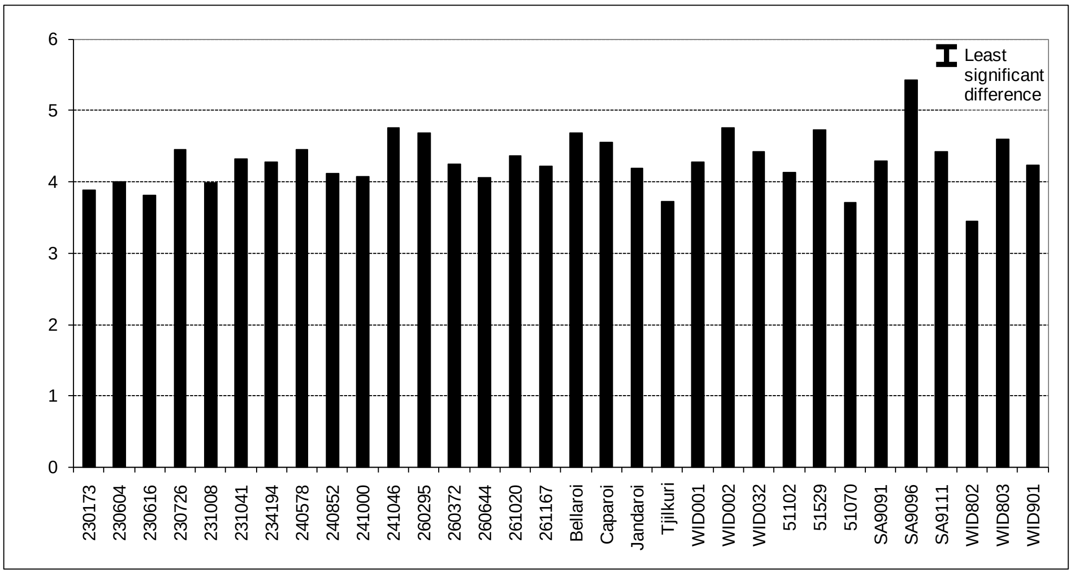


Figure 2. Grain yield (t/ha) at Tamworth Durum Breeder's Trial, 2010. The first 19 varieties are NSW-lines; the rest are SA lines.

Summary

While this report is based on just one year's results, it does look promising for the durum breeding program to be able to select and advance high yielding lines that are more tolerant to low chloride conditions. Furthermore, methods such as digital image analysis and Greenseeker appear to be useful tools for reliably selecting lines more tolerant to chloride deficiency in seasons where symptoms are expressed.

Acknowledgements

This project was funded by NSW DPI and GRDC. Thanks to the Durum Breeding team at Tamworth for all fieldwork David Gulliford, Brent Johnson, Richard Morphett, Lyn O'Brien. Thanks also go to Bruce Haigh (Greenseeker measurements), Bruce McCorkell (biometrics support), and to David Tudgey (Newhaven) for providing the Currabubula trial site.

Breeding for salinity tolerance in durum wheat

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Introduction

Salinity is an important soil constraint in many durum growing areas in NSW and other states. Durum wheat is generally considered to be sensitive to saline soils although there is limited information on the performance of current durum varieties and elite breeding lines to suggest otherwise. The Australian durum wheat improvement program (ADWIP) has the goal of expanding durum production into new regions, including areas affected by salinity.

The aim of this research was to evaluate current varieties and elite breeding lines for yield performance at a saline site in Northern NSW. South Australian durum lines were also included and were expected to perform well because some of the selection environments for the SA breeding node suffer from salinity, and hence these lines were expected to be more adapted.

Field trial details

Location: Ashley

Sowing Date: June 3rd, 2010

Harvest Date: November 24th, 2010

Plot size: 10 x 1.2 metres

Soil measurements: EC readings and soil coring were performed by CSIRO Plant Industry in order to confirm that the selected site was homogeneous for salinity.

Plant material

A total of 32 lines were tested. Durum varieties included Caparoi, Jandaroi, EGA Bellaroi, Wollaroi, Yallaroi, Tamaroi, Hyperno and the new variety Tjilkuri (WID801). Elite ADWIP lines evaluated in recent years in national variety trials (NVT) were also included (234194, 230726 and 230173 (NSW) and WID802, WID803, WID901, WID001 and WID002 (SA)). The field design was a row/column design with 4 replications.

Evaluation of durum wheat lines

Based on a single year of data, the results were encouraging because the site mean yield was 6.5 tonnes/hectare. This yield was comparable to other ADWIP field trials located at Moree, North Star and Tamworth. Based on 10 m plots, it was estimated that there was more than 1.5 tonnes difference between the highest and lowest yielding lines. At Ashley, EGA Bellaroi was the top-yielding NSW variety, and Caparoi performed reasonably well. Tamaroi was the best SA variety and is reputed to have some tolerance to saline conditions from previous research, however Kalka or Saintly were not included. Three SA breeding lines, SA9111, SA9091 and SA9096 were the highest yielding at this site (Figure 1). The line 241046, a promising NSW-developed line, also performed well.

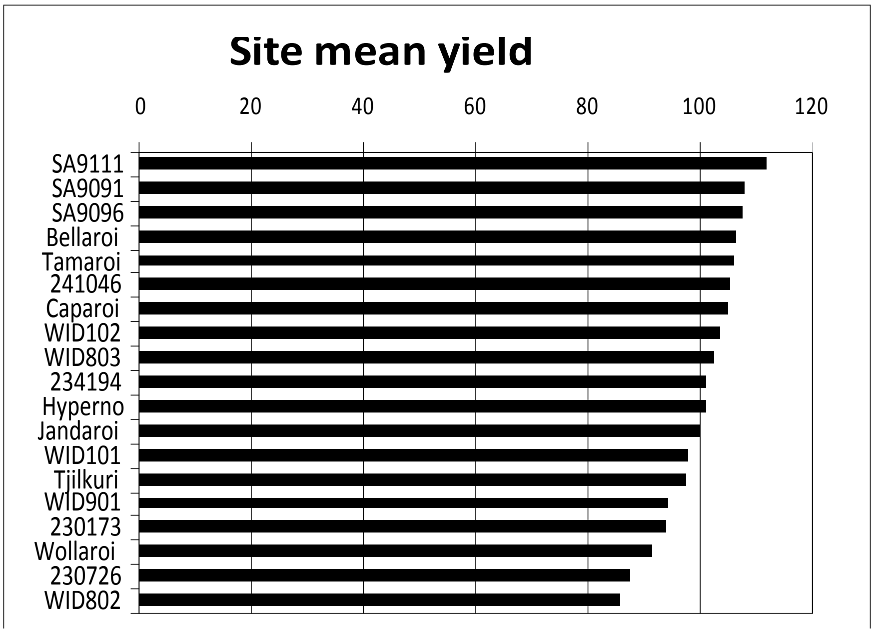

Figure 1. Performance of durum varieties and elite breeding lines at saline field site in 2010.

Further work

It is critical that these durum varieties and lines are re-evaluated in subsequent years at this or other saline sites because 2010 was atypical with record-breaking rainfall. In wet years, roots do not generally grow as deep in the soil as in drier years and so the durum lines may not have been exposed to high levels of saline soil that are likely to be present at greater depths (e.g. > 1 metre). Therefore, ADWIP will continue to conduct field trials at saline sites for several more years.

An important point to be mentioned (from an analysis viewpoint) was that kangaroos grazed the plots at seedling stage. This was more evident within plots on the outside edge of the trial. Although a spatial analysis was performed by NSW DPI biometricians to compensate for this in the analysis, the lines in this trial need to be re-evaluated in subsequent years.

Summary

Genetic differences in the performance of durum lines at a saline site were observed, including breeding lines that performed better than current commercial varieties. Further work is required to test the performance of these lines in 2011 and beyond, to more thoroughly evaluate the performance of durum wheat material under saline conditions.

Acknowledgements

This project was funded by NSW DPI and GRDC (DAN00118). Thanks to Richard Morphett and Brent Johnson for technical assistance and Bruce McCorkell for statistical support. The assistance of Dr. Richard James (CSIRO PI) in evaluating the salinity levels at this field site is gratefully acknowledged. A special thanks to Andrew Crowe "Sunbury", for the use of his land for the ADWIP field trial.

Durum Benchmarking – Hillston irrigation district 2009

Barry Haskins[1] and Mike Sissons[2]

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Introduction

This report describes the application of the most recent agronomy practices on a select number of commercial irrigated fields, aiming to achieve target yields, target water use efficiencies, DR1 quality grade and to evaluate other quality characteristics that are currently not measured in commercial situations. The outcome from this project was to identify and evaluate linkages in agronomic practices that increase yield, water use efficiency and grain quality for end users.

Key outcomes

- Lab grain test results for Hard Vitreous Kernels (HVK) sometimes differed to results obtained at grain receival sites. This is likely to be because of sample variations within field and individual loads.
- High yielding, water efficient DR1 durum was achieved in most of the 18 benchmarked fields.
- Grain protein, HVK, test weight, 1000 grain weight, falling number, semolina colour and semolina yield all fell within desirable limits.
- Dough strength on the other hand was poor in the majority of samples; however this may be due to seasonal conditions and/or varietal characteristics since the two samples of Caparoi performed better than most of the EGA Bellaroi samples. Further varietal testing under these conditions is necessary.
- Nutrition (sulphur) and irrigation management (time of last irrigation) seemed to influence grain protein in some crops, (where added sulphur increased protein, and late irrigations decreased protein). This needs further investigation.
- Paddock rotation had a big influence on nitrogen fertiliser efficiency.

Site details

Location: Hillston, 2009

Varieties: EGA Bellaroi and Caparoi

Seasonal conditions: 2009 was a very dry year, with only 97–168 mm of rain falling in the growing season (compared to the average of 220 mm) in benchmarked crops. This made irrigation essential for achieving high yields. Temperatures were consistently warmer than average throughout the growing season, apart from a cool period in late October. Harvest was only disrupted by one late rain event.

Treatments: Eighteen commercial fields were benchmarked (including four smaller trial paddocks) and managed according to current agronomic best practice. Many crop measurements were taken (soil N status, plant, tiller and head count, grains/head, water applied and used, rainfall, WUE). The grain from these fields was sampled at random from various places in the field to obtain about 5 kg of grain. Samples were then sent to NSW DPI durum laboratory in Tamworth, for quality analysis.

Results

In irrigation systems water use efficiency (WUE), is the key driver to productive and profitable farming. Since many crops had varying irrigation methods and target yields, WUE is the best way to measure crop performance. Whilst there was a good mix of irrigation methods (flood, centre pivot and lateral move), no single irrigation system performed obviously better than another. This is again likely to be because of the lack of in crop rainfall and high evaporation in 2009.

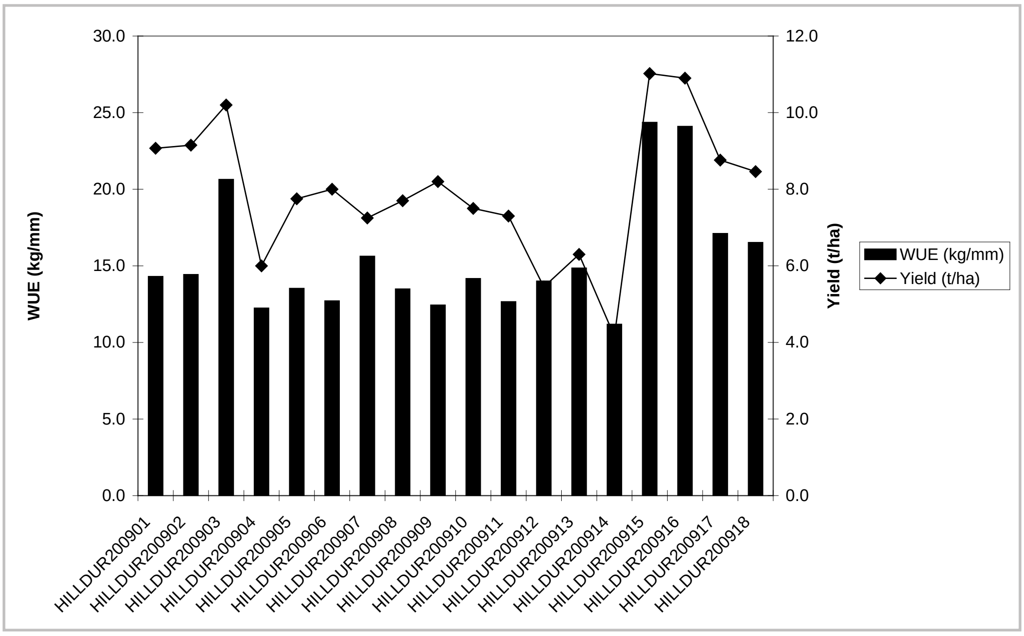

Figure 1. WUE of durum crops

Yield is obviously the most important factor for profitable crops, however when targeting high quality DR1 grain, protein and HVK targets can sometimes be difficult to achieve. This was the case in only a few samples (Figure 2) with most above the HVK DR1 cut-off (80%) and the protein minimum of 13%. All samples showed desirable one thousand grain weight and test weight.

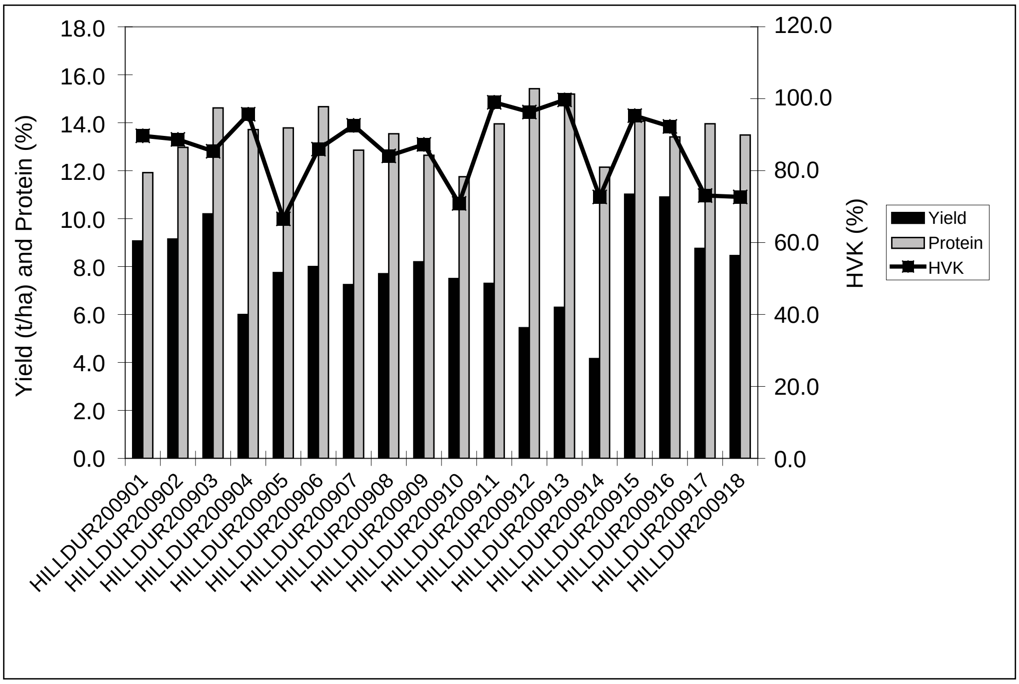

Figure 2. Yield, protein and HVK for the benchmarked fields

The semolina yield from these samples ranged from 68.7% to 71%. 70% is usually considered desirable. Most semolina samples exhibited excellent yellow colour. Dough properties were assessed using the mixograph and gluten index test. For mixograph, a lower resistance breakdown (RBD) is desirable. In Figure 3 RBD levels indicated weak dough strength for most samples.

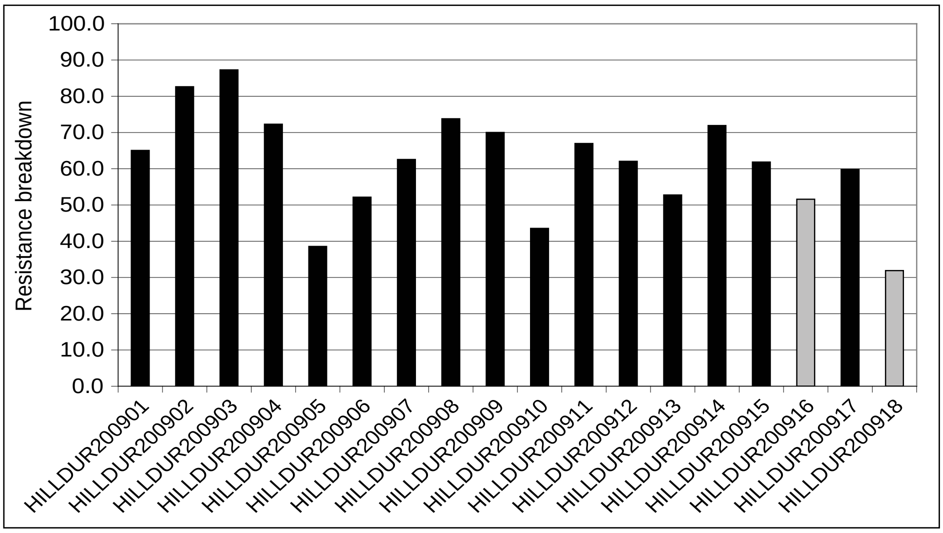

Figure 3. RBD levels of all samples. Caparoi highlighted in grey.

In the gluten index test (GI) most samples fell below the desirable level of > 50 (good strength). Again only a few EGA Bellaroi samples reached this level indicating weak sample strength, but both of the Caparoi samples were > 50.

Summary

Yields were closely correlated with WUE (r2 =0 74). Only about 30% of samples reached the target of 15 kg/mm, however that is to be expected in such a hot, dry season, with high evaporation. Many crops were also sown a little later than ideal, causing them to flower in the warmer part of the season. Samples 15, 16, 17 and 18 were all sown in the earlier part of the window.

Various aspects of agronomy affected the achieved yield and WUE, however the major identified influences included paddock history and underlying nutrition, sowing time, and irrigation scheduling. The interaction between many agronomic aspects was complex, and no single factor showed any extreme influence on yield and WUE, rather a combination of various factors. Sample 14 was a 'semi irrigated' field, and as a result of the dry season was one of the lower WUE fields. Also of interest were crops sown into fallow (4, 5, 6, 8, 9 and 11) all were lower in WUE. This may be because they started with an extremely dry profile, and irrigation water was required to build that profile up. Other paddocks may have had residual moisture remaining from the previous crop (eg samples 3, 15 and 16) which followed corn/maize, making WUE look unusually high.

Most samples that reached 13% protein also achieved the HVK target. Of interest samples 5, 17 and 18 were lower in HVK whilst still showing high grain protein. These samples were from typical heavy clay 'rice' soils, which are heavier in texture and tend to be lower in some nutrients. This lower HVK has been anecdotally reported by some farmers growing durum on those soils, but further investigation is warranted. Crops following cotton (samples 1, 2, 10, 14) all showed lower grain protein levels even though they were given a lot of fertiliser N. This was expected, as the cotton stubble that was incorporated tied up nitrogen making it unavailable for plant use. Crops following fallow (4, 5, 6, 8, 11), corn and potatoes all reached protein and HVK targets. This highlights the underlying nutrition in these rotations, the mineralisation of nutrients, and also the absence of other things such as disease that can lower yield and quality.

Grain size, semolina yield, falling numbers and colour all fell within favourable guidelines for producing high quality pasta. Dough strength on the other hand was not so desirable, as indicated by the MPT, RBD and GI tests. This may be because of a number of environmental factors that may have occurred within the 2009 season, and to be certain further testing would be required. This issue may be totally different in another season and why testing over more than one year is desirable, preferably typical years matching conditions over a 5 year average for the region. Conditions during grain filling can impact on glutenin formation and the ratio of glutenin to gliadin which impacts on dough rheological properties. There is however a strong suggestion that EGA Bellaroi seems inferior to Caparoi in terms of dough strength under irrigation. Varietal differences are well known, and it may be necessary to undertake more varietal evaluation under high yielding irrigated durum in Southern NSW to confirm this.

Acknowledgements

Thanks to the Hillston irrigators that included their crops in the project and the staff at NSW DPI Tamworth who performed the grain quality testing.

Row spacing response of wheat and durum varieties – Coonamble 2009 & 2010

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Introduction

There has been a trend to wider row spacings in recent years. Likely benefits include:

- an ability to sow into higher levels of retained stubble
- a reduction in fuel costs during sowing and/or increased sowing speed
- ability to inter-row sow subsequent crops
- reduced soil disturbance, and
- lower cost of sowing equipment.

However, potential costs from wider spacings include:

- lower yields with wider row spacing, particularly under higher yielding conditions, and
- reduced weed competition.

There are a number of studies currently examining the responses of cereal and broadleaf crops to row spacing, and also the interaction with plant population. In targeting a desired population, the likely establishment percentage has to be selected. In practice establishment rates rarely exceed 90% and can fall as low as 30% depending on sowing conditions and seed quality. Germination tests do not necessarily give a good indication that germinated seed will be able to establish a viable plant.

Site details

2009

Location: Coonamble

Cooperator: Clyde Agriculture

2010

Location: Coonamble

Cooperator: George Lefebvre

Treatments

2009	2010
1 sowing date – 26th June	2 sowing dates – 10th May and 6th June
2 durum and 6 bread wheat	1 durum and 4 bread wheat varieties
3 row spacings – 30 cm, 40 cm and 50 cm	3 row spacings – 30 cm, 40 cm and 50 cm

Results 2009

- Significant yield loss was incurred for each of the wider row spacings. Moving from 30 cm to 40 cm row spacing reduced yield by an average of approx. 800 kg/ha (25%), with a further reduction of 400 kg/ha when moving from a 40 cm to 50 cm row spacing.
- There was no significant effect of increasing plant population on yield at any of the row spacings.
- There was no strong evidence that any varieties are better adapted to wider row spacings, with all varieties having reduced yields at wider row spacings.

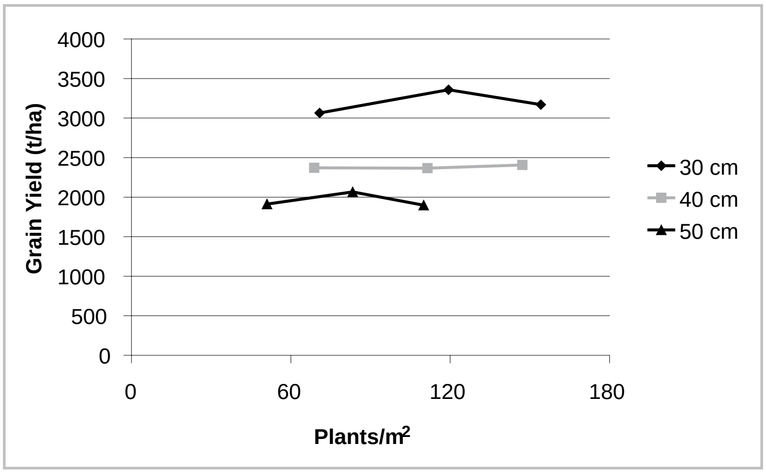


Figure 1. Effect of row spacing and plant population on grain yield at Coonamble in 2009.

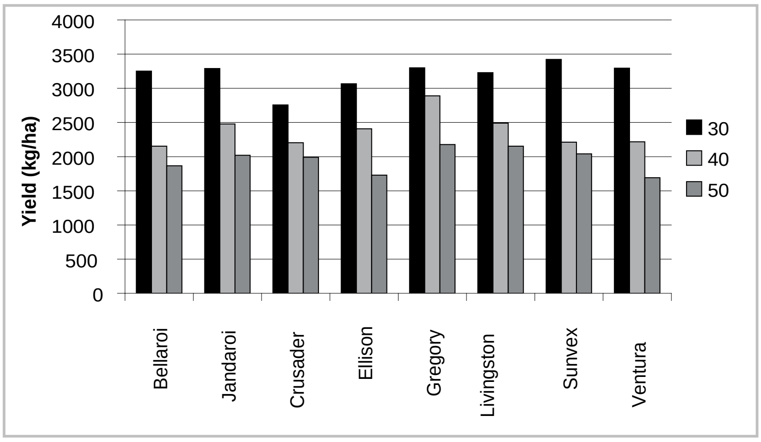


Figure 2. Variety yields at 3 row spacings at Coonamble in 2009.

Results 2010

- The yield penalty for delayed sowing (10th May to 6th June) was on average 1 t/ha across all row spacings.
- In 2010, although yields were significantly lower at the later sowing time the yield loss at wider row spacings remained the same.

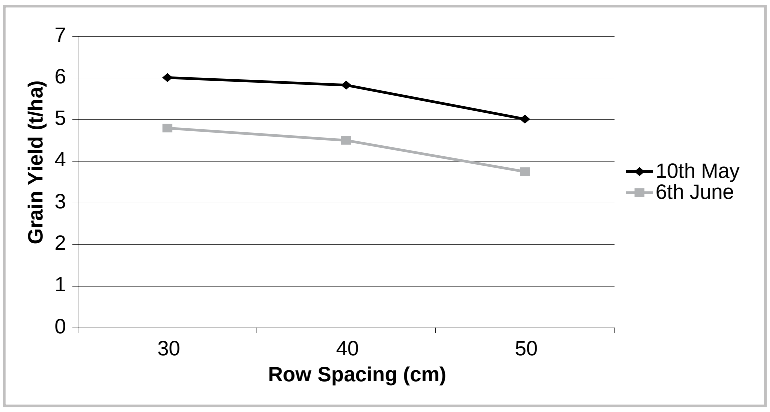


Figure 3. Grain yield at 2 sowings times and 3 row spacings at Coonamble in 2010.

Summary

The yield losses at wider row spacings in both 2009 and 2010 were in seasons that had above average rainfall and relatively cool conditions during grain-fill. Wider row spacings have provided yield and quality stability in areas that experience high temperature and moisture is limiting after flowering.

Acknowledgements

This project is funded by NSW DPI and GRDC under the Variety Specific Agronomy Package Project (DAN00129). Thanks to Jayne Jenkins and Rob Pither for technical assistance.

Sowing depth response of wheat and durum varieties – Coonamble 2010

Guy McMullen[1], Rohan Brill[2], Rod Bambach[1] and Alan Bowring[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Coonamble

Treatments

Timely sowing is a key component of optimising grain yield and quality. In some seasons moisture seeking or deep sowing is a tool that growers use to ensure crops are established in their optimal window. There are a range of factors that determine the ability of a seedling to emerge from depth including seed size, seed treatments, coleoptile length, soil conditions and temperature. Some of the disadvantages of deep sowing can be delayed emergence, poor establishment, reduced early vigour, increased disease susceptibility or reduced grain yield. Research trials are investigating wheat and durum varietal responses to seeding depth and the impact of triadimenol on emergence.

Site details

Location: Coonamble

Cooperator: George Lefebvre

Sowing Date: 10th May

Treatments

- 3 durum and 8 bread wheat
- 3 sowing depths targeting 35 mm, 70 mm and 105 mm
- Seed sown at 70 mm were +/– treatment with triadimenol at 150 mL/100 kg seed
- All varieties sown targeting 80 plants/m^2.

Results

- As expected establishment was reduced across all varieties when seeding depth was increased to 105 mm (Figure 1). On average, compared to the 35 mm sowing depth the establishment at 70 and 105 mm was 83% and 39% respectively.

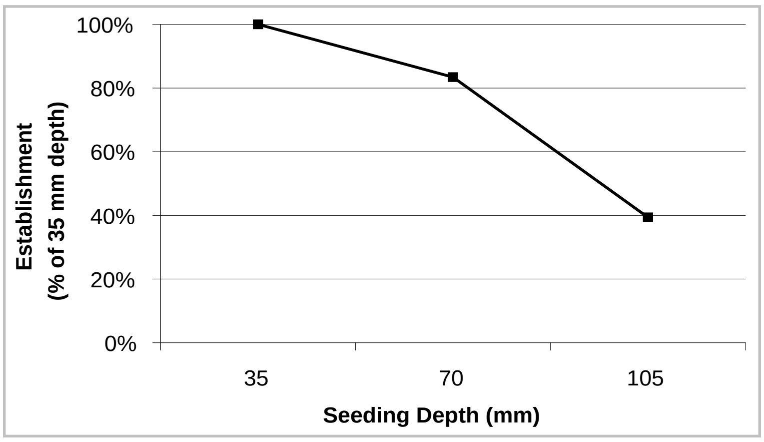


Figure 1. Effect of sowing depth on plant populations at Coonamble in 2010.

- There was a trend ($P < 0.10$) for EGA Bellaroi and Hyperno durum varieties to have better establishment compared to Jandaroi at the deeper sowings.
- There was no significant difference between any of the bread wheat varieties in establishment from deep sowing in this trial (Figure 2).

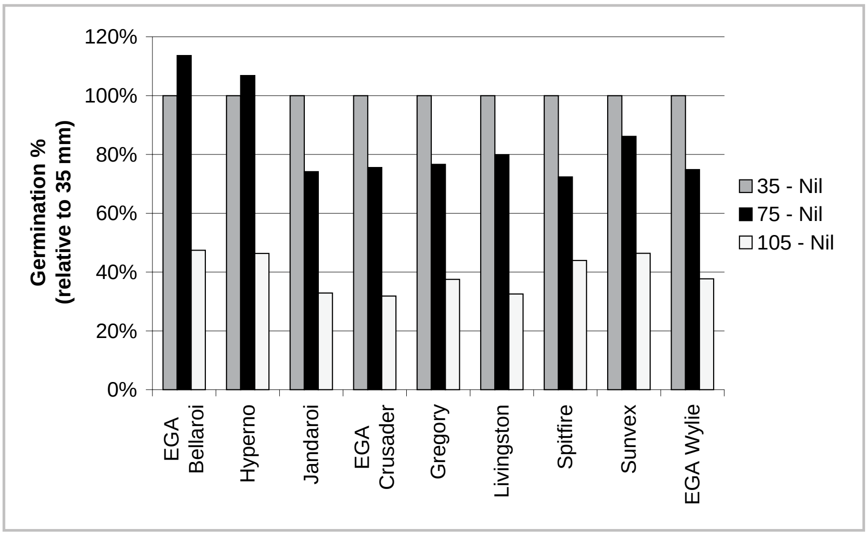


Figure 2. Effect of sowing depth on plant populations across a range of varieties of wheat and durum.

- Triadimenol treated seed (at the 70 mm sow depth) reduced establishment by 15% across all varieties compared to untreated seed.

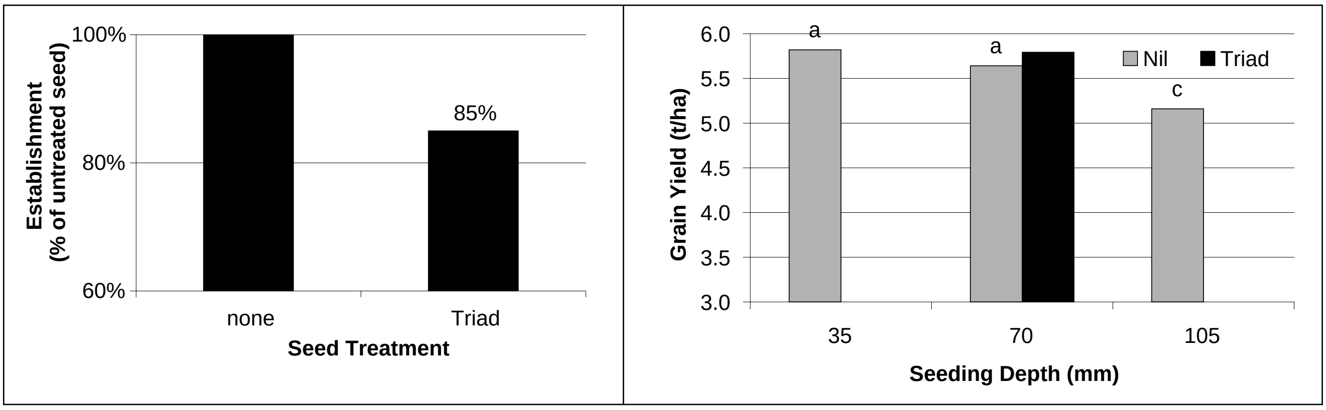


Figure 3. (Left hand) Effect of seed treatment with triadimenol (150 mL/100 kg seed) on establishment
Figure 4. (Right hand) Effect of deep sowing and seed treatment with triadimenol (150 mL/100 kg seed) on grain yield.

- A comparison of a wider range of fungicidal seed treatments on EGA Gregory resulted in variable emergence and establishment across seed treatments. All seed treatments reduced emergence compared to untreated seed but there were no statistical differences between treatments.
- At harvest yields from deeper sowing and seed treatment are related to the final populations and any delay in emergence from the deep sowing. The true comparison for deep sowing is the difference in yield from earlier sowings deep sowings compared to later shallow sowings. In this trial deep sowing did reduce yields compared to shallow sowing at the same time. There was no statistical difference in yield between treated and untreated seed (Figure 4).

Summary

The main benefits from deep sowing are gained from establishing varieties in the optimal sowing window. When considering deep sowing or moisture seeking use seed of large size and high germinative capacity. Also consider increasing seeding rates to compensate for the reduced emergence of deep sown crops.

Acknowledgements

This project is funded by NSW DPI and GRDC under the Variety Specific Agronomy Package Project (DAN00129). Thanks to Jayne Jenkins and Rob Pither for technical assistance.

Disease

National Adult Plant Resistance Project – "Nowley," Spring Ridge 2010

Alan Bowring[1], Steven Simpfendorfer[1] and Col Wellings[2]

[1] NSW DPI, Tamworth

[2] University of Sydney, PBI Cobbity (seconded from NSW DPI)

Introduction

Adult plant resistance (APR) refers to the inherent genetic resistance of a plant to diseases such as stripe rust (Yr) and yellow leaf spot (YLS) as it matures. The timing of APR expression within plants can be variable depending on variety, temperature and other factors such as nutrition. APR can develop during stem elongation (Z30–39), the booting stage (Z41–49) or be delayed until head emergence (Z59). The mechanisms of development and expression are not completely understood and the aim of the national APR project is to gain further understanding of resistance development. Knowledge gained should assist growers and consultants to better utilise the effectiveness of APR within their disease management strategies.

Site details

Location: "Nowley," Spring Ridge

Co-operator: Noel Ticehurst – Nowley

Sowing Date: 21st June, 2010

Fertiliser: 50 kg/ha Starter Z

Harvest Date: 20th December, 2010

Treatments

- Four varieties were used in the trial with varying resistance ratings for both Yr and YLS

Variety	Yr Rating	YLS Rating
EGA Gregory	MR	MS-S
Yitpi	MR-MS	S-VS
Janz	MS	S
Wyalkatchem	S	MS

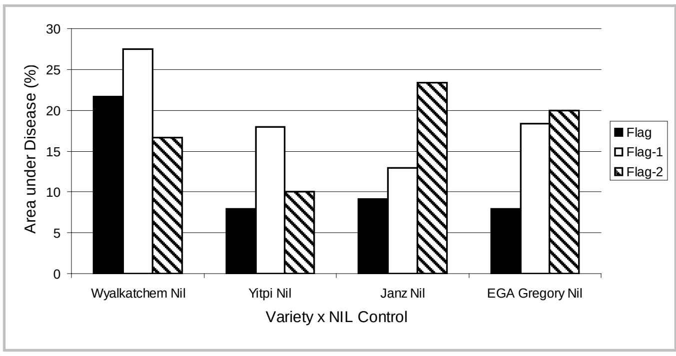
- Plus or Minus seed treatment fluquinconazole (Jockey ®) at rate of 450 mL/100 kg of seed.
- Fungicide applications consisted of:
  1. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha for a single application at Z32 only
  2. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha for a single application at Z39 only
  3. multiple applications propiconazole + cyproconazole (Tilt Xtra®) of 250 mL/ha at (Z32 + Z39).

  All fungicides were applied at a water rate of 75 L/ha.
- All treatment plots were buffered on either side to limit disease spread between plots.

Disease incidence and severity

- Yr and YLS infection in the variety (Wyalkatchem) reduced green leaf area (GLA) by between 17–28% on each of the upper three leaves (Figure 1).
- Generally, low levels of Yr infection were observed in the remaining more resistant varieties.
- Generally, YLS resistance ratings for the varieties were low. Highly conducive YLS infection conditions were experienced throughout the season, particularly post flag leaf emergence.
- Seasonal conditions and limited resistance to YLS was considered to have had a major impact on the photosynthetic capacity and green leaf retention of the upper leaves in most varieties (Figure 2). **Note:** At each assessment timing the loss of leaf area to either Yr or YLS was distinguished. Similarly, senescent tissue which was unable to be distinguished as a particular disease was separately proportioned in GLA loss.

- For fungicide application timing, no significant differences were observed for the flag leaf. In contrast for the following two leaves the Z32 treatment was found to retain significantly greater GLA than the unprayed control (NIL).



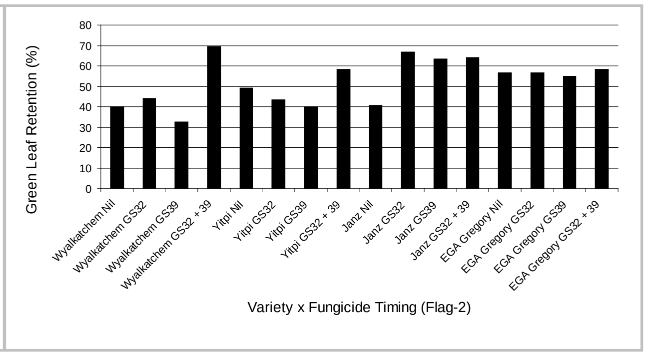


Figure 1. Left. Area infected by disease (%) for the NIL control treatment in four bread wheat varieties
Figure 2. Right. Effect of in-crop fungicide timing on the green leaf retention (%) of four bread wheat varieties

Grain yield

- For final grain yield, a significant interaction was observed between variety and fungicide application timing, although this was clearer for varieties with lower Yr resistance ratings.
- The variety Wyalkatchem, although rated S for Yr, was the highest yielding variety. This was most likely a result of Wyalkatchem having the highest resistance to YLS of the four wheat varieties, even though only MS for YLS, as yellow spot was particularly prevalent later in the season (post application timing).
- Averaged across all varieties, a significant yield increase was found for fungicide application compared to the NIL control, but no differences existed for time of application, although this finding varied between wheat varieties.
- A significant yield interaction was observed for the seed treatment fluquinconazole (Jockey®), but was only apparent in the one variety (Wyalkatchem).

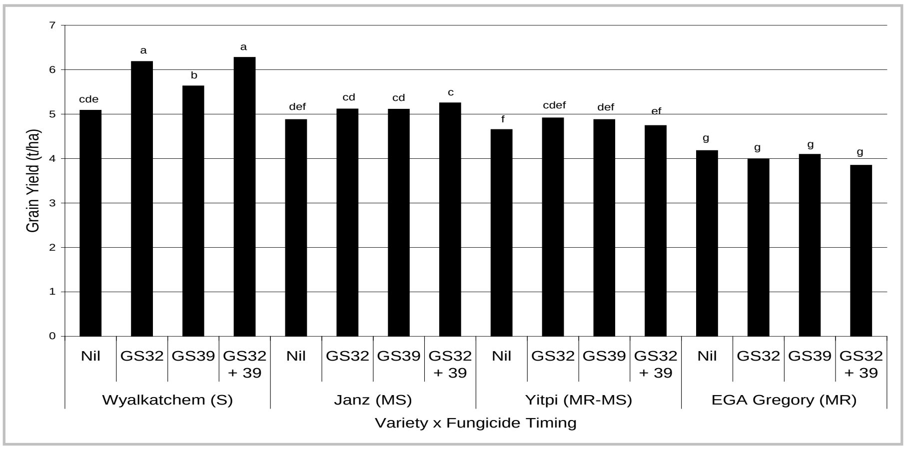


Figure 3. Effect of in-crop fungicide timing on the grain yield of four bread wheat varieties

Summary

The effect of seasonal conditions conducive to late development and spread of YLS was particularly evident within the 2010 season. Initial varietal selection for the trial based on resistance ratings for Yr was found to be a challenge to this study, with difficulty in control of YLS evident. In a medium to longer season variety such as EGA Gregory, loss of GLA and thereby photosynthetic capacity limited maximum grain fill and yield potential.

Averaged across varieties, no clear distinctions were determined between the timing of in-crop fungicide application, although within the variety Wyalkatchem, there appeared to be a clear advantage in the earlier ZS32 or Z32+Z39 spray option. No advantage from fungicide application was observed in the more YR resistant variety EGA Gregory, although as noted, late YLS development was not restricted by the fungicide treatments. Alternative fungicide strategies not examined in this study may have improved efficacy in controlling YLS.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Many thanks to Tiffany Biggs and Ben Bowman for field assistance. Thanks also to Steve Morphett, Jim Perfrement and Patrick Mortell for sowing and site management.

National Adult Plant Resistance Project – "Coorong," Yallaroi 2010

Alan Bowring[1], Steven Simpfendorfer[1] and Col Wellings[2]

[1] NSW DPI, Tamworth

[2] University of Sydney, PBI Cobbity (seconded from NSW DPI)

Introduction

Adult plant resistance (APR) refers to the inherent genetic resistance of a plant to diseases such as stripe rust (Yr) and yellow leaf spot (YLS) as it matures. The timing of APR expression within plants can be variable depending on variety, temperature and other factors. APR can develop during stem elongation (Z30–39), the booting stage (Z41–49) or be delayed until head emergence (Z59). The mechanisms of development are not completely understood and the aim of the national APR project is to gain further understanding of resistance development. Knowledge gained should assist growers and consultants to better utilise the effectiveness of APR within their disease management strategies.

Site details

Location: "Coorong", Yallaroi

Co-operator: Scott Donaldson

Sowing Date: 9th June, 2010

Fertiliser: 50 kg/ha Starter Z

Harvest Date: 26th November, 2010

Treatments

- Four varieties were used in the trial with varying resistance ratings for both Yr and YLS

Variety	Yr Rating	YLS Rating
EGA Gregory	MR	MS-S
Yitpi	MR-MS	S-VS
Janz	MS	S
Wyalkatchem	S	MS

- Plus or Minus seed treatment fluquinconazole (Jockey ®)at rate of 450 mL/100 kg of seed.
- Fungicide applications consisted of:
  1. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha for a single application at Z32 only
  2. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha for a single application at Z39 only
  3. multiple applications propiconazole + cyproconazole (Tilt Xtra®) of 250 mL/ha at (Z32 + Z39).

All treatment plots were buffered on either side to limit disease spread between plots.

Disease incidence and severity

- The severity of Yr infection in the most susceptible variety (Wyalkatchem) reduced green leaf area (GLA) by between 43–63% on each of the upper three leaves (data not shown)
- Lower levels of Yr infection were observed in the more Yr resistant varieties.

Highly conducive YLS infection conditions were experienced during the season. Generally, YLS resistance ratings for the varieties were low. This was particularly evident in the varieties EGA Gregory and Yitpi which had large reductions (36–50%) in GLA on Flag–2. **Note:** At each assessment timing the loss of leaf area to Yr was distinguished from that occurring from YLS infection.

- Across varieties, the Z32 and split (Z32 + Z39) treatments were found to retain significantly greater GLA than the unsprayed control (Nil) and Z39 only treatments (Figure 1).

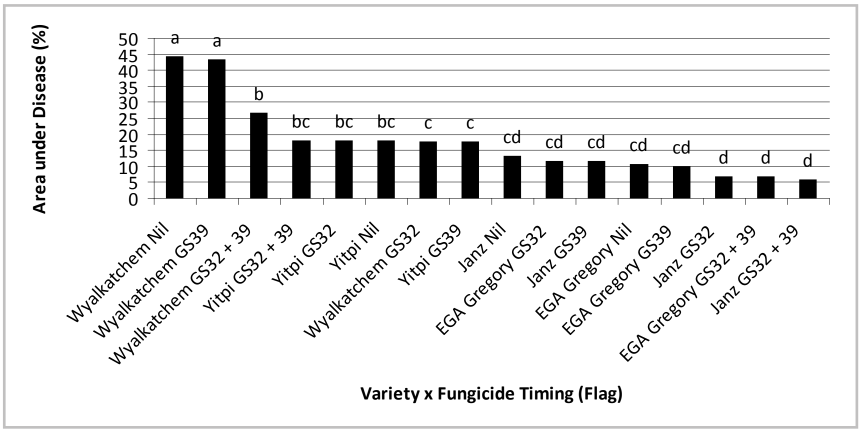


Figure 1. Effect of in-crop fungicide timing on area under disease (%) for four bread wheat varieties

Grain yield

- A significant interaction on final grain yield was evident between varieties and fungicide timing (Figure 2).
- The Yr resistant variety EGA Gregory (MR) was the highest yielding variety even without fungicide applications.
- All of the fungicide applications increased yield in the four varieties but not always statistically.
- Averaged across the four varieties, an early single fungicide application at Z32 increased yield by 7.8% compared to a single late application at Z39.
- No significant yield interactions were measured for seed treatment.

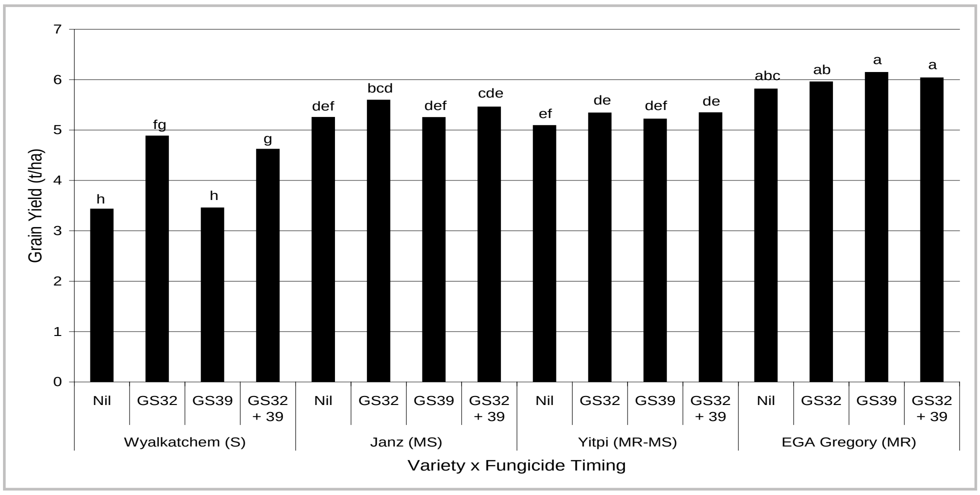


Figure 2. Effect of in-crop fungicide timing on grain yield of four bread wheat varieties

Summary

The relationship between varietal resistance and timing of in-crop fungicide application was found to impact on the retention of green leaf area, and subsequent yield. Varieties with higher Yr resistant ratings exhibited lower levels of disease severity on the upper three leaves with significant differences being apparent. Highly conducive conditions for YLS infection and disease development in the 2010 season was a complication in this study aimed primarily at Yr management. This was compounded by a narrow range in YLS resistance in the varieties examined and these fungicide applications having limited efficacy in suppressing late YLS infections on upper leaves.

In the current study, fungicide application to the variety with the lowest Yr resistance level (Wyalkatchem – S) was found to be effective with an early spray (Z32). Although not statistically significant, a similar trend was observed in the MS (Janz) and MR-MS (Yitpi) varieties. The lack of yield response with any fungicide timing in a MR variety such as EGA Gregory suggests the selection of resistant varieties, even in a season highly conducive to the development of foliar diseases, appears to be integral in any integrated disease management system. The adoption of more resistant varieties under such a scenario may alleviate the need for in-crop fungicide management.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman and Rod Bambach for field assistance. Thanks also to Steve Morphett, Jim Perfrement and Patrick Mortell for sowing and site management.

Integrated management of winter cereal diseases – Coolah 2010

Alan Bowring[1], James Fleming[2], Guy McMullen[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Coonabarabran

Introduction

The following report outlines one in a series of 11 trials conducted throughout central and northern NSW in 2010 in a collaboration between the NSW DPI Northern Cereal Disease Management Unit and District Agronomists.

Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot (CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: Coolah, northern NSW

Co-operator: McMaster family, 'Tmimi'

Sowing Date: 9th June 2010

Harvest Date: 20th December 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties; a bread wheat variety EGA Gregory and a barley variety Commander sown to target a plant population of 100 plants/m^2.
- Plus or minus imidaclcloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot, provided through inoculation at sowing.
- Plus or minus slashing (simulated grazing with a lawn mower and biomass removed from plots) at Z31.
- Plus or minus a foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus an experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Trial design

- Small plot trials (10 x 2 m plots)
- Complete randomised block designs
- 3 replicates

Experiment 1: Crown rot/BYDV – Yield results

- EGA Gregory was 10.5% higher yielding than the barley variety Commander at a 93% confidence level.
- Slashing at Z31 did not impact on final grain yield.
- The imidacloprid seed treatment slightly increased yield by 4.4% (Figure 1).
- No other significant differences (95% confidence level) in yield were evident with other treatments or interactions.

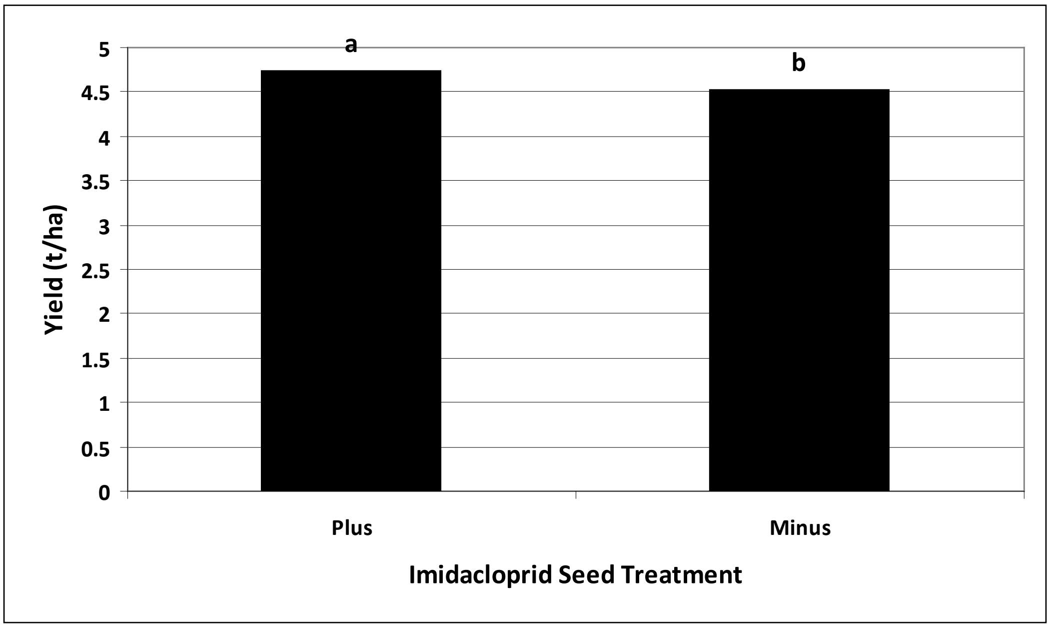


Figure 1. Effect of imidacloprid seed treatment on grain yield

Experiment 2: Crown rot seed treatment trial – Yield results

- The experimental seed treatment did not have a significant effect on yield in the presence of crown rot in either EGA Wylie or Ellison.
- The seed treatment clearly had no activity against stripe rust in these two MS varieties which were both visually severely infected.
- There was a significant difference between the yield of the two varieties at this site with Ellison (3.30 t/ha) providing a 10.4% yield benefit over EGA Wylie (2.99 t/ha).

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in an extended grain-fill period. It is therefore not surprising that crown rot did not have an impact on yield in this trial. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following application of tebuconazole to provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did not impact on yield. Commercially, this neutral yield effect would additionally be complemented by the grazing value of dry matter removed at Z31.

Use of the insecticide seed treatment Imidacloprid provided a slight yield benefit of 4.4% when averaged across the barley (Commander) and bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010 but counts were taken at Z32 and Z39. A full analysis of aphid and pathology assessments is still to be conducted which may explain this yield response.

The experimental seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Dougal Pottie and Peter Foreman. Thanks to Loretta Serafin for assistance with co-ordination of the trial network in 2010.

Integrated management of winter cereal diseases – Walgett 2010

Alan Bowring[1], Myles Parker[2], Guy McMullen[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Walgett

Introduction

The following report outlines one in a series of eleven trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot (CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location:	Come-by-chance, northern NSW
Co-operator:	Bill Buchanan, 'Bungle Gully'
Sowing Date:	26th May 2010
Harvest Date:	13th November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties, a bread wheat variety EGA Gregory and barley variety Commander sown at a target plant population of 80 plants/m^2.
- Plus or minus imidaclcloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with a lawn mower and biomass removed from plots) at Z31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Crown rot/BYDV – Head number

- Head density differed between species, with a higher tillering ratio per plant in Barley (Commander) compared to the bread wheat (EGA Gregory).
- Plots were slashed at Z31 and no treatment effect was observed between the barley or the bread wheat (Figure 1).
- No other treatment differences or interactions were observed for head density.

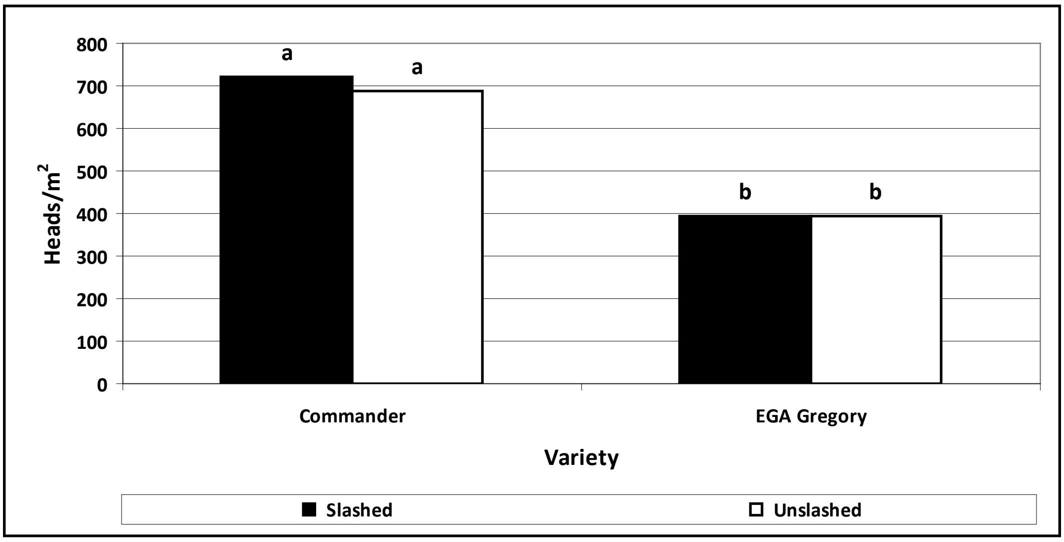


Figure 1. Effect of slashing on variety on head density

Experiment 1: Yield and lodging

Grain yield was significantly different between the two species, with the Commander barley out yielding the bread wheat EGA Gregory by 1.7 t/ha (31%)(Figure 2a).

- The slashing treatment also significantly affected grain yield with a reduction of 12% (Figure 2b).
- No treatment interaction was apparent for variety and slashing.
- No other treatment differences or interactions were observed for yield (95% confidence level).

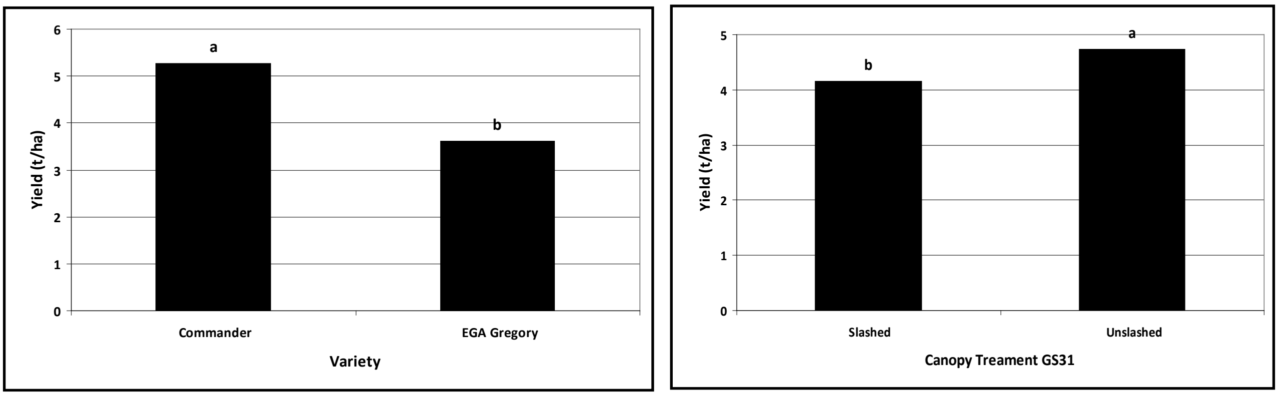


Figure 2. Effect of variety (a) and slashing (b) on grain yield

Experiment 2: Seed treatment trial

The experimental seed treatment did not have a significant effect on head numbers in the presence of crown rot in either EGA Wylie or Ellison.

With seasonal conditions ideal for foliar leaf disease, observations suggest that the seed treatment had no activity against stripe rust in these two MS varieties which were both visually infected.

There was a significant difference in grain yield between the two varieties, with Ellison yielding 5.04 t/ha and EGA Wylie 2.97 t/ha.

The experimental seed treatment did not provide a significant yield benefit over untreated seed (Figure 3).

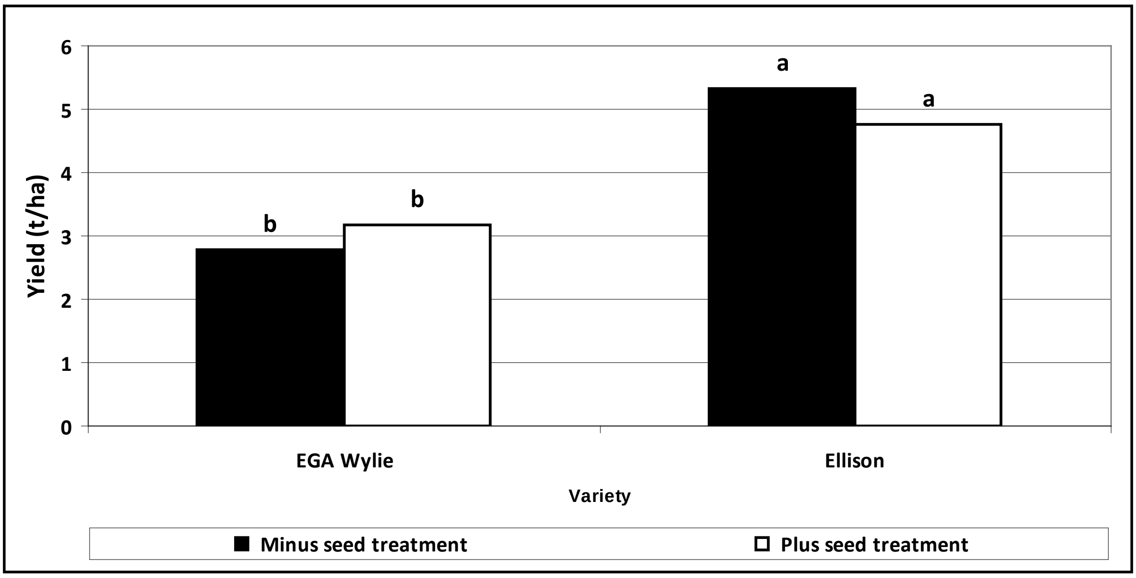


Figure 3. Effect of seed treatment on grain yield

Summary

It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period. The 2010 season began with excellent soil water profiles and constant rainfall events throughout the growing period, combined with mild temperatures resulted in a prolonged grain-fill period. Unsurprisingly, crown rot did not have an obvious impact on yield in this trial.

Use of the insecticide seed treatment Imidacloprid did not provide a yield benefit in either the barley (Commander) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010. The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following tebuconazole application provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. Application of the fungicide tebuconazole at Z31 did not provide a yield benefit over unsprayed plots when averaged across the two varieties.

An experimental seed treatment (Ipconazole + metalaxyl) failed to provide a significant yield benefit over untreated seed when averaged across EGA Wylie and Ellison. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Rohan Brill and Gerard Lonergan. Thanks to Loretta Serafin for assistance with co-ordination of trial network in 2010.

Integrated management of winter cereal diseases – Coonamble 2010

Steven Simpfendorfer[1], Rohan Brill[2], Alan Bowring[1] and Guy McMullen[1]

[1]NSW DPI, Tamworth

[2]NSW DPI, Coonamble

Introduction

The following report outlines one in a series of eleven trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot (CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location:	Coonamble
Co-operator:	Cain family, ''Cooba"
Sowing Date:	14th May 2010
Fertiliser:	60 kg/ha Granulock 12Z @ sowing 80 L/ha Easy N applied on 10th July (34 kg/ha N)
Harvest Date:	12th November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties; a bread wheat variety EGA Gregory and the barley variety Commander sown at a target plant population of 80 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with a lawn mower and biomass removed from plots) at Z31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Head number

- The barley (Commander) as expected was higher tillering and hence produced more heads than the bread wheat (EGA Gregory).
- Slashing plots at Z31 increased head numbers in barley (Commander) but had no effect in the bread wheat (EGA Gregory)(Figure 1).
- No other treatments or interactions had a significant effect on head density.

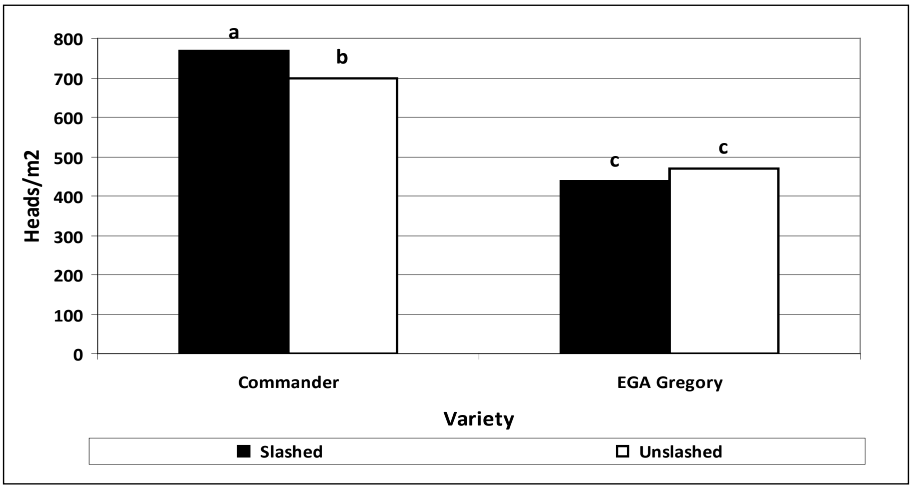
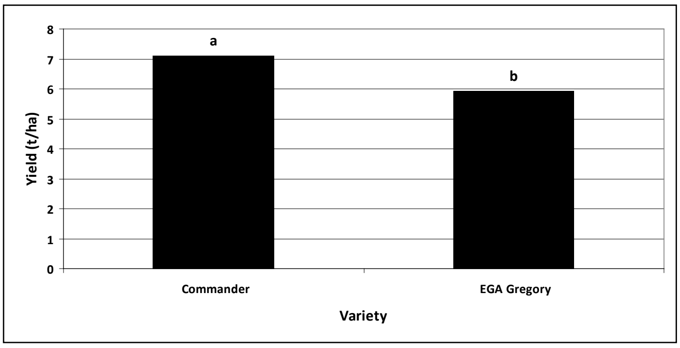


Figure 1. Effect of slashing on head density

Experiment 1: Yield

- Commander barley was 19.6% higher yielding than the bread wheat EGA Gregory (Figure 2a).
- Averaged across the two varieties, slashing at Z31 reduced final grain yield by 12.7% (Figure 2b).
- No significant differences (95% confidence level) in yield were evident with other treatments or interactions.



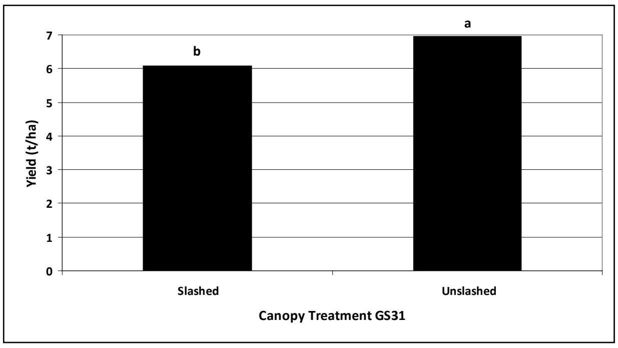


Figure 2. Effect of variety (a) and slashing (b) on grain yield

Experiment 2: Seed treatment trial

- The experimental seed treatment did not have a significant effect on head numbers in the presence of crown rot in either EGA Wylie or Ellison.
- The seed treatment clearly had no activity against stripe rust in these two MS varieties which were both visually infected.
- There was no significant difference between the yield of the two varieties at this site with Ellison yielding 5.30 t/ha and EGA Wylie 5.06 t/ha.
- The experimental seed treatment provided an 11.6% yield benefit over untreated seed (Figure 3).

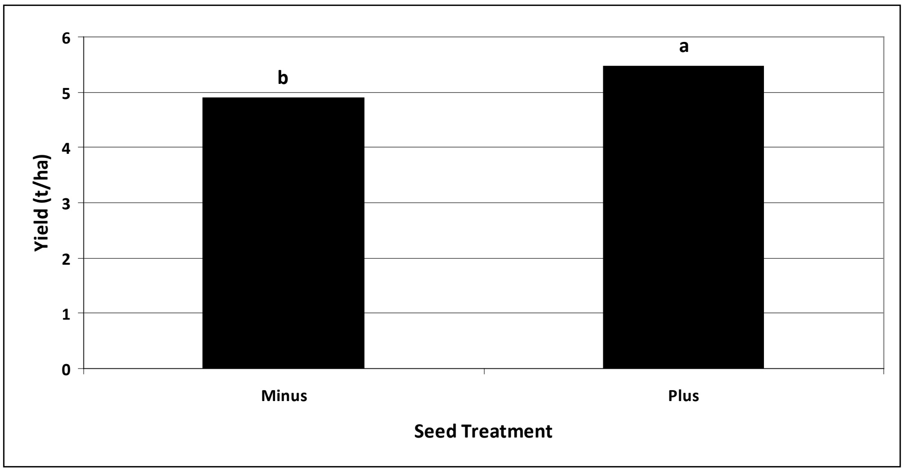


Figure 3. Effect of seed treatment on grain yield

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in a prolonged grain-fill period. It is therefore not surprising that crown rot did not have an impact on yield in this trial. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following tebuconazole application provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did have a negative impact on yield resulting in 12.7% yield loss averaged across the barley and bread wheat variety. Commercially, this yield loss may be partially offset by the grazing value of dry matter removed at Z31.

Use of the insecticide seed treatment Imidacloprid did not provide a yield benefit in either the barley (Commander) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010. Application of the fungicide tebuconazole at Z31 provided a small 2.3% yield benefit over unsprayed plots when averaged across the two varieties. However, the difference was only significant at a 92% confidence level (i.e. 8% probability difference is not real).

An experimental seed treatment (Ipconazole + metalaxyl) provided a significant (99% confidence level) yield benefit of 11.6% over untreated seed when averaged across EGA Wylie and Ellison. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease. All plots in this experiment were inoculated with crown rot at sowing, so pathology assessment of harvest samples may reveal the mechanism behind the yield benefit apparent with this seed treatment at Coonamble in 2010. Care should be taken with all seed treatments as they have the potential to shorten coleoptile length and reduce emergence. This can be particularly exacerbated by deep sowing.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Dougal Pottie. Thanks to Loretta Serafin for assistance with co-ordination of the trial network in 2010.

Integrated management of winter cereal diseases – North Star 2010

Steven Simpfendorfer[1], Rebecca Byrne[2], Alan Bowring[1] and Guy McMullen[1]

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[2] NSW DPI, Moree

Introduction

The following report outlines one in a series of eleven trials conducted throughout central and northern NSW in 2010 in a collaboration between the NSW DPI Northern Cereal Disease Management Unit and District Agronomists.

Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot (CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: North Star, northern NSW

Co-operator: Malcolm Doolin, 'Glenhoma'

Sowing Date: 10th June 2010

Fertiliser: 92 kg/ha Supreme Z and 50 kg/ha of N as urea

Harvest Date: 26 November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties; a bread wheat variety; EGA Gregory and a durum variety EGA Bellaroi were sown to target a plant population of 100 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot, provided through inoculation at sowing.
- Plus or minus slashing (simulated grazing with a lawn mower and biomass removed from plots) at Z31.
- Plus or minus a foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus an experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Crown rot/BYDV – Head number

The main treatment effect was on the total number of heads between the two varieties with EGA Bellaroi having 436 heads/m^2 compared to only 402 heads/m^2 with EGA Gregory. Slashing at Z31 also significantly increased head numbers; averaged across the two varieties as 402 heads/m^2 when un-slashed up to 436 heads/m^2 in the slashed treatment.

Experiment 1: Lodging and yield

Slashing at Z31 significantly reduced the extent of lodging in EGA Gregory at harvest by around 36%. There was no significant reduction in lodging associated with slashing at Z31 in EGA Bellaroi (Figure 1).

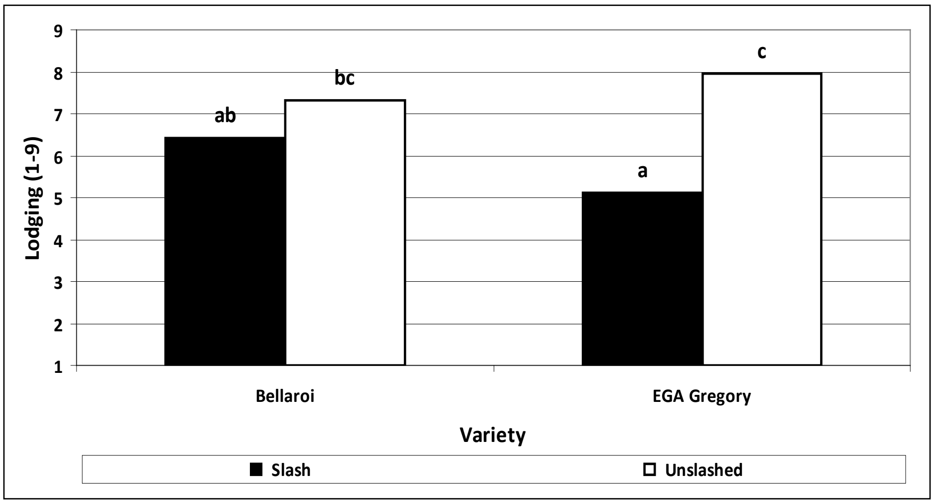

Figure 1. Effect of slashing on lodging

- Applying a fungicide to EGA Bellaroi at Z31 provided a yield advantage of +13.8% (0.66 t/ha) over EGA Gregory sprayed at the same time. However, the yield of the two varieties was comparable in the absence of an in-crop fungicide application at Z31.
- Slashing at Z31 reduced yield by 12.6% in the presence of added CR. However, slashing had no significant impact on yield in the absence of added CR inoculum (Figure 2).
- No other significant differences in yield (95% confidence level) were evident in the other treatments or interactions.

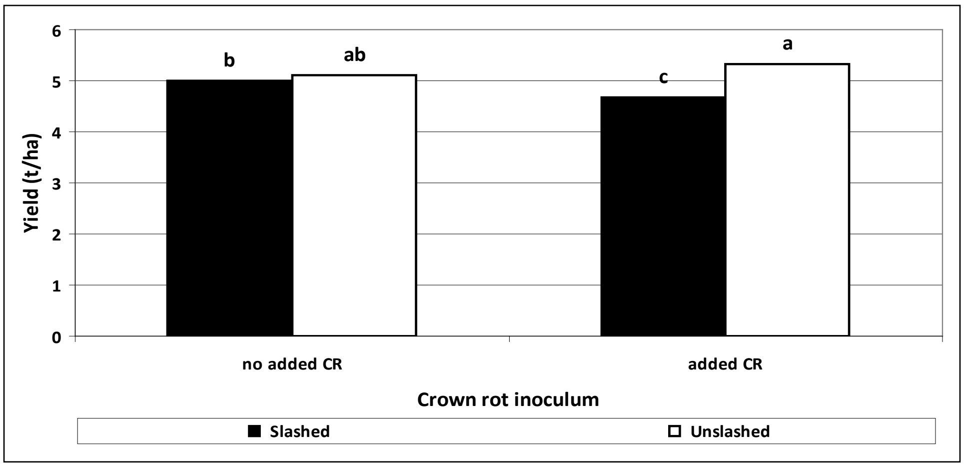

Figure 2. Effect of slashing on grain yield in the presence or absence of added crown rot

Experiment 2: Crown rot seed treatment trial

The experimental seed treatment did not have a significant effect on the extent of lodging or yield in the presence of crown rot in either EGA Wylie or Ellison. The experimental seed treatment had no activity against stripe rust in these two MS varieties. There was also no significant difference between the two varieties in the extent of lodging at harvest but Ellison (3.95 t/ha) had a 16.5% yield advantage over EGA Wylie (3.39 t/ha) at this site.

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in an extended grain-fill period. It is therefore not surprising that crown rot had reduced impact on yield in this trial with a 7.0% yield loss from infection in slashed plots only. It is well established that yield loss associated with crown rot infection is closely related to the extent of moisture stress during the grain-fill period.

The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following application of tebuconazole provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised any soil moisture interactions but a slashing effect was still evident with slashing exacerbating yield loss to crown rot. Pathology assessments of basal browing and CR infection may assist in explaining this interaction.

Slashing had a negative impact on yield resulting in 12.6% yield loss averaged across the durum and bread wheat variety in the presence of crown rot infection. Slashing had no effect on yield in the absence of crown rot infection. Commercially, this yield loss may be partially offset by the grazing value of dry matter removed at Z31.

Use of the insecticide seed treatment Imidacloprid did not provide a yield benefit in either the durum (EGA Bellaroi) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010. Application of the fungicide tebuconazole at Z31 on EGA Bellaroi provided a 13.8% yield benefit over EGA Gregory but their yields were comparable in unsprayed plots. Again once pathology assessments are complete the mechanism behind this yield response may become evident.

An experimental seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease in 2010.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Dougal Pottie, Gerard Lonergan and Russell Carty. Thanks to Loretta Serafin for assistance with co-ordination of the trial network in 2010.

Integrated management of winter cereal diseases – Spring Ridge 2010

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Introduction

The following report outlines one in a series of eleven trials conducted throughout central and northern NSW in 2010 in a collaboration between the NSW DPI Northern Cereal Disease Management Unit and District Agronomists.

Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot(CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: Spring Ridge, Liverpool Plains

Co-operator: Don Hubbard, 'Cooiniee'

Sowing Date: 11th June 2010

Harvest Date: 15th December 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties; a bread wheat variety EGA Gregory and durum variety EGA Bellaroi were sown to target a plant population of 100 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot, provided through inoculation at sowing.
- Plus or minus slashing (simulated grazing with mower and biomass removed from plots) at Z31.
- Plus or minus a foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus an experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Crown rot/BYDV – Head number

- EGA Gregory (422 heads/m^2) produced slightly more heads than EGA Bellaroi (394 heads/m^2).
- Slashing at Z31 also slightly increased head density when averaged across the two varieties from 398 heads/m^2 in the unslashed treatment up to 418 heads/m^2 in the slashed treatment.
- No other treatments or interactions had a significant effect on head density.

Experiment 1: Crown rot/BYDV – Lodging and yield

- EGA Gregory had around twice the amount of lodging compared to EGA Bellaroi at harvest (Figure 1a).
- Slashing at Z31 reduced the extent of lodging by around 10% at harvest averaged across the two varieties (Figure 1b).

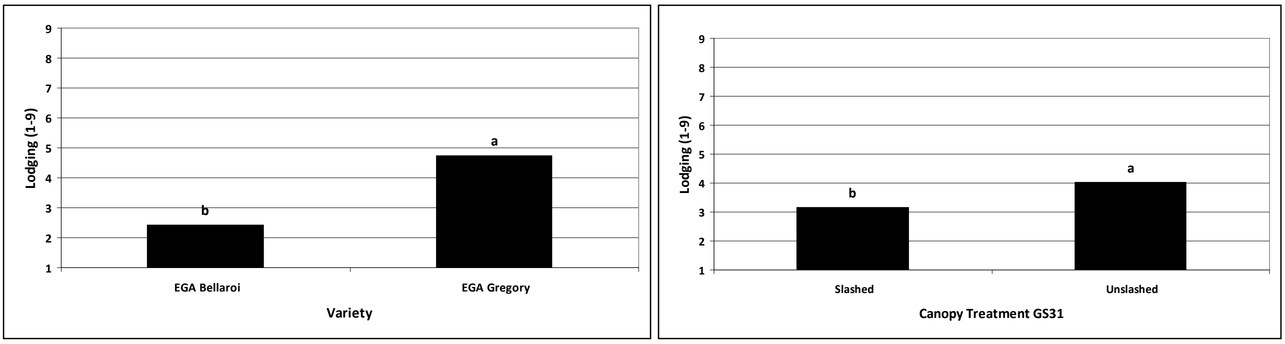

Figure 1. Effect of variety (a) and slashing (b) on lodging

- EGA Gregory (5.55 t/ha) had a 10.6% yield advantage over EGA Bellaroi (5.02 t/ha).
- The addition of crown rot still caused slight (2.6%) yield loss even though 2010 was a very wet season.
- Slashing at Z31 decreased the final grain yield by around 3.5% averaged across the two varieties.
- The imidacloprid seed treatment provided a 6.9% yield benefit in EGA Gregory but had no significant effect on yield in EGA Bellaroi (Figure 2).
- No other significant differences in yield (95% confidence level) were evident in the other treatments or interactions.

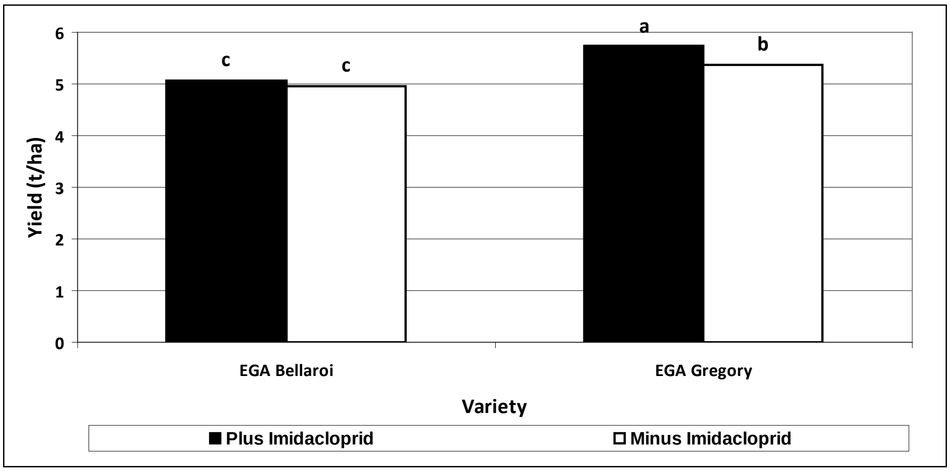

Figure 2. Effect of imidacloprid seed treatment on yield

Experiment 2: Crown rot seed treatment trial

The experimental seed treatment did not have a significant effect on head numbers or yield in the presence of crown rot in either EGA Wylie or Ellison but did reduce the extent of lodging at harvest by about 10%. The experimental seed treatment had no activity against stripe rust in these two MS varieties which were both visually infected.

Even though EGA Wylie had a higher head number (476 heads/m^2) than Ellison (416 heads/m^2) this did not translate into a significant yield difference between the two varieties at this site with EGA Wylie yielding 2.66 t/ha and Ellison 2.86 t/ha.

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in an extended grain-fill period. It is therefore not surprising that crown rot only had a small impact (–2.6%) on yield in this trial. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following application of tebuconazole provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did have a slight negative impact on yield resulting in a 3.5% yield loss averaged across the two varieties. Commercially, this yield loss may be partially offset by the grazing value of dry matter removed at Z31.

Use of the insecticide seed treatment Imidacloprid provided a yield benefit of 6.9% in EGA Gregory at this site in 2010 but had no effect on yield in EGA Bellaroi. Frequent rainfall events assisted in minimising the development of aphid populations in 2010 but counts were taken at Z32 and Z39. A full analysis of aphid and pathology assessments is still to be conducted which may explain this yield response.

An experimental seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease in 2010.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Dougal Pottie and Peter Foreman. Thanks to Loretta Serafin for assistance with co-ordination of the trial network in 2010.

Integrated management of winter cereal diseases – Gilgandra 2010

Kathi Hertel[1], Alan Bowring[2], Guy McMullen[2] and Steven Simpfendorfer[2]

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Introduction

The following report outlines one in a series of 11 trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location:	Gilgandra, central NSW
Co-operator:	Kevin & Jenny Kilby, 'Inglewood'
Sowing Date:	21 May 2010
Fertiliser:	100 kg/ha Granulock 15 (14 : 12 : 11)
Harvest Date:	18 December 2010

Treatments

Experiment 1: Crown rot/BYDV

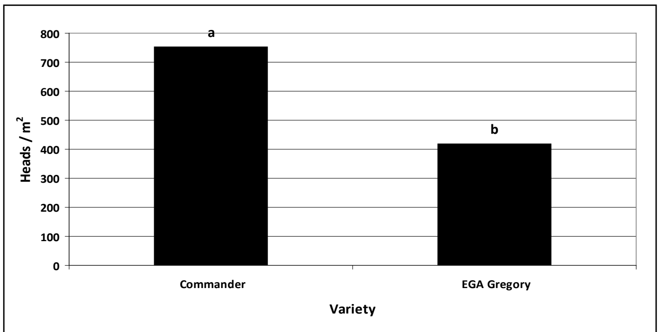
- Bread wheat EGA Gregory and barley variety Commander sown at a target plant population of 100 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600 g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with mower and biomass removed from plots) at Z31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Head number

- The inherent capacity of different crop species (and varieties) varies. Figure 1a shows the number of heads produced by Commander barley – 753 /m^2, and EGA Gregory wheat – 418 / m^2 when sown at similar densities of 100 plants/m^2.
- Slashing at first node formation (Z31) reduced final head number by 7% (Figure 1b).
- No other treatments or interactions had a significant effect on head density.



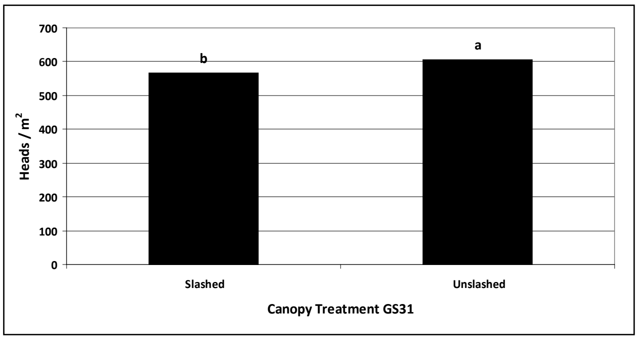


Figure 1. Effect of variety (a), and slashing (b), on head density

Experiment 1: Yield

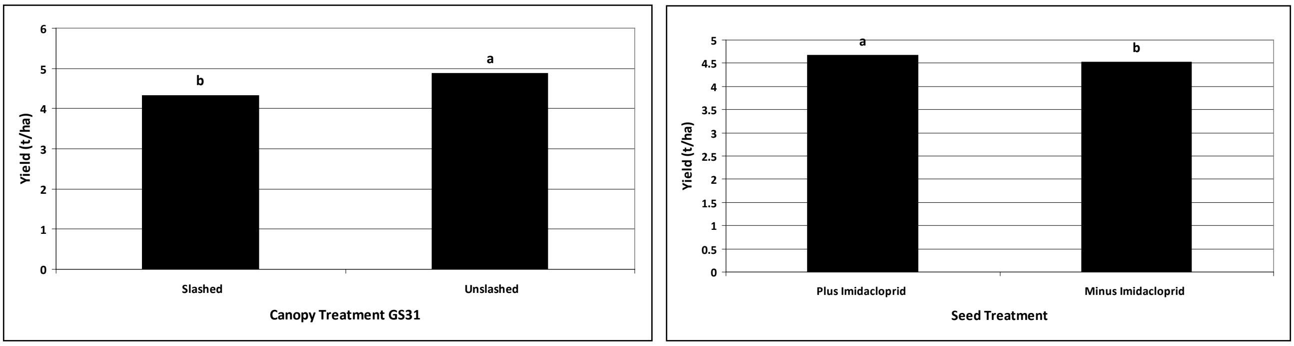


Figure 2. Effect of slashing (a), and imidacloprid application (b), on grain yield

- Slashing decreased yield by 11.5% (Figure 2a) and imidacloprid provided a small 3.3% yield benefit (Figure 2b).
- The barley variety Commander (4.82 t/ha) had a 9.8% yield benefit over EGA Gregory (4.39 t/ha).
- No significant differences (95% confidence level) in yield were evident with other treatments or interactions.

Experiment 2: Seed treatment trial

The experimental seed treatment did not have a significant effect on head numbers or yield in the presence of crown rot in either EGA Wylie or Ellison. The experimental seed treatment clearly had no activity against stripe rust in these two MR-MS varieties which were both visually severely infected. There was also no significant difference between the yield of the two varieties at this site with Ellison yielding 3.78 t/ha and EGA Wylie 3.70 t/ha.

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in a prolonged grain-fill period. It is therefore not surprising that crown rot did not have an impact on yield in this trial. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at Z31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following Folicur® application provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did impact on final head numbers by a reduction of 7%. Subsequent effect on yield resulted in an 11.5% yield loss. Commercially, this yield loss would be compensated to a degree by the grazing value of dry matter removed at Z31.

Insecticide seed treatment using imidacloprid provides early protection against aphids and earth mites that can reduce important early crop vigour and potentially transmit BYDV. Despite the apparent absence of BYDV, there was a positive response in final yields to imidacloprid.

An experimental fungicide seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease. Seed treatment had no effect on final head numbers or yield.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Scott Boyd. Thanks to Loretta Serafin for assistance with co-ordination of trial network.

Integrated management of winter cereal diseases – Somerton 2010

Loretta Serafin, Alan Bowring, Guy McMullen and Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

The following report outlines one in a series of eleven trials conducted throughout central and northern NSW in 2010 in a collaboration between the NSW DPI Northern Cereal Disease Management Unit and District Agronomists.

Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot (CR) caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on the levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: Somerton

Co-operator: Barnier family, 'Eastbourne'

Sowing Date: 12th June 2010

Fertiliser: 78 kg/ha Supreme Z

Harvest Date: 23rd November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Two varieties; a bread wheat; EGA Gregory and a durum wheat; EGA Bellaroi sown to target a plant population of 100 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600 g/L imidacloprid).
- Plus or minus crown rot, provided through inoculation at sowing.
- Plus or minus slashing (simulated grazing with a lawn mower and biomass removed from plots) at Z31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at Z31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus an experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Trial design

- Small plot trials (10 x 2 m plots)
- Complete randomised block designs
- Three replicates

Experiment 1: Crown rot/BYDV – Plant establishment

The trial established on average 120 plants/m^2 which was slightly higher than the target population of 100 plants/m^2.

There was no significant effect of crown rot or the imidacloprid seed treatment on plant establishment. There was a significant difference in establishment between varieties, with EGA Gregory (125.8 plants/m^2) having better plant numbers than EGA Bellaroi (115.4 plants/m^2).

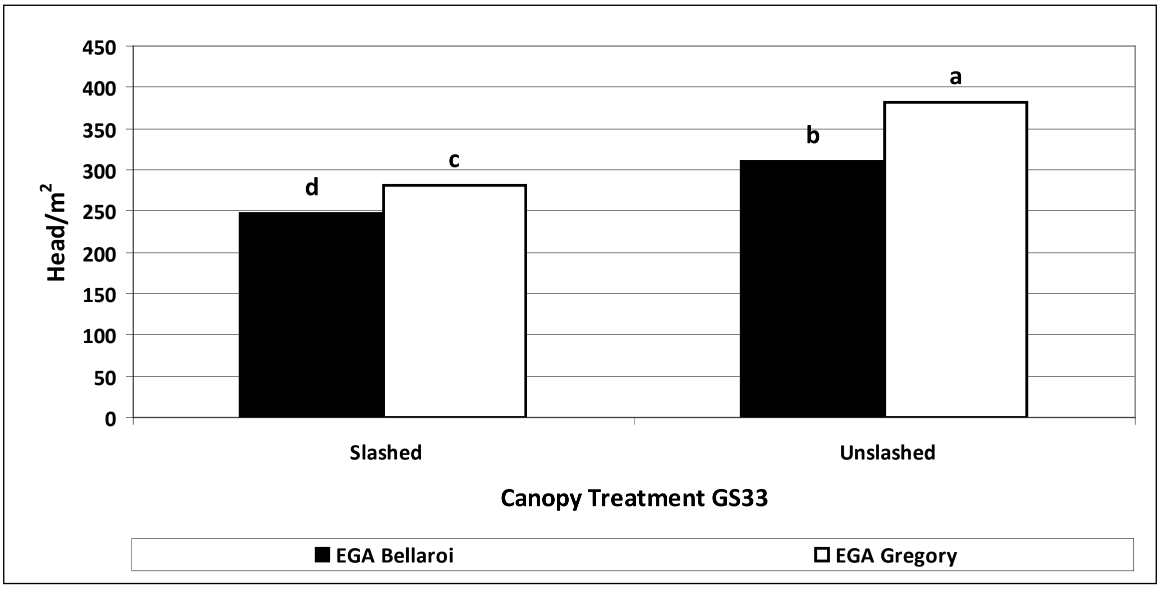


Figure 1. Effect of slashing on head density.

Experiment 1: Crown rot/BYDV – Head number

- Slashing in this trial was slightly delayed due to wet weather. As such the growth stage was further advanced than the intended Z31. The result was that the slashed treatments had significantly lower head numbers than the unslashed treatments (Figure 1). Most likely the timing of slashing resulted in loss of potential head numbers.
- EGA Gregory produced more heads than EGA Bellaroi in both the slashed and unslashed treatments. (Figure 1).
- The addition of crown rot inoculum or an in-crop fungicide had no effect on head number in 2010.
- Seed treatment with imidacloprid (313.2 heads/m^2) significantly increased head numbers at harvest compared to untreated seed (296.7 heads/m^2).

EXPERIMENT 1: Crown rot/ BYDV – YIELD

- The trial averaged 3.85 t/ha.
- Slashing had a negative impact on yield for both varieties.
- There was no difference in the yield of EGA Bellaroi and EGA Gregory in the unslashed treatments, however in the slashed treatments, EGA Bellaroi performed better than EGA Gregory (Figure 2).
- Seed treatment with imidacloprid (4.00 t/ha) provided an 8.1% yield benefit over untreated seed (3.70 t/ha).
- No significant differences (95% confidence level) in yield were evident with other treatments or interactions; i.e. there was no effect of crown rot or in-crop fungicide application on yield.

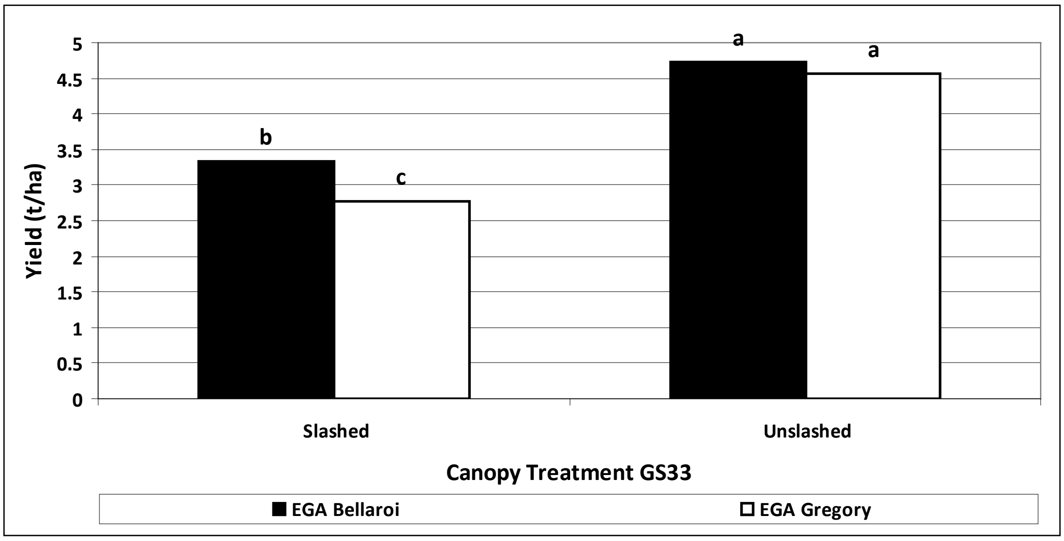


Figure 2. Effect of slashing on grain yield

Experiment 2: Seed treatment trial

The trial established well, averaging 109.8 plants/m^2. However there were no significant differences between the treatments.

The experimental seed treatment did not have a significant effect on head numbers or yield in the presence of crown rot in either EGA Wylie or Ellison. The experimental seed treatment clearly had no activity against stripe rust in these two MR-MS varieties which were both visually infected. There was also no significant difference (95% confidence level) between the average yield of the two varieties at this site even though Ellison yielded 4.23 t/ha and EGA Wylie 3.56 t/ha.

Summary

It is well established that crown rot expression is worse when moisture stress occurs during grain-fill. The wet conditions therefore obviously limited crown rot expression in 2010. Therefore many of the expected differences in plant establishment, head number and yield due to the impact of crown rot were not seen as a result of the wet spring conditions. No impact of the in-crop fungicide application was seen at this site either.

The effect of slashing on both head number and yield was strongly evident in this trial, largely due to the slightly late timing of the treatment. This data reinforces the importance of removing stock from grazing in a dual purpose situation prior to head initiation.

The seed treatment imidacloprid increased both head number and grain yield at this site. Imidacloprid provides early protection against aphids and earth mites that can reduce crop vigour and potentially transmit BYDV. Aphids were detected at this site, but population and species identification are still occurring.

The use of the experimental seed treatment targeted again crown rot, was found to be ineffective. Under conditions of applied crown rot infection, seed treatment had no effect on final head numbers or yield.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Ben Frazer, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Dougal Pottie and Peter Foreman.

Integrated management of winter cereal diseases – Bellata 2010

Tim Burley[1], Alan Bowring[2], Guy McMullen[2] and Steven Simpfendorfer[2]

[1] NSW DPI, Moree

[2] NSW DPI, Tamworth

Introduction

The following report outlines one in a series of 11 trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot caused by the fungus, Fusarium pseudograminearum. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: Bellata, northern NSW

Co-operator: Phil Christie, 'Orlando'

Sowing Date: 22nd May 2010

Fertiliser: 45 kg/Ha Starter 12Z

Harvest Date: 25th November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Bread wheat variety EGA Gregory and durum variety EGA Bellaroi sown at a target population of 80 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with mower and biomass removed from plots) at GS31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at GS31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Head number

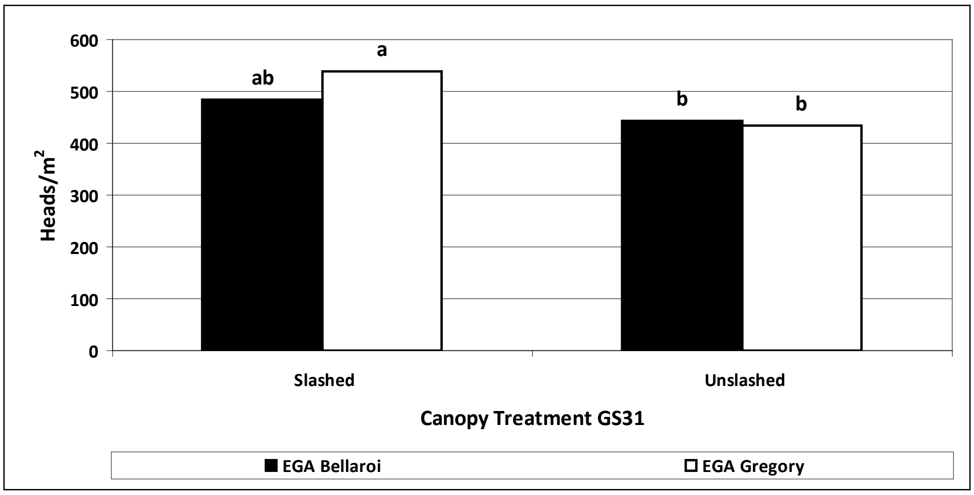
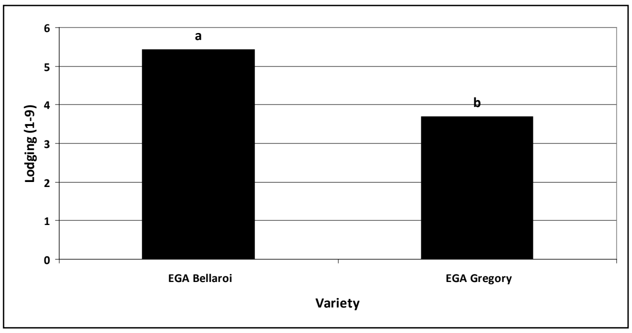


Figure 1. Effect of slashing at GS31 on head density

Slashing significantly increased head numbers in EGA Gregory but had no significant effect in EGA Bellaroi (Figure 1).

Experiment 1: Lodging and yield



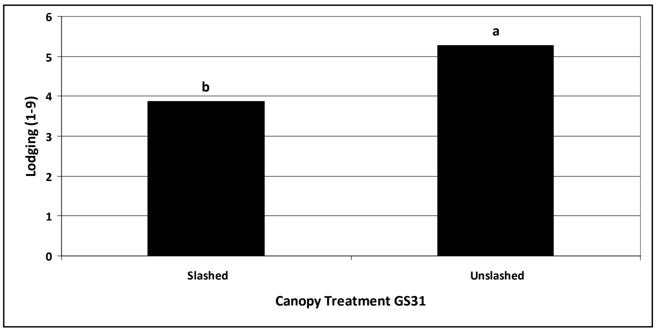


Figure 2. Effect of variety (a) and slashing (b) on lodging

- The severity of lodging in EGA Bellaroi was significantly greater than in EGA Gregory (Figure 2a).
- Slashing at GS31 significantly reduced lodging at harvest compared to unslashed treatments (Figure 2b).

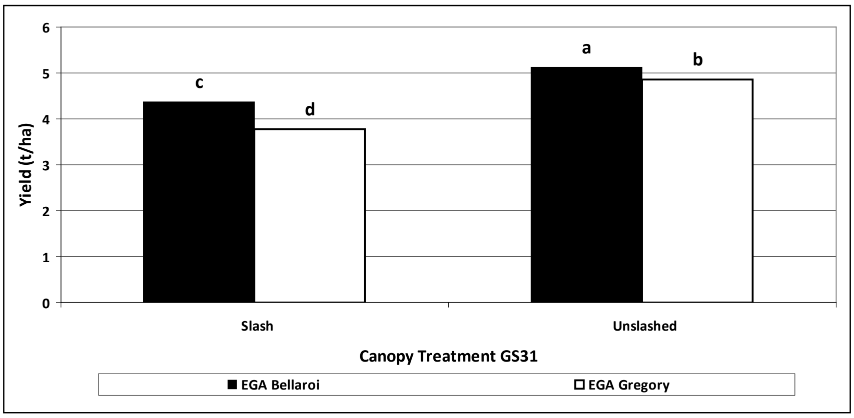


Figure 3. Effect of slashing on grain yield

- The yield of EGA Bellaroi was significantly greater than EGA Gregory in both slashed and unslashed treatments.
- Slashing had a significant impact on grain yield in both varieties with a 22.4 % yield reduction from slashing in EGA Gregory and a 14.6% yield reduction in EGA Bellaroi (Figure 3).
- Fungicide application at GS31 provided a small +2.5% (0.11 t/ha) but significant yield benefit.
- No other significant differences (95% confidence level) in yield were evident with other treatments or interactions.

Experiment 2: Seed treatment trial

The experimental seed treatment did not have a significant effect on the extent of lodging or yield in the presence of crown rot in either EGA Wylie or Ellison. The experimental seed treatment clearly had no activity against stripe rust in these two MS varieties. There was also no significant difference between the yield of the two varieties even though EGA Wylie had greater lodging (score 7.4) at harvest compared to Ellison (score 3.6).

Summary

It is well established that crown rot expression is worse when moisture stress occurs during grain-fill. The wet conditions therefore obviously limited crown rot expression in 2010. Therefore many of the expected differences in plant establishment, head number and yield due to the impact of crown rot were not seen as a result of the wet spring conditions in 2010.

Slashing at GS31 generally increased head numbers being significant in EGA Gregory but not in EGA Bellaroi. Furthermore, slashing at GS13 significantly reduced the severity of lodging in both varieties at harvest compared to the unslashed treatments. However, these effects on head number and lodging did not translate to yield with slashing at GS 31 resulting in an average reduction in grain yield across the two varieties of 18.6%.

Use of the insecticide seed treatment Imidacloprid did not provide a significant (95% confidence level) yield benefit in either the durum (EGA Bellaroi) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010. Fungicide application at GS31 provided a small but significant yield increase of 2.5% averaged across the two varieties. Pathology assessments are still to be completed but they may assist in explaining this yield effect.

The use of the experimental seed treatment targeted again crown rot, was found to be ineffective. Under conditions of applied crown rot infection, seed treatment had no effect on final head numbers or yield.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Gerard Lonergan and Russell Carty. Thanks to Loretta Serafin for assistance with co-ordination of trial network in 2010.

Integrated management of winter cereal diseases – Wongarbon 2010

Steven Simpfendorfer[1], Greg Brooke[2], Alan Bowring[1] and Guy McMullen[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Wellington

Introduction

The following report outlines one in a series of 11 trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location: Wongarbon

Co-operator: John Kelly and family, 'Hillview'

Sowing Date: 24th May 2010

Harvest Date: 21st December 2010

Treatments

Experiment 1: Crown rot/BYDV

- Bread wheat variety EGA Gregory and barley variety Commander sown at a target population of 100 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with mower and biomass removed from plots) at GS31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at GS31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).
- All plots inoculated with crown rot at sowing.

Experiment 1: Head number

- Commander barley, as expected was higher tillering and hence produced more heads (497 heads/m^2) than the bread wheat variety EGA Gregory (298 heads/m^2).
- Inoculation with crown rot at sowing reduced head numbers by 6.6%.
- Fungicide application at Z31 increased head numbers by 8.0% in EGA Gregory but had no significant effect in the barley variety Commander (Figure 1).
- No other treatments or interactions had a significant effect on head density.

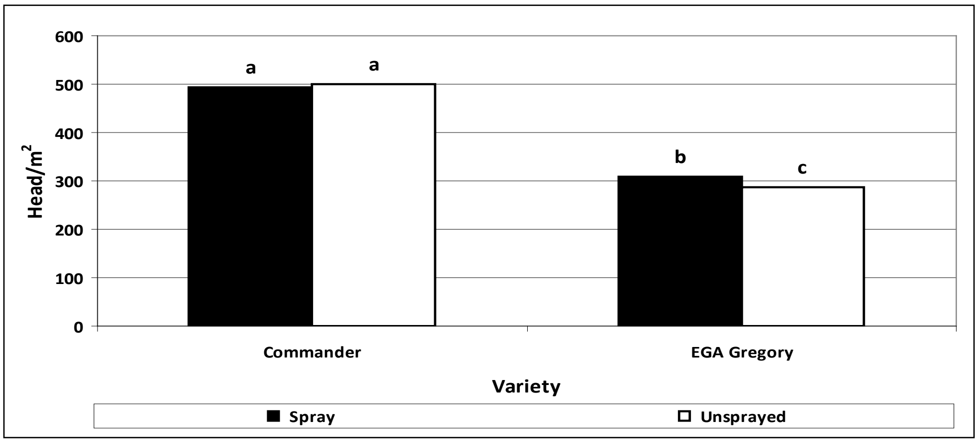


Figure 1. Effect of variety and fungicide application on head density

Experiment 1: Yield

- EGA Gregory was 18.4% higher yielding than the barley variety Commander (Figure 2).
- Slashing at GS31 increased final grain yield by 3.2% in Commander barley but had no significant effect on yield in EGA Gregory (Figure 2).
- No significant differences (95% confidence level) in yield were evident with other treatments or interactions.

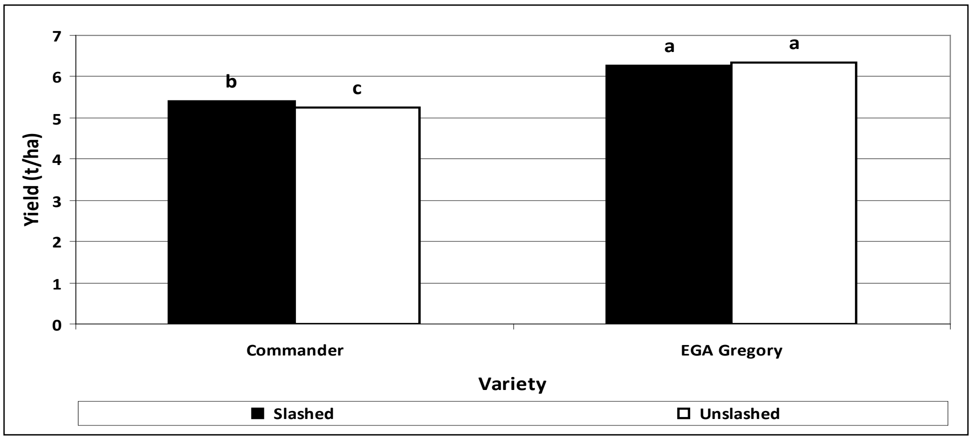


Figure 2. Effect of slashing on grain yield

Experiment 2: Seed treatment trial

The experimental seed treatment did not have a significant effect on head numbers or yield in the presence of crown rot in either EGA Wylie or Ellison. The seed treatment clearly had no activity against stripe rust in these two MR-MS varieties which were both visually severely infected. There was a significant difference between the yield of the two varieties at this site with Ellison (4.02 t/ha) providing an 11.4% yield benefit over EGA Wylie (3.61 t/ha).

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in a prolonged grain-fill period. It is therefore not surprising that crown rot did not have an impact on yield in this trial even though a slight reduction in head numbers was evident. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at GS31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following Folicur application provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did have a slight impact on yield resulting in a 3.2% yield gain in the barley (Commander) but no effect evident in the bread wheat variety (EGA Gregory). Commercially, this neutral or slightly positive yield gain would additionally be complemented by the grazing value of dry matter removed at GS31.

Use of the insecticide seed treatment Imidacloprid did not provide a yield benefit in either the barley (Commander) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010.

An experimental seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by NSW DPI mobile units with thanks to Scott Boyd, Dougal Pottie and Peter Foreman. Thanks to Loretta Serafin for assistance with co-ordination of trial network in 2010.

Integrated management of winter cereal diseases – Trangie 2010

Steven Simpfendorfer[1], Rohan Brill[2], Jayne Jenkins[3], Leigh Jenkins[4], Alan Bowring[1] and Guy McMullen[1]

[1] NSW DPI, Tamworth, [2] NSW DPI, Coonamble
[3] NSW DPI, Trangie, [4] NSW DPI, Warren

Introduction

The following report outlines one in a series of 11 trials conducted throughout central and northern NSW in 2010 in a collaboration between the I&I Northern NSW Cereal Disease Management Unit and District Agronomists. Essentially two separate trials were conducted at each site aimed at examining a range of disease management options and their potential interactions. Both trials were aimed primarily at the integrated management of crown rot caused by the fungus, *Fusarium pseudograminearum*. However, the first experiment also contained an imidacloprid seed treatment known to have activity on cereal aphids and hence potentially on levels of Barley Yellow Dwarf Virus (BYDV). Levels of other winter cereal diseases were recorded throughout the season if present.

Site details

Location:	Trangie Research Station
Sowing Date:	18th May 2010
Fertiliser:	100 kg/ha Granulock 12Z @ sowing 65 L/ha Easy N applied on 10th July (28 kg/ha N)
Harvest Date:	19th November 2010

Treatments

Experiment 1: Crown rot/BYDV

- Bread wheat variety EGA Gregory and barley variety Commander sown at a target population of 80 plants/m^2.
- Plus or minus imidacloprid (240 mL/100 kg seed of 600 g/L imidacloprid).
- Plus or minus crown rot inoculation at sowing.
- Plus or minus slashing (simulated grazing with mower and biomass removed from plots) at GS31.
- Plus or minus foliar fungicide application (290 mL/ha tebuconazole) at GS31.

Experiment 2: Crown rot seed treatment

- Two bread wheat varieties, Ellison and EGA Wylie.
- Plus or minus experimental seed treatment (ipconazole + metalaxyl).

All plots inoculated with crown rot at sowing.

Experiment 1: Head number

- Commander barley, as expected was higher tillering and hence produced more heads (616 heads/m^2) than the bread wheat variety EGA Gregory (482 heads/m^2).
- No other treatments or interactions had a significant effect on head density.

Experiment 1: Lodging and yield

- The extent of lodging, given the season, was relatively low across varieties at harvest.
- Commander barley had more lodging than the bread wheat variety EGA Gregory (Figure 1a).
- Slashing at GS31 slightly reduced the extent of lodging at harvest (Figure 1b).
- Commander barley was 22.2% higher yielding than the bread wheat EGA Gregory (Figure 2a).
- Averaged across the two varieties, slashing at GS31 reduced final grain yield by 11.4% (Figure 2b).
- No significant differences (95% confidence level) in yield were evident with other treatments or interactions.

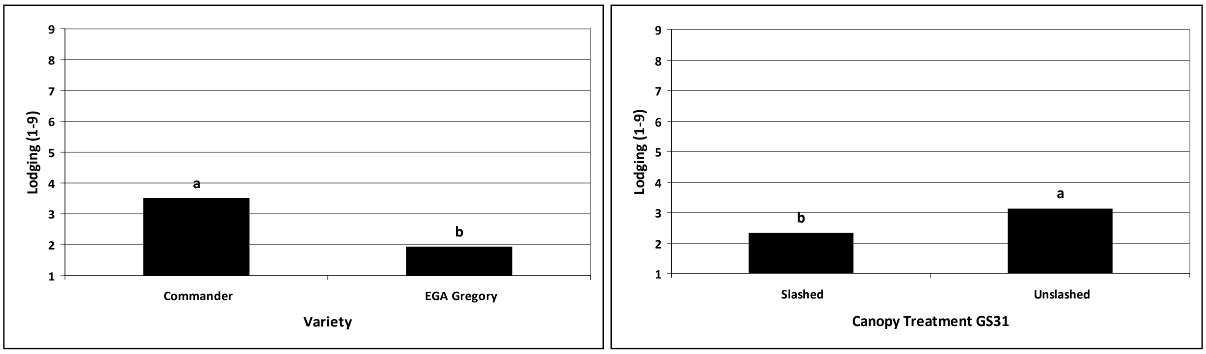


Figure 1. Effect of variety (a) and slashing (b) on extent of lodging at harvest

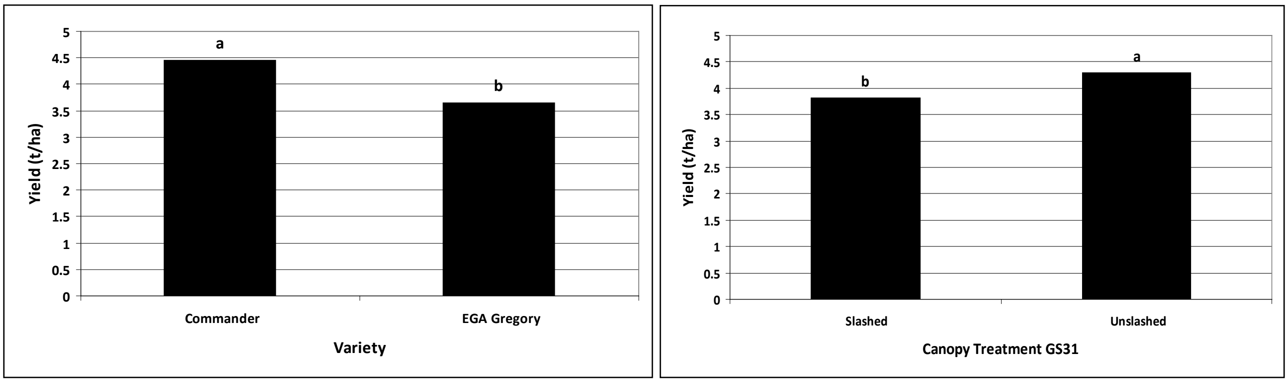


Figure 2. Effect of variety (a) and slashing (b) on grain yield

Experiment 2: Seed treatment trial

The experimental seed treatment did not have a significant effect on head numbers or yield in the presence of crown rot in either EGA Wylie or Ellison. The seed treatment clearly had no activity against stripe rust in these two MR-MS varieties which were both visually severely infected. There was also no significant difference between the yield of the two varieties at this site with Ellison yielding 3.05 t/ha and EGA Wylie 2.74 t/ha.

Summary

The 2010 season was characterised by frequent, often heavy, rainfall events which in combination with mild temperatures resulted in a prolonged grain-fill period. It is therefore not surprising that crown rot did not have an impact on yield in this trial. It is well established that yield loss associated with crown rot infection is related to the extent of moisture stress during the grain-fill period.

The slashing treatment at GS31 was primarily designed to conserve soil moisture for grain-fill and also potentially in combination with a following Folicur application provide better fungicide penetration into tiller bases where crown rot infection resides. The wet 2010 season minimised crown rot expression so these interactions were not evident. However, in the absence of disease expression, slashing did have a negative impact on yield resulting in 11.4% yield loss averaged across the barley and bread wheat variety. Commercially, this yield loss may be partially offset by the grazing value of dry matter removed at GS31.

Use of the insecticide seed treatment Imidacloprid did not provide a yield benefit in either the barley (Commander) or bread wheat variety (EGA Gregory) at this site in 2010. Frequent rainfall events assisted in minimising the development of aphid populations in 2010.

An experimental seed treatment (Ipconazole + metalaxyl) did not provide a yield benefit at this site in 2010 in either EGA Wylie or Ellison inoculated with crown rot at sowing. Both these varieties are moderately susceptible to stripe rust but visually this seed treatment had no activity against this leaf disease.

Grain quality and pathology assessment of harvest samples from both trials are occurring which may reveal further significant effects and interactions between treatments and assist in the interpretation of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Kay Warren and Karen Cassin for packaging trial kits and assistance with head counts. Trials were kindly sown, managed and harvested by Trangie Research Station with thanks to Rob Pither. Thanks to Loretta Serafin for assistance with co-ordination of trial network in 2010.

Influence of inoculum location and in-crop fungicides on crown rot – Coonamble 2010

Alan Bowring, Amy-Sue Alston & Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

The fungus *Fusarium pseudograminearum* (Fp), which causes crown rot in winter cereal crops, is a stubble-borne pathogen which survives as mycelium ('cottony growth') inside of tillers. Infection can occur through the sub-crown internode (which joins the seed to the crown) or crown tissue (both below ground), or the base of tillers at the soil surface (above ground). As industry has moved to greater adoption of stubble retention and no-till farming practices this has favoured a proportional increase in primary infections through tiller bases at the soil surface. However, previous crown rot research has largely been based on placing the inoculum source in the furrow with seed at sowing. The method of application of inoculum may be important to the vigour of fungal infection under different conditions (above vs. below ground infection sites) and exposure to different elements (heat, moisture, microbial action) and the timing when the fungus enters a new host.

The basis of this study was to differentiate between above and below ground infection within a trial situation to obtain a greater awareness of the variability in response of the pathogen to management options such as in-crop fungicides.

Site details

Location:	Coonamble, Northern NSW
Co-operator:	George Lefebvre
Sowing Date:	6th June
Harvest Date:	23rd November

Treatments

- Two varieties; a durum wheat variety EGA Bellaroi and a bread wheat variety EGA Gregory.
- Three crown rot infection treatments – Nil (control), in-furrow at sowing (below ground) or surface spread at Z15 (above ground).
- Inoculum consisted of sterilised durum grain colonised by Fp (mixture of 5 isolates) applied at a rate of 2 g/m of row at sowing or over emerged rows at Z15.
- Two foliar fungicide treatments – Nil (control) or a split application at Z32/33 of tebuconazole (145 mL/ha) at each timing. NOTE: The use of tebuconazole for the control of crown rot is not registered and has been used in this study as an experimental treatment only.

Grain yield

- In EGA Gregory, yield was only significantly reduced by below ground infection. In contrast in the durum variety EGA Bellaroi, only above ground infection resulted in a significant yield loss from crown rot infection (Figure 1).
- EGA Bellaroi out yielded EGA Gregory in the absence of crown rot infection. However, the percentage yield loss due to crown rot infection (averaged from both infection sites) was less in EGA Gregory (4%) than in EGA Bellaroi (6%) (Figure 1).

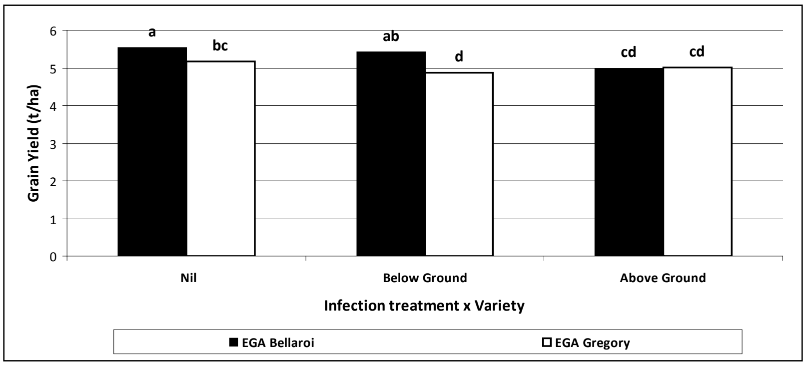


Figure 1. Effect of crown rot infection site on grain yield for the two wheat varieties

- Averaged across the two varieties (Nil fungicide treatments), above ground application of inoculum to the soil surface reduced yield by 9.8% which was significantly greater than the application of inoculum below ground in the seed furrow which reduced yield by only 2.1% (Figure 2).
- The below ground crown rot infection fungicide treatment at Z32 + 33 had no significant effect on the extent of yield loss. However, above ground infection grain yield was reduced by 9.3% in the absence of fungicide application while spraying at Z32+33 decreased the extent of yield loss to 3.6% (a 5.7% improvement; Figure 2).

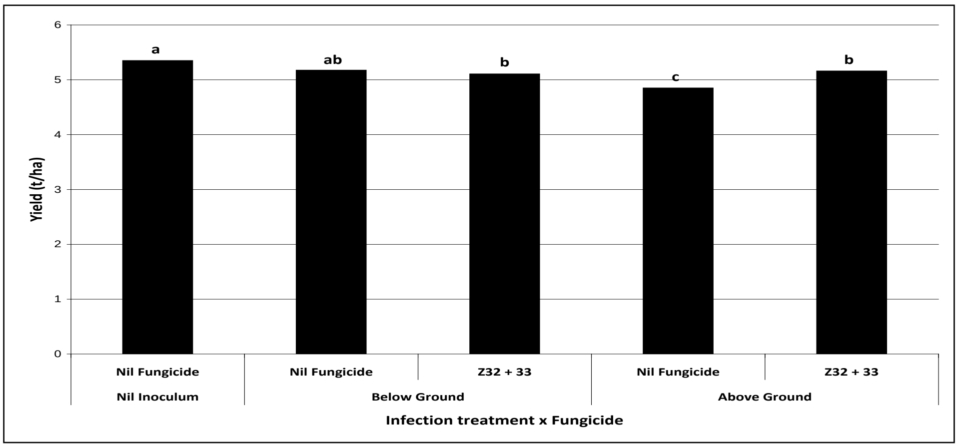


Figure 2. Effect of crown rot infection site and fungicide application on grain yield

Summary

Initiation of crown rot infections either below ground (in-furrow) or above ground (soil surface) had variable impacts on grain yield between the two varieties. The durum wheat EGA Bellaroi appeared more susceptible to above ground infections with crown rot, whereas EGA Gregory had a tendency to be more susceptible to below ground infections.

The extent of yield loss from crown rot infection was less in the EGA Gregory than in EGA Bellaroi, which is consistent with the increased susceptibility of EGA Bellaroi and all commercial durum varieties to crown rot. Frequent rainfall and mild temperatures were experienced in the trial in 2010, which reduced the expression of crown rot which is known to be exacerbated by moisture stress during grain-fill. However, significant differences were still apparent which could have potentially been much greater with a tougher finish to the season.

Use of fungicide at Z32+33 was more effective in the treatment of crown rot when infections occurred above ground compared to below ground in the soil. This suggests that infection timing and location may play an important role in the treatment of crown rot. It could be hypothesised that plants infected within the soil have a longer time for the fungus to migrate within the plant and infections reside predominantly below ground hence it would be less susceptible to the fungicide treatment at Z32–33. In contrast, plants infected at the surface have less time before Z32–33 for the fungus to take hold and the infections are predominantly above ground hence there is more exposure to a fungicide application.

Grain quality and pathology evaluation of harvest samples are occurring which may disclose further important effects and interactions between treatments and assist in the understanding of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Rod Bambach, Ben Frazer and Patrick Mortell for field assistance. Thanks also to Rohan Brill for assistance with trial management.

Influence of inoculum location and in-crop fungicides on crown rot – Gilgandra 2010

Alan Bowring, Amy-Sue Alston & Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

The fungus *Fusarium pseudograminearum (Fp),* which causes crown rot in winter cereal crops, is a stubble-borne pathogen which survives as mycelium ('cottony growth') inside tillers and on the crown. Infection can occur through the sub-crown internode which joins the seed to the crown or crown tissue (both below ground), or the base of tillers above the soil surface. The increase in stubble retention and no-till farming practices has favoured a proportional increase in primary infections through tiller bases at the soil surface. However, previous crown rot research has largely been based on placing the inoculum source in the furrow with seed at sowing. The method of application of inoculum may be important to the vigour of fungal infection under different conditions (above vs. below ground infection sites) and exposure to different elements (heat, moisture, microbial action) and the timing of when the fungus enters a new host.

The basis of this study was to differentiate between above and below ground infection within a trial situation to obtain a greater awareness of the variability in response of the pathogen to management options such as in-crop fungicides.

Site details

Location: Gilgandra, Central Northern NSW

Co-operator: Kevin Kilby

Sowing Date: 24th June 2010

Harvest Date: 17th December 2010

Treatments

- Two varieties, a durum wheat variety EGA Bellaroi and a bread wheat variety EGA Gregory.
- Three crown rot infection treatments – Nil (control), in-furrow at sowing (below ground) or surface spread at Z15 (above ground).
- Inoculum consisted of sterilised durum grain colonised by Fp (a mixture of 5 isolates) applied at a rate of 2 g/m of row at sowing or over emerged rows at Z15.
- Two foliar fungicide treatments – Nil (control) or a split application at Z32/33 of tebuconazole (145 mL/ha) at each timing. NOTE: The use of tebuconazole for the control of crown rot is not registered and has been used in this study as an experimental treatment only.

Grain yield

- In EGA Gregory, grain yield was not significantly reduced by above or below ground infection with Fp .
- The grain yield of EGA Bellaroi was reduced by the infection treatments compared to the nil control (13% in-furrow, 17% surface spread) however, there were no statistical difference between infection treatments (Figure 1).

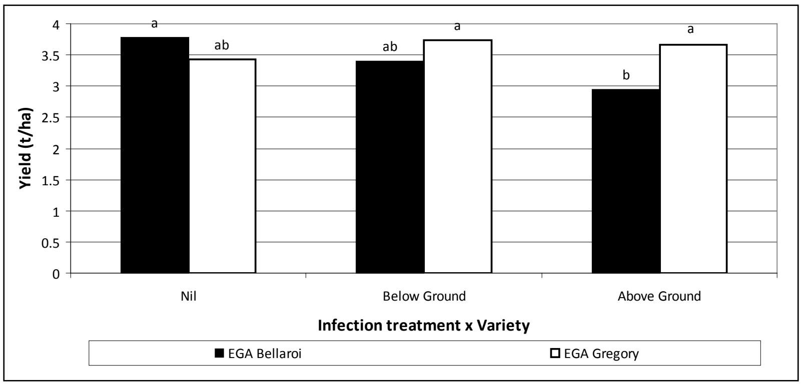


Figure 1. Effect of crown rot infection site on grain yield

- Potential interactions between site of infection and foliar fungicide were investigated. No significant effect on grain yield was observed when averaged across the two varieties or in EGA Bellaroi alone.
- In EGA Gregory, fungicide application at Z32+33 had no significant effect on the extent of yield loss from crown rot when infections were below ground. In contrast, with above ground infection yield was significantly increased by 18% through the application of a fungicide spray at Z32+33 compared to the unsprayed nil fungicide treatment (Figure 2).

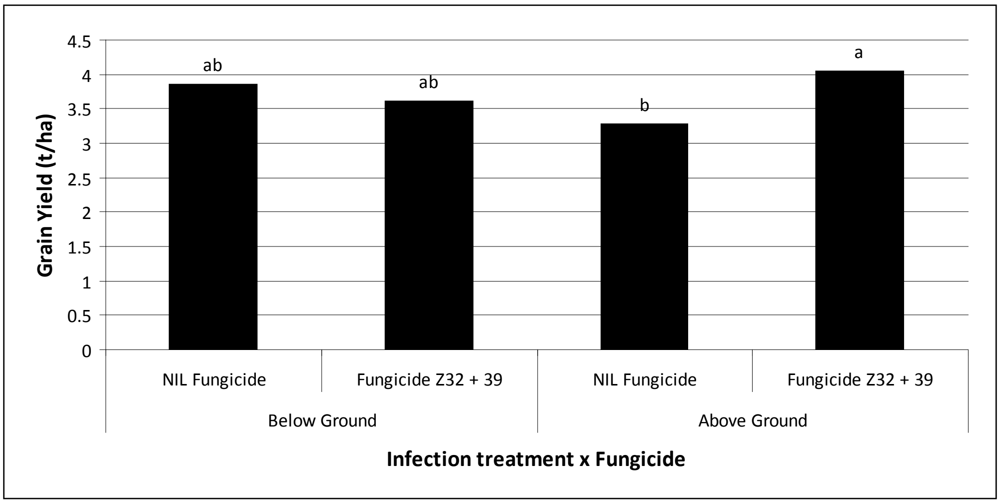


Figure 2. Effect of crown rot infection site and fungicide application on grain yield in EGA Gregory

Summary

The results suggest that EGA Bellaroi is more susceptible to crown rot infection on the surface compared to below ground, whereas no clear trend could be defined for EGA Gregory.

The extent of yield loss from crown rot infection was less in the EGA Gregory than the EGA Bellaroi, which is consistent with the increased susceptibility of EGA Bellaroi and all commercial durum varieties to crown rot. Frequent rainfall and mild temperatures were experienced in the trial in 2010, which reduced the expression of crown rot which is known to be exacerbated by moisture stress during grain-fill. However, significant differences were still apparent which could have potentially been much greater with a tougher finish to the season.

Fungicide application at Z32+33 was more effective in the treatment of crown rot when infections occurred above ground compared to below ground in the soil. This suggests that infection timing and location may play an important role in the treatment of crown rot. It could be hypothesised that plants infected within the soil have a longer time for the fungus to migrate within the plant and infections reside predominantly below ground hence it would be less susceptible to the fungicide treatment at Z32–33. In contrast, plants infected at the surface have less time before Z32–33 for the fungus to take hold and the infections are predominantly above ground hence there is more exposed to a fungicide application.

Grain quality and pathology evaluation of harvest samples from both trials are occurring which may disclose further important effects and interactions between treatments and assist in the understanding of outcomes.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143). Thanks to Tiffany Biggs, Ben Bowman, Rod Bambach, Ben Frazer and Patrick Mortell for field assistance.

Management of root lesion nematodes in wheat – Mungindi 2010

Alan Bowring[1], Amy-Sue Alston[1], Tim Burley[2] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Moree

Introduction

Root lesion nematodes (RLN) are microscopic worms that feed and reproduce inside plant roots which can lead to yield loss in intolerant crops. Two species of RLN are important to crop production in the northern grains region namely, *Pratylenchus thornei (Pt)* and *Pratylenchus neglectus (Pn).*

RLN tolerance relates to a varieties ability to maintain yield in the presence of nematodes. A high level of variability exists within current commercial bread wheat varieties in their tolerance to these two important species of RLN. A standard nematode resistance rating system has been adopted across all of Australia. Variety tolerances range from tolerant (T), moderately tolerant (MT), moderately intolerant (MI), intolerant (I), to very intolerant (VI).

In this study four bread wheat varieties varying in nematode tolerance rating were sown into a paddock with known high *Pt* infestations. The aim of the study was to:

1. Determine how the tolerances of each variety affect yield.
2. Determine if crown rot interacts with *Pt* to increase yield loss from both of these pathogens.
3. Determine what effect the application of an experimental nematicide at a range of concentrations had on grain yield in the presence of a high *Pt* population.

Site details

Location:	Mungindi
Co-operator:	B. & J. Longworth, 'Jabiru' Weemalah
Sowing Date:	15th June 2010
Fertiliser:	50 kg/ha Starter Z
Harvest Date:	26th November 2010

Treatments

- Four bread wheat varieties with varying Pt tolerance ratings: EGA Wylie and EGA Gregory (MT), Strzelecki (MI-I) and Ellison (I) Provisional.
- The wheat varieties were sown into a soil containing an average of 15,036 *Pt*/kg soil in the top 30 cm based on DEEDI manual counts and 0 *Pn*/kg soil. **Note:** Research in Qld by DEEDI suggests a base threshold for yield loss in intolerant wheat varieties is 2,000 *Pt*/kg soil.
- Plus or minus crown rot inoculation at sowing.
- Experimental nematicide seed treatment: rates ranging from Nil, 40, 80, and 160 mL/100 kg seed.
- Small plots (10 x 2 m) with four replicates.

Yield loss

- Grain yield of the four wheat varieties varied significantly. EGA Gregory had the highest yield, followed by EGA Wylie, Ellison and Strzelecki (Figure 1).
- Based on Pt tolerance rating, the MT variety EGA Gregory out yielded the MT variety EGA Wylie by 18.6%. For the MI-I variety Strzelecki, yield was reduced by 69% in comparison to the average yield of the MT varieties (EGA Gregory & EGA Wylie). Although the variety Ellison had the lowest Pt rating (I), its yield was 27% higher than Strzelecki (Figure 1).

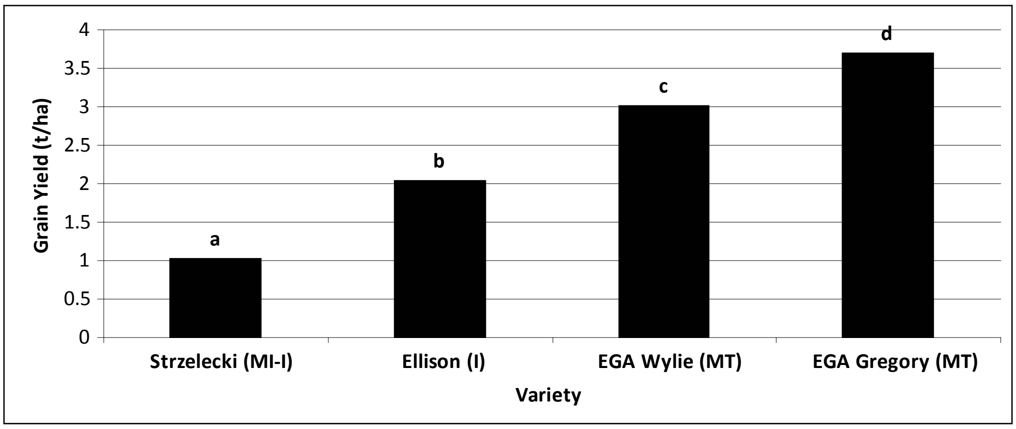


Figure 1. Grain yield of four wheat varieties in presence of high population of **Pratylenchus thornei**

- Crown rot inoculation had no significant effect (P=0.05) on grain yield in any of the four varieties.
- The experimental nematicide seed treatment did not have a significant effect on grain yield (Figure 2).

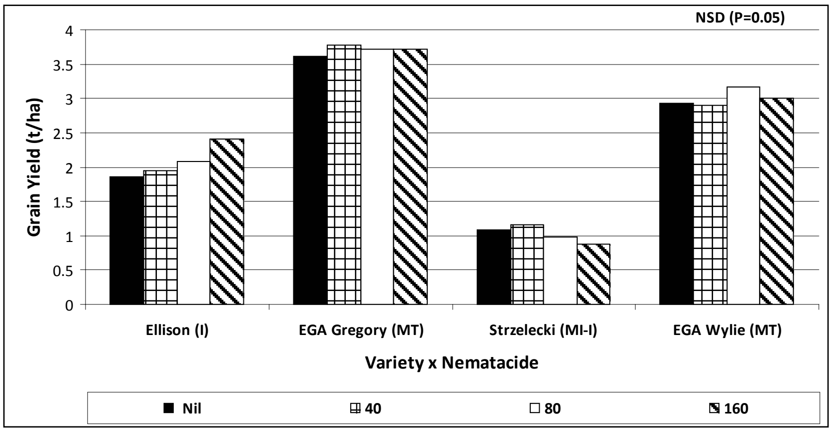


Figure 2. Effect of nematicide seed treatment (mL/100 kg seed) on yield in Pt infested soil

Summary

The Pt varietal tolerance rating for the four wheat varieties was:

EGA Wylie = EGA Gregory > Strzelecki > Ellison

In this study the current ratings were mirrored to an extent with yield decreasing from EGA Gregory > EGA Wylie > Ellison > Strzelecki. Although not observed, conditions for foliar leaf diseases such as stripe rust may have been a factor in the difference in grain yield between EGA Gregory and EGA Wylie as no lodging was apparent at this site. The fact that inoculation with crown rot and use of an experimental nematicide seed treatment at vary rates had no significant effect on yield indicates the importance of variety choice in nematode infested soils.

It is critical in sites with high populations of Pt, similar to the paddock used in this study, to sow wheat varieties that have higher tolerance ratings to Pt. This simple decision can have a major impact on the profitability of wheat production. For example, in this paddock in 2010, if the commercial crop had been planted to EGA Gregory, which is moderately tolerant to Pt, a 44.8% yield benefit would have been seen over sowing the Pt intolerant variety Ellison and a 72.2% yield benefit if Strzelecki, a Pt moderately intolerant variety had been sown .

Testing of soil for both population and actual RLN species is important. Wheat varieties can vary markedly in their tolerance to Pt and Pn. For example, Strzelecki is a poor variety choice if a high population of Pt exists in a paddock but Strzelecki has very good tolerance to Pn as highlighted in a similar trial conducted at Gulargambone in 2010.

Growing RLN tolerant varieties can minimise yield loss. Crop rotation also remains a key management tool for reducing Pt populations by growing Pt resistant crops including canola, linseed, cotton, millet, sorghum and sunflowers. However, these crops only reduce nematode reproduction; they do not eliminate the problem, as nematodes can survive in the soil for many years.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN000143). Thanks to Ben Bowman, Tiffany Biggs, Rod Bambach, Russell Carty and Michael Dal Santo for field assistance. Thanks also to Rob Holmes (HMAg) for site co-ordination.

Management of root lesion nematodes in wheat – Gulargambone 2010

Alan Bowring, Amy Alston and Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

Root lesion nematodes (RLN) are microscopic worms that feed and reproduce inside plant roots which can lead to yield loss in intolerant crops. Two species of RLN are important to crop production in the northern grains region namely, *Pratylenchus thornei* (Pt) and *Pratylenchus neglectus* (Pn).

RLN tolerance relates to a varieties ability to maintain yield in the presence of nematodes. A high level of variability exists within current commercial bread wheat varieties in their tolerance to these two important species of RLN. A standard nematode resistance rating system has been adopted across all of Australia. Variety tolerances range from tolerant (T), moderately tolerant (MT), moderately intolerant (MI), intolerant (I), to very intolerant (VI).

In this study four bread wheat varieties varying in nematode tolerance rating were sown into a paddock with known high Pn infestations. The aim of the study was to:

1. Determine how the tolerances of each variety affected yield.
2. Determine if crown rot interacts with Pn to increase yield loss from both of these pathogens.
3. Determine what effect the application of an experimental nematicide at a range of concentrations had on grain yield in the presence of a high Pn population.

Site details

Location:	Gulargambone
Co-operator:	David Peart “Tondeburine”
Sowing Date:	24th June 2010
Fertiliser:	50 kg/ha Starter Z
Harvest Date:	17th December 2010

Treatments

- Four bread wheat varieties with varying *Pn* tolerance ratings: Merinda (MT), Strzelecki (MT-MI), EGA Wylie (MI) and Ellison (MI-I)* (* Provisional).
- Wheat varieties were sown into a paddock containing an average of 12, 222 *Pn*/kg soil in top 15 cm based on SARDI PreDicta B DNA assessment and 0 *Pt*/kg soil. **Note:** Research in Qld by DEEDI suggests a base threshold for yield loss in intolerant wheat varieties is 2,000 *Pn*/kg soil.
- Plus or minus crown rot inoculation at sowing.
- Experimental nematicide seed treatment: rates ranging from Nil, 40, 80, and 160 mL/100 kg seed.
- Small plots (10 x 2 m) with four replicates.

Lodging and yield loss

- Due to seasonal conditions at harvest, lodging scores were taken for all varieties. Some degree of yield reduction should be attributed to differences in lodging, particularly in EGA Wylie and Merinda where significant lodging was apparent (Figure 1).

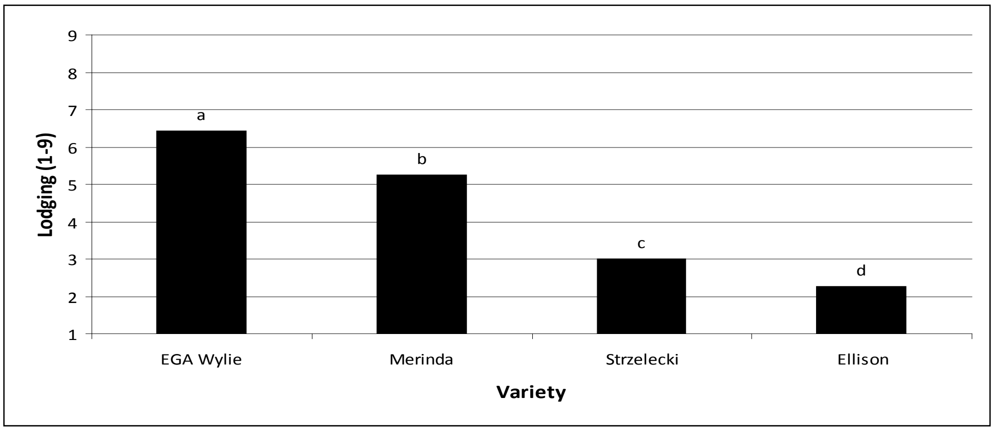


Figure 1. Lodging scores by variety taken pre-harvest. Lodging scores range 1–9. (Lodging scores represent a condition* scale *of the plots where 1 = upright (no lodging) and 9 = flat on the ground)

- Grain yield of the four wheat varieties varied significantly. Strzelecki had the highest yield, followed by Ellison, Merinda & EGA Wylie (Figure 2).
- When examined by tolerance rating, the MT-MI variety (Strzelecki) had a 21.6% higher grain yield compared to an MI-I variety (Ellison). A larger variation in yield was found for the MT variety (Merinda) which was outperformed by 29.3% and 9.8% by Strzelecki and Ellison, respectively. The MI variety (EGA Wylie) was 43.6% lower yielding than the top variety Strzelecki (Figure 2).

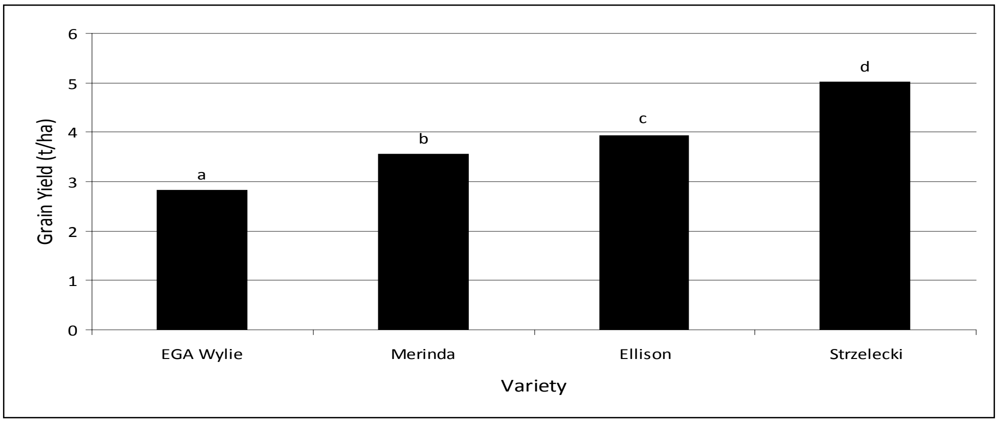


Figure 2. Grain yield of four wheat varieties in the presence of high population of Pratylenchus neglectus

- Crown rot inoculation had no significant effect (P=0.05) on grain yield in any of the four varieties.
- The experimental nematicide seed treatment did not have a significant effect on grain yield in any of the four varieties (Figure 3).

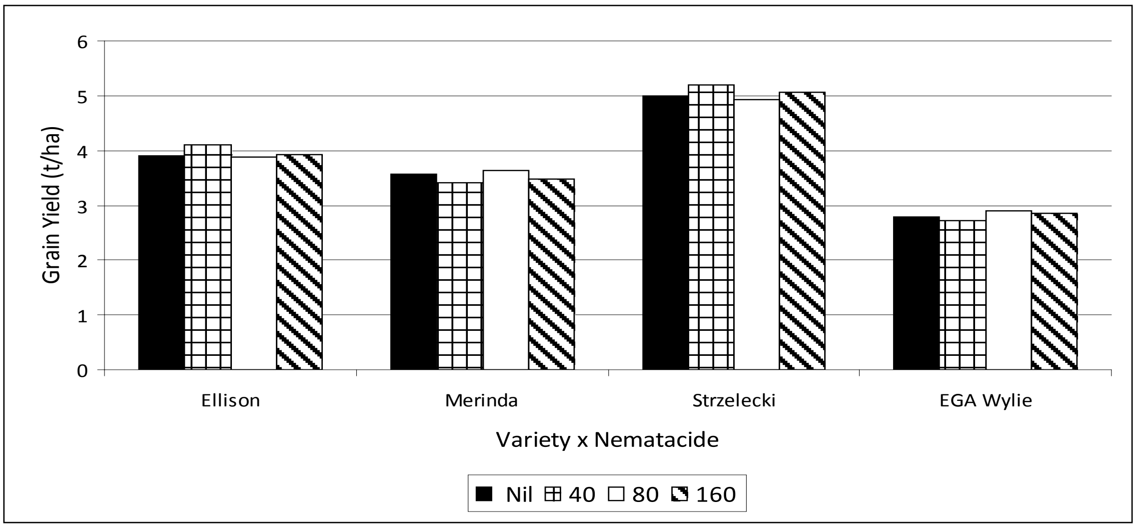


Figure 3. Effect of nematicide seed treatment (mL/100 kg seed) on yield in Pn infested soil

Summary

The *Pn* varietal tolerance rating for the four wheat varieties was:

Merinda > Strzelecki > EGA Wylie > Ellison

In this study the current variety tolerance ratings differed to the expected trends with yield decreasing from Strzelecki > Ellison > Merinda > EGA Wylie. Significant lodging was observed at harvest (particularly in EGA Wylie and Merinda) and the lower than expected yield from the MT variety Merinda suggests harvest losses would have contributed to its lower yield. The fact that inoculation with crown rot and use of an experimental nematicide seed treatment at vary rates had no significant effect on yield indicates the importance of variety choice in nematode infested soils.

It is critical in sites with high populations of *Pn*, similar to the paddock used in this study, to sow wheat varieties that have higher tolerance ratings to *Pn*. This simple decision can have a major impact on the profitability of wheat production. For example, if the paddock had been commercially planted to Strzelecki, which is moderately tolerant – moderately intolerant to *Pn,* then a 27.6% yield benefit would have been experienced over choosing the *Pn* moderately intolerant – intolerant variety Ellison in this paddock in 2010. Note: this is a yield comparison that was not differently affected by lodging.

Testing of soil for both population and actual RLN species is an important consideration to assist management decisions. Wheat varieties can vary markedly in their tolerance to *Pt* and *Pn*. For example, Strzelecki is a good choice of variety if a high population of *Pn* exists in a paddock such as this study but Strzelecki has very low tolerance to *Pt* as highlighted in a similar trial conducted at Mungindi in 2010.

Growing RLN tolerant varieties can minimise yield loss. Crop rotation also remains a key management tool for reducing *Pn* populations by growing *Pn* resistant crops including faba bean, linseed, mung bean, and sunflowers. However, these crops only reduce nematode reproduction; they do not eliminate the problem, as nematodes can survive in the soil for many years.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN000143). Thanks to Ben Bowman, Rod Bambach and Tiffany Biggs for field assistance.

Fungicide management of Fusarium head blight in wheat

Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

Fusarium head blight (FHB), primarily caused by the fungus *Fusarium graminearum* (*Fg*), has been a sporadic problem to wheat production in isolated areas of northern NSW since 1999. FHB has particularly caused problems on the Liverpool Plains in durum wheat varieties which are all highly susceptible to the disease. Frequent rainfall/ high humidity during flowering and grain-fill are required for both infection and continuing disease development. A range of fungicides are registered for the control of FHB in Europe and north America but there is no information on efficacy under Australian conditions.

NOTE: THE TREATMENTS EXAMINED IN THIS STUDY ARE FOR EXPERIMENTATION ONLY. NO FUNGICIDES ARE CURRENTLY REGISTERED FOR THE CONTROL OF FHB IN AUSTRALIA.

Site details

Location: Tamworth Agricultural Institute

Sowing Date: 22nd June 2004

Harvest Date: 13th December 2004

Treatments

- Two durum varieties (EGA Bellaroi and Yallaroi) and two bread wheat varieties (Sunstate and Kennedy).
- Conducted in a screenhouse with overhead mist irrigation to favour disease development.
- One metre long plots with four rows split for variety. Three replicates of each treatment.
- Fungicide applications at 25–50% flowering in water volume of 150 L/ha.
- Fungicide treatments were:
    1. Tebuconazole (430 g/L) at 290 mL/ha
    2. Prothioconazole (480 g/L) at 420 mL/ha
    3. Propiconazole (250 g/L) at 500 mL/ha
    4. Epoxiconazole (125 g/L) at 500 mL/ha
    5. Azoxystrobin (200 g/L) at 800 mL/ha
    6. Tebuconazole (430 g/L) at 235 mL/ha + Prothioconazole (480 g/L) at 210 mL/ha.
- Each plot was inoculated with 25 mL of *Fusarium graminearum* (*Fg*) spore suspension (macroconidia mixture of five isolates at concentration of 50,000 spores/ mL) five hours after fungicide treatments applied.
- Two control treatments: Minus FHB = **not** sprayed with fungicide and **not inoculated** with *Fg*.

  Plus FHB = **not** sprayed with fungicide but **inoculated** with *Fg*.
- All plots were overhead misted for 2 minutes of every 30 minute period between 6pm and 6am for 28 days after treatments imposed to encourage infection and FHB development.

Disease severity

- The two durum varieties were more susceptible to FHB (Yallaroi 58% and EGA Bellaroi 57% of grain infected) than the two bread wheat varieties (Kennedy 33% and Sunstate 32% grain infected).
- Low levels of FHB infection (< 5%) still occurred in the uninoculated minus FHB treatment which demonstrated that there was limited disease spread between plots (Figure 1).
- Tebuconazole + prothioconazole (16% infection) or prothioconazole alone (20% infection) provided the greatest control of FHB infection (Figure 1).

- Tebuconazole alone provided intermediate control (< 50%).
- Epoxiconazole, Propiconazole and Azoxystrobin did not provide significant control of FHB infection. Azoxystrobin application actually increased grain infection levels above those in both the Epoxiconazole and Propiconazole treatments (Figure 1).

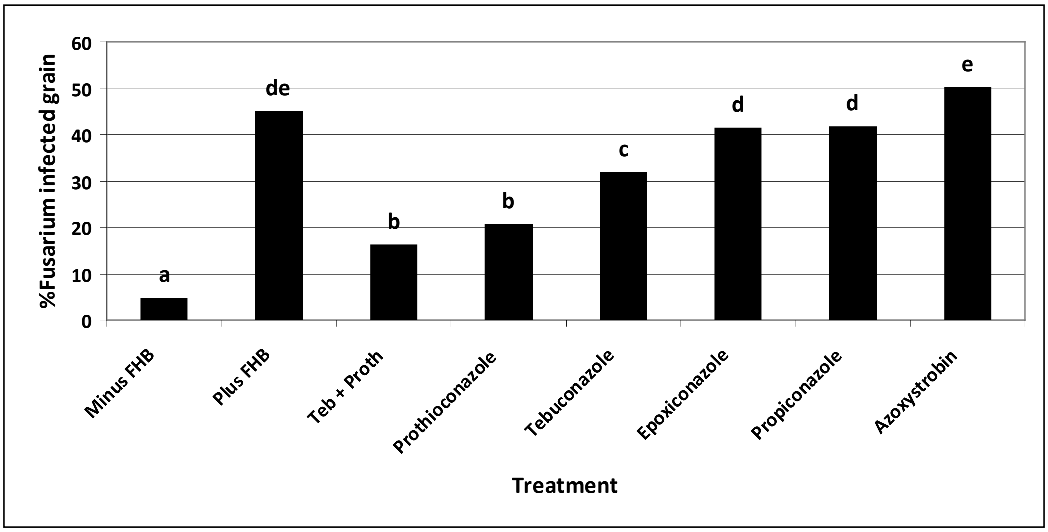


Figure 1. Effect of various fungicide strategies on levels of FHB. (Bars with same letter are not significantly different at 95% confidence level).

Grain yield

- FHB infection caused 34% yield loss (–2.1 t/ha) when averaged across the four winter cereal varieties (Figure 2).
- Tebuconazole + prothioconazole provided the lowest level of yield loss from FHB infection (5.4%) with yield not significantly different from the minus FHB control (Figure 2).
- Prothioconazole or Tebuconazole alone provided slightly lower yield protection (11.2% and 16.2% yield loss, respectively) but were not significantly different from each other.
- Epoxiconazole and Propiconazole provided a similarly poor level of yield protection (23.5% and 24.3% yield loss, respectively).
- Azoxystrobin did not have a significant effect on lowering yield loss from FHB infection with yield the same (33.9% yield loss) as the plus FHB control.

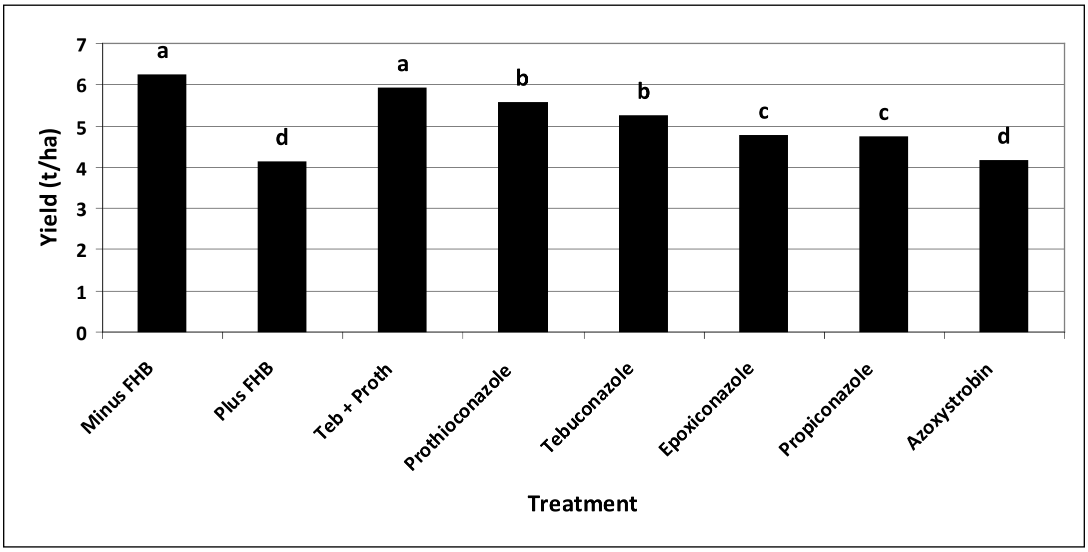


Figure 2. Effect of various fungicides on grain yield in the presence of FHB infection. (Bars are average of two durum and two bread wheat varieties. Bars with same letter are not significantly different at 95% confidence level).

- Yield loss resulting from FHB infection differed across the four winter cereal varieties being greatest in the two durum varieties (45.9% in Yallaroi and 40.7% in EGA Bellaroi) and lower in the more resistant bread wheat varieties (27.9% in Kennedy and 23.3% in Sunstate)(Figure 3).

- Tebuconazole alone or tebuconazole + prothioconazole significantly increased yield in the presence of FHB infection (i.e. compared Plus FHB treatment) in all four winter cereal varieties.
- In Yallaroi and Sunstate the yield benefit from application of tebuconazole + prothioconazole was significantly better than the application of tebuconazole alone. However, in EGA Bellaroi and Kennedy both fungicide options provided the same level of yield benefit.
- Combination of the two different active ingredients trended to slight lower yields than the uninfected control (Minus FHB treatment) but the differences were not significant in any of the four varieties.

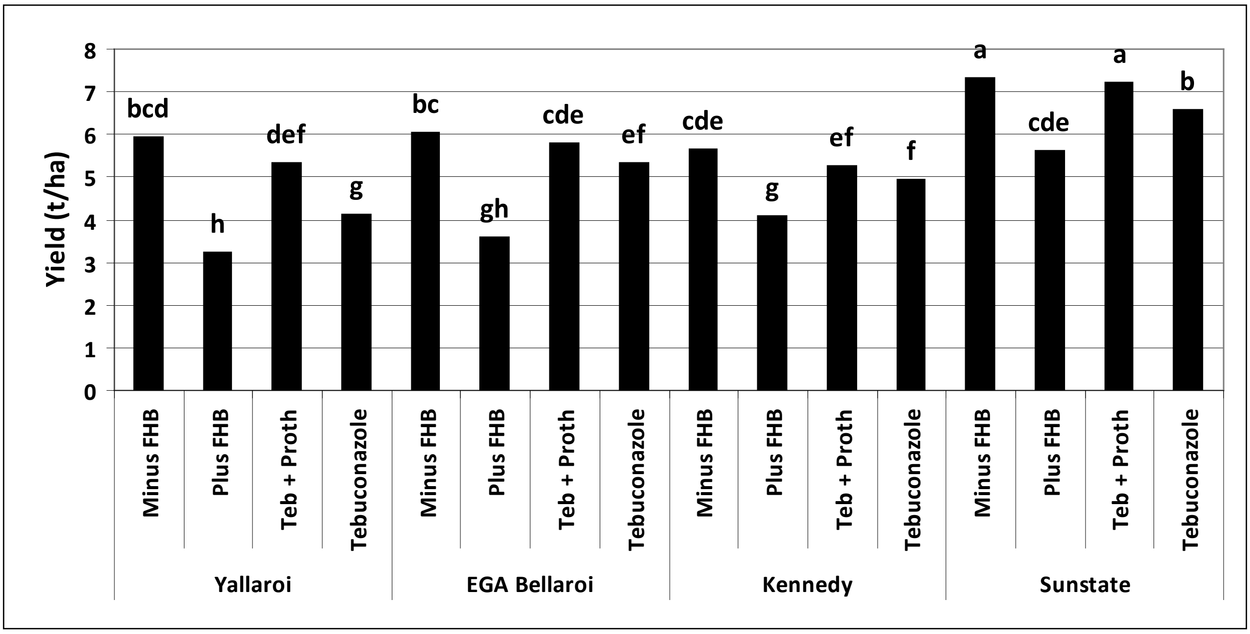


Figure 3. Effect of two fungicide strategies on grain yield of two durum and two bread wheat varieties in presence of FHB infection. (Bars with same letter are not significantly different at 95% confidence level).

Summary

This trial highlights the increased susceptibility of durum wheat varieties to FHB compared to bread wheats. The two durum varieties had both increased grain infection levels and yield loss from FHB compared to the two bread wheat varieties examined.

Fungicides containing the active ingredient tebuconazole or prothioconazole appear effective at reducing FHB infection levels and protecting yield. However, a combination of these two actives appears to have an additive effect in improving FHB control.

Again it must be stressed that this work is purely EXPERIMENTAL ONLY. NO FUNGICIDES are currently registered for the control of FHB in Australia. Commercially, if a high risk of FHB development is considered coming into flowering then an emergency permit for fungicide application should be sought, as in previous seasons, before legally applying chemicals.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN485). Thanks to Paul Nash for field assistance, Robyn Shapland and Karen Cassin for laboratory assistance and Alan Bowring for statistical analysis.

Fungicide management of spot-form of net blotch in barley

Alan Bowring[1], Patrick Mortell[1], Steven Simpfendorfer[1], Guy McMullen[1] and Greg Platz[2]

[1] NSW DPI, Tamworth

[2] DEEDI, Warwick

Introduction

Spot-form of net blotch (SFNB), caused by the fungus *Pyrenophora teres f. teres*, is an important leaf disease of barley in the northern grains region. Yield loss to this pathogen can be over 40%, although it is highly seasonal with wetter years driving inoculum build-up and infection events. The disease is characterised by brown spots (lesions) which appear on the leaf surface and reduce the green leaf (photosynthetic) area of infected plants. The main options for management are rotation (avoid sowing barley on barley stubble), varietal resistance and in-crop fungicide application(s). A study was undertaken in 2010 to examine potential management options for SFNB in the northern environment. The study utilised various fungicide strategies on the control of SFNB in combination with differing levels of varietal resistance.

Site details

Location:	Tamworth Agricultural Institute
Sowing Date:	11th June 2010
Fertiliser:	50 kg/ha Supreme Z
Harvest Date:	25th November 2010

Treatments

- Four barley varieties varying in resistance to SFNB. Mackay (S-VS), Commander (MS-S), Flagship (MR) and the breeding line NRB6059 (R-MR).
- Fungicide applications consisted of propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha for single applications (T1 only or T2 only) or 250 mL/ha for multiple applications (T1 + T2 and full control). All fungicides were applied at a water rate of 75 L/ha.
- Spray timings were T1 at Z24 and T2 at Z32. Full control had an additional two spray applications at GZ15 and Z39 (total of four applications). (**NOTE:** this is an experimental treatment ONLY, it is NOT legal to apply this frequency commercially).
- All plots, with exception of the full control plots, had barley leaf material infected with SFNB added between rows at Z15 to evenly initiate disease throughout the trial area. The full control plots had the same rate of clean barley leaves added at Z15.
- All treatment plots were buffered on either side to limit disease spread between plots.

Disease severity

- Severity of SFNB correlated well with known resistance ratings ranging from 35% leaf area infected in most susceptible variety (Mackay) down to 10.5% leaf area infected in the most resistant variety (NRB6059), when not treated with fungicides (solid black bars, Figure 1).
- Fungicide application at either timing reduced disease severity in all varieties but there was limited additional benefit from two applications.
- In all varieties the lowest SFNB levels occurred in the full control treatment (i.e. non-inoculated plus four sprays). However, moderate disease levels, especially in the most susceptible variety Mackay (23.5% leaf area infected), still occurred. This highlights the ease of spread of SFNB spores under highly conducive seasonal conditions in 2010 and the limited efficacy of propiconazole under this situation.
- Lowest SFNB levels occurred when fungicides were used in combination with varietal resistance.

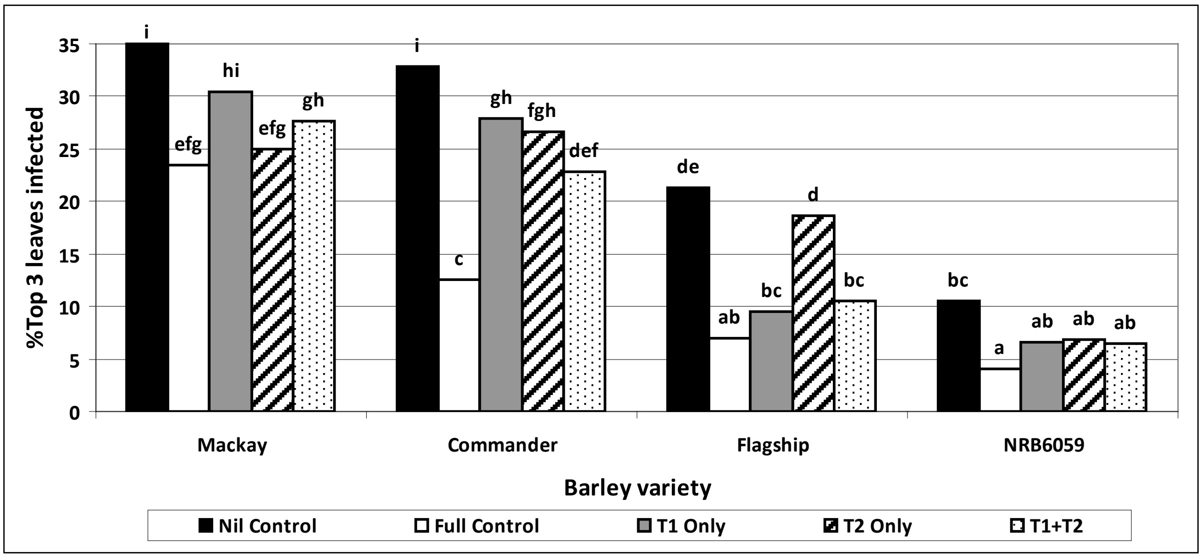


Figure 1. Effect of fungicide and variety on severity of SFNB at start of grain-fill

Grain yield

- There were no significant relationships between variety and fungicide strategy on final grain yield.
- The breeding line NRB6059 was the highest yielding variety followed by Commander (Figure 2).

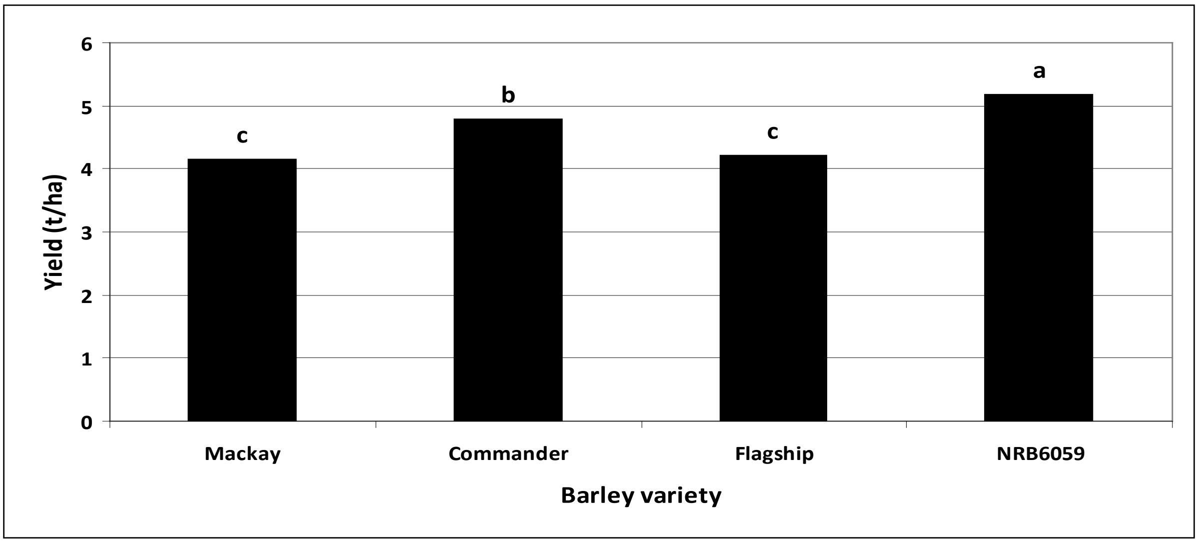


Figure 2. Grain yield of four barley varieties

- On average the application of propiconazole at either Z24 (T1 only) or Z32 (T2 only), or at both timings (T1+T2) provided a 6.8% yield advantage over the untreated control (Nil).
- The full control treatment was the highest yielding with a 15.7% yield increased over the untreated control (Figure 3).

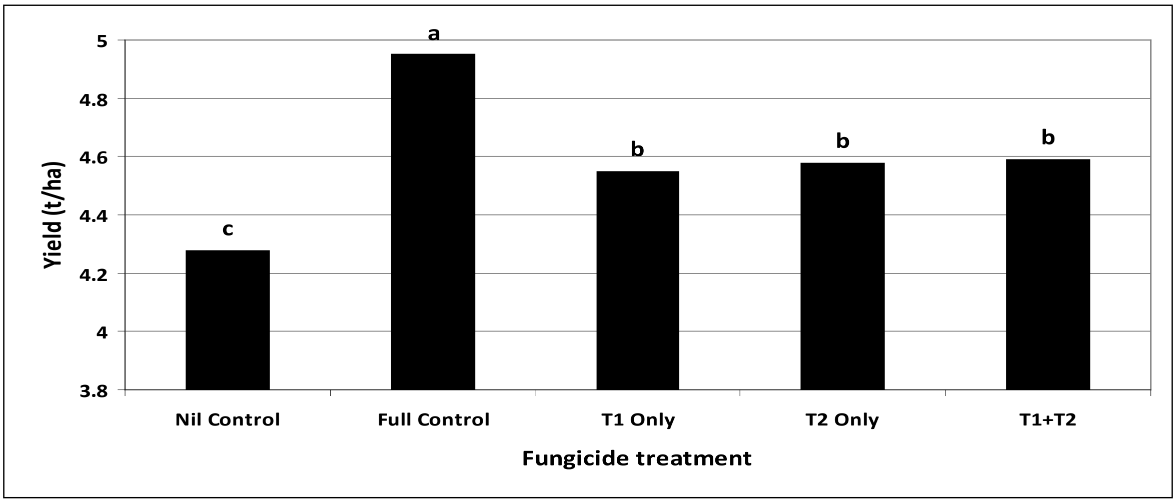


Figure 3. Effect of fungicide strategy on grain yield

Summary

Fungicide strategy, in terms of timing, had limited impact on efficacy with intervention at either Z24 or Z32 providing both a disease suppression and yield benefit. A half rate application of propiconazole (250 mL/ha) at both Z24 + Z32 did not provide a significant disease or yield benefit over a single application at the full rate (500 mL/ha) at either Z24 or Z32 alone.

Fungicide application was generally more effective when combined with increasing levels of genetic resistance. SFNB appears difficult to fully control with propiconazole, particularly in susceptible varieties such as Mackay and Commander, even with four half-rate applications for experimental purposes ONLY. Other fungicides not evaluated in this study may have increased efficacy.

Genetic resistance is clearly the best option for managing SFNB with the breeding line NRB6059 having the lowest disease severity and highest yield. Incorporating this level of SFNB resistance into commercial barley varieties may make fungicide applications for this disease even more marginal or unnecessary.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143) and Northern Grains Agronomy Project (DAN000131). Thanks to Paul Nash for field assistance.

Effect of potassium and fungicides on the management of spot-form of net blotch in barley

Alan Bowring[1], Patrick Mortell[1], Steven Simpfendorfer[1], Guy McMullen[1] and Greg Platz[2]

[1] NSW DPI, Tamworth

[2] DEEDI, Warwick

Introduction

Spot-form of net blotch (SFNB), caused by the fungus *Pyrenophora teres f. teres*, is an important leaf disease of barley in the northern grains region. Research in Western Australia has indicated that the application of potassium (K) can reduce the severity of SFNB on soils deficient in this element. This study aimed to examine the role of K nutrition on the management of SFNB alone and in combination with fungicide application(s).

Site details

Location:	Tamworth Agricultural Institute
Sowing Date:	11th June 2010
Fertiliser:	50 kg/ha Supreme Z
Harvest Date:	25th November 2010

Treatments

- One barley variety, Commander which is rated as MS-S to SFNB.
- All nutrients treatments were applied as solutions sprayed onto plots at GS15.

Nutrient treatments were:

1. Potassium chloride (KCl) at a rate of 96 kg/ha,
2. Potassium sulphate (K_2SO_4) at a rate of 120 kg/ha
3. Calcium chloride ($CaCl_2$) at rate of 96 kg/ha.

Rates utilised were aimed at providing 80 kg/ha of K or balancing Cl levels. Over 20 mm of rain fell in the 12 hours following application which ensured good plant uptake.

Fungicide treatments consisted of:

1. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha at Z24 only.
2. propiconazole + cyproconazole (Tilt Xtra®) at rate of 500 mL/ha at Z32 only
3. propiconazole + cyproconazole (Tilt Xtra®) at a rate of 250 mL/ha for multiple applications (Z24 + Z32).
4. propiconazole + cyproconazole (Tilt Xtra®) at a rate of 250 mL/ha for full control, applied at Z15, Z24, Z32 and Z39. (**NOTE:** this is an experimental treatment ONLY; it is NOT legal to apply this frequency commercially).

All fungicides were applied at a water rate of 75 L/ha.

- All plots had barley leaf material infected with SFNB added between rows at Z15 to evenly initiate disease throughout the trial area.
- All treatment plots were buffered on either side to limit disease spread between plots.

Green leaf retention

- Application of high rates of K (two forms), calcium (one form) or chloride (two forms) did not appear to reduce the severity of SFNB and hence the retention of green leaf area (Figure 1).
- The application of KCl in combination with a range of in-crop fungicide timings did not appear to improve disease control achieved by the fungicides alone.
- Single or multiple fungicide applications were more effective than nutrition alone in reducing the severity of SFNB.

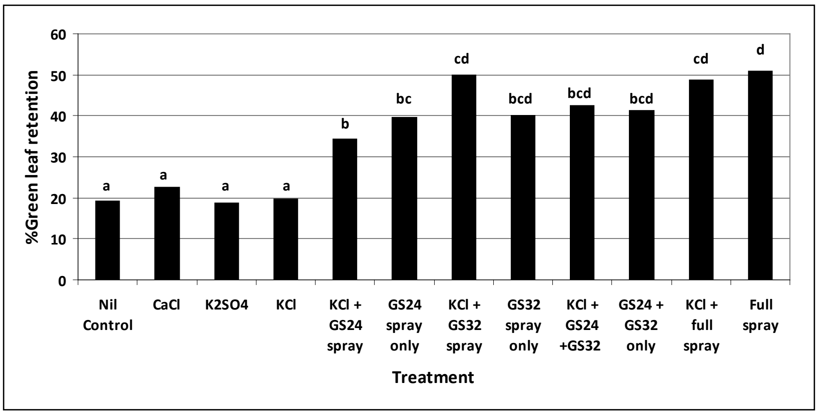


Figure 1. Effect of nutrition and fungicide on the retention of green leaf area at mid grain-fill

Grain yield

- Nutrition (K, Ca and Cl) alone did not significantly increase grain yield compared to the nil control.
- KCl nutrition in combination with in-crop fungicide applications at a range of timings and strategies did not significantly improve yield above that achieved by the application of the fungicide only (Figure 2).
- Average yield across all treatments containing a fungicide treatment (5.14 t/ha) was improved by 8.9% compared to the average of treatments not receiving an application of propiconazole + cyproconazole (Tilt Xtra®) (4.72 t/ha).

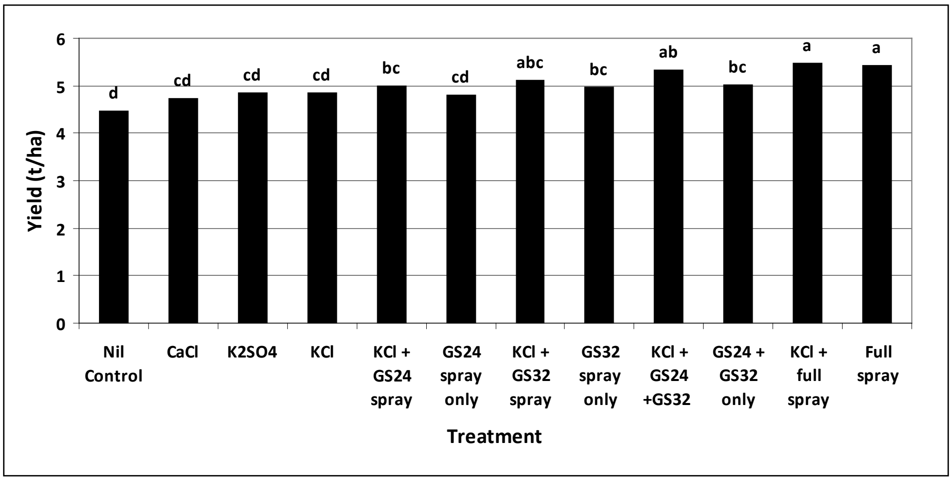


Figure 2. Effect of nutrition and fungicide application on yield

Summary

Potassium nutrition did not appear to reduce the severity of SFNB in this study, even though high rates were applied. K nutrition also did not improve the control or associated yield improvement from the application of in-crop fungicides. The starting paddock K levels in this trial were not determined so the lack of response from the application of K may be due to sufficient levels already being present in the soil. Future trials need to be conducted on soils known to be deficient in K to determine if nutrition can play a role in managing SFNB in the northern region. Supplementary K should not be applied to barley crops as a perceived SFNB control strategy when sown into paddocks known to have adequate soil K levels.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00143) and Northern Barley Agronomy Project (DAN00131). Thanks to Paul Nash for field assistance.

Carry-over of crown rot in various winter cereal stubbles

Steven Simpfendorfer

NSW DPI, Tamworth

Introduction

The fungus Fusarium pseudograminearum (Fp), which causes crown rot (CR) in all winter cereals, is a stubble-borne pathogen. Fp survives as hyphal ('cottony' growth) inside the stems of winter cereal plants. However, do the different winter cereal types and bread wheat varieties differentially carry-over this CR inoculum within the cropping system?

To address this question a fieldpea break crop (non-host of Fp) was sown across a range of winter cereal stubble plots in 2008 which were either inoculated or uninoculated with CR in 2007. The cv. Morgan fieldpea crop grown in 2008 produced incredible biomass (over 1.5 m high before falling over at harvest) which maximised the decomposition of the 2007 cereal stubbles underneath this canopy. To assess the carry-over of CR inoculum through the fieldpea break crop the durum variety Jandaroi was re-sown across the original plots in 2009.

Site details

Location: Tamworth Agricultural Institute

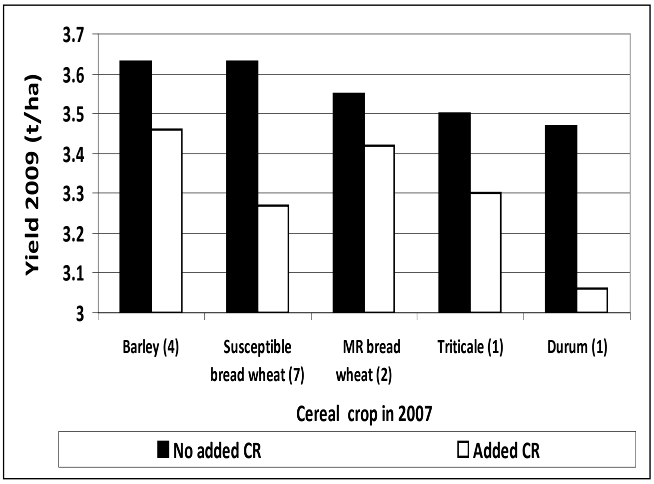
Sowing Date: 19th June 2009

Harvest Date: 19th November 2009

Treatments

- Four barley varieties, seven susceptible bread wheat varieties, two moderately resistant bread wheat varieties, one durum and one triticale variety sown plus or minus added CR inoculum in 2007.
- Fieldpea crop (cv. Morgan) sown across trial area in 2008.
- Durum (cv. Jandaroi) sown across plots from 2007 on 19 June 2009 with 50 kg/ha of N as urea and 50 kg/ha of Granulock Z.

Yield loss



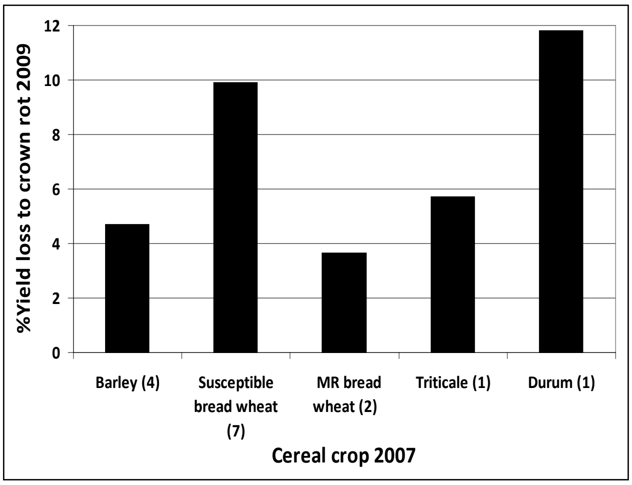


Figure 1. Effect of winter cereal on carry-over of crown rot (a) yield and (b) percentage yield loss from crown rot

- Inoculation of various winter cereal crops in 2007 with CR carried through the 2008 break crop (fieldpeas) to affect the yields of a durum crop (cv. Jandaroi) in 2009 (Figure 1a).
- Yield loss resulting from the carry-over of CR inoculum from 2007 to 2009 can be determined for each winter cereal type by comparing the difference between Jandaroi yields in 2009 in plots either inoculated (Added CR) or uninoculated (No added CR) with crown rot in 2007.
- Greatest yield loss to CR in 2009 (11.8%) occurred when sowing into durum stubble (cv. Bellaroi) remaining from 2007 (Figure 1b).

- Susceptible bread wheat varieties carried through more CR into 2009 (9.9% yield loss to CR) compared to moderately resistant (MR) varieties (3.7% yield loss to CR) with barley and triticale being intermediate.

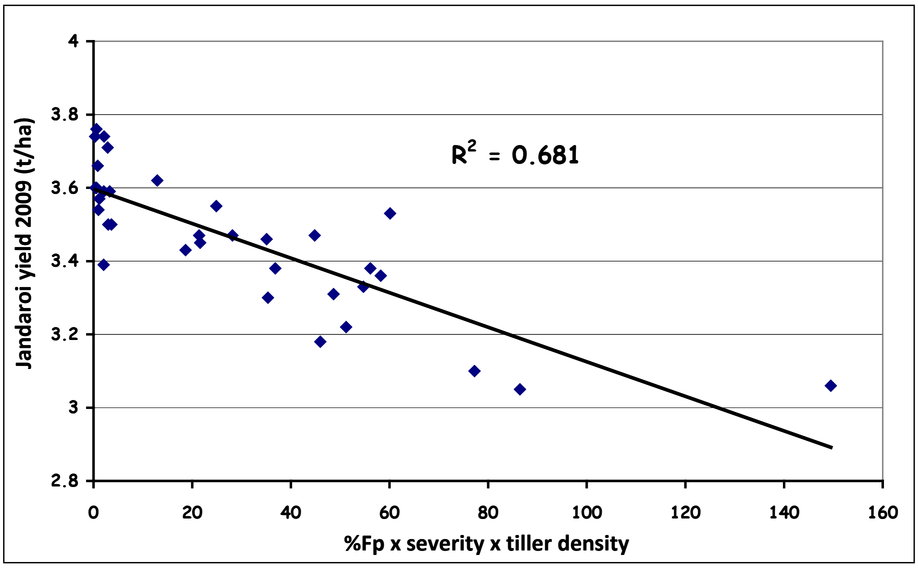


Figure 2. Relationship of yield to crown rot incidence/severity and tiller density

What dictates the extent of crown rot carry-over?

- The extent of carry-over of CR within the rotation is a function of the number of plants infected with the CR fungus at harvest in 2007 (%Fp), the extent to which the stubble is infected (CR severity in 2007) and the actual amount of stubble produced by the various winter cereals (tiller density in 2007). This explained 68% of the yield obtained in the cv. Jandaroi plots in 2009 (Figure 2).
- Other factors not assessed in this study which may impact on CR levels within the rotation associated with sowing various winter cereals may be: 1) the rate of decomposition and hence length of hosting of the CR fungus and 2) build-up of other soil-borne pathogens (e.g. root lesion nematodes, common root rot) which interact with the expression of CR.

Summary

The various winter cereal types and also varieties appear to differentially carry-over CR through the cropping system. This should be a consideration when planning rotation sequences.

Acknowledgements

This project was funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00109). Thanks to Paul Nash and Richard Morphett for field assistance and Tiffany Biggs, Robyn Shapland, Karen Cassin and Kay Warren for laboratory processing.

Fungicide management of stripe rust in wheat

Steven Simpfendorfer

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Introduction

Stripe rust, caused by the fungus *Puccinia striiformis*, has re-emerged as a significant issue to wheat production in eastern Australia since 2002. Yield and quality losses are related to reductions in green leaf area resulting from pustule formation on infected leaves. Variety resistance is ultimately the best option for managing stripe rust in the long term. However, in the short to medium term growers planting moderately susceptible varieties are reliant on the use of fungicides either at sowing (in-furrow on fertiliser or seed treatments) or in-crop (application of foliar fungicides), or a combination of both options.

This study evaluated a range of at sowing and in-crop fungicide strategies on the control of stripe rust in a moderately susceptible bread wheat variety, EGA Wylie.

Site details

Location: Tamworth Agricultural Institute

Sowing Date: 16th June 2009

Harvest Date: 30th November 2009

Treatments

- Bread wheat variety EGA Wylie which is moderately susceptible to stripe rust (all pathotypes).
- Conducted in a screenhouse with overhead mist irrigation to favour disease development.
- One metre long plots with 38 cm row spacing. Three replicates of each treatment.
- All plots inoculated with stripe rust spores (WA Yr17+ pathotype) at Z15.

Six at sowing fungicide options of:

1. Flutriafol on Granulock 12Z (400 mL/ha)
2. Triadimefon on Granulock 12Z (200 g/ha)
3. Experimental 1 on Granulock 12Z (IF#1)
4. Experimental 2 on Granulock 12Z (IF#2)
5. Fluquinconazole on seed (300 mL/100 kg seed)

Four in-crop foliar fungicide options of:

1. Tebuconazole (145 mL/ha plus 1% Agridex) at Z32
2. Tebuconazole (145 mL/ha plus 1% Agridex) at Z32 + Z39
3. Tebuconazole + prothioconazole (150 mL/ha plus 1% Hasten) at Z32 + Z39
4. Propiconazole + Cyproconazole (250 mL/ha) at Z32 + Z39

Four at sowing + in-crop treatment combinations of:

1. Flutriafol on Granulock 12Z (400 mL/ha) + Tebuconazole (145 mL/ha plus 1% Agridex) at Z39
2. Triadimefon on Granulock 12Z (200g/ha) + Tebuconazole (145 mL/ha plus 1% Agridex) at Z39
3. Experimental 2 on Granulock 12Z (IF#2) + Tebuconazole (145 mL/ha plus 1% Agridex) at Z39
4. Fluquinconazole on seed (300 mL/100 kg seed) + Tebuconazole (145 mL/ha plus 1% Agridex) at Z39
5. Nil control treatment with no fungicide treatment either at sowing or in-crop.

All plots were overhead misted (2 min of every 30 min period between 6pm and 6am) every second day from Z14 until Z49 to encourage infection and stripe rust development.

Grain yield

- The severity of stripe rust infection in EGA Wylie in the absence of any fungicide application resulted in 29.5% yield loss (–1.92 t/ha) compared to the highest yielding treatment (6.50 t/ha, flutriafol in-furrow + tebuconazole at Z39)(Figure 1).
- All at sowing treatments alone (i.e. with no following in-crop fungicide application) provided a significant yield benefit over the untreated nil control. The yield benefit ranged from +32.3% with flutriafol in-furrow down to +13.8% with the IF#1 treatment (Figure 1).
- All in-crop fungicide treatments alone provided a significant yield benefit over the untreated nil control.
- A single application of 145 mL/ha of tebuconazole at Z32 provided a yield benefit of 21.8% with a significant further yield increase of 10.7% resulting from a second application at Z39 (total yield increase over untreated control of 32.5%). That is, 2/3rd of the total yield benefit of a Z32 + Z39 spray was achieved with the Z32 spray.
- There was no significant difference in the yield benefit provided by the three different in-crop fungicide products examined when applied at Z32 + Z39.
- With the exception of the triadimefon in-furrow treatment, a follow-up application of 145 mL/ha of tebuconazole at GS39 provided a significant yield benefit over at sowing options alone.
- The yield benefit associated with stripe rust control in the four at sowing + Z39 tebuconazole treatments was generally comparable to the three Z32 + Z39 in-crop spray options examined.

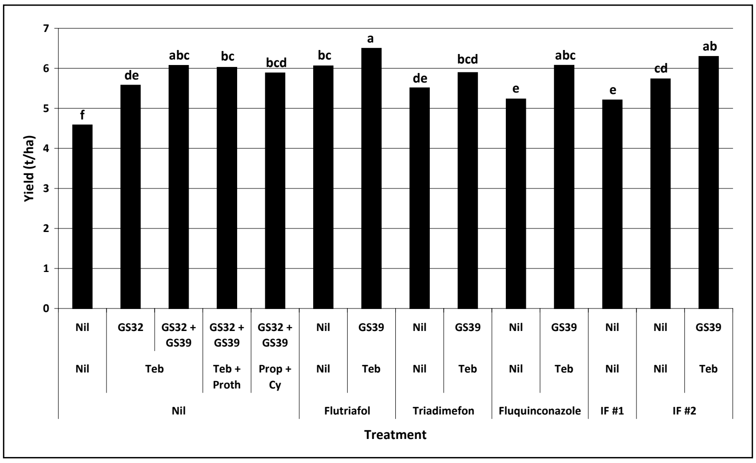

Figure 1. Effect of stripe rust fungicide strategies on yield of a MS wheat variety (EGA Wylie) (Treatment axis: bottom row = at sowing fungicide options, 2nd row = in-crop fungicide, 3rd row = in-crop fungicide timing. Teb = tebuconazole, Proth = prothioconazole and Cy = cyproconazole).

Summary

It must be emphasised that this experiment was inoculated with stripe rust at the seedling stage (5-leaf, Z15) and misted to encourage infection and disease spread throughout the canopy. This represents extreme and sustained stripe rust pressure which resulted in nearly 30% yield loss in the moderately susceptible variety EGA Wylie.

Good levels of disease control and associated yield benefits were still measured under this extreme level of disease pressure which highlights the effectiveness of a range of fungicide strategies in managing stripe rust.

Generally flutriafol in-furrow and the IF#2 treatment provided a bit longer protection than triadimefon in-furrow, IF#1 or the fluquinconazole seed treatment which tended to be waning by flag leaf emergence (Z39). The yield benefit from at sowing options was generally increased further when followed by an in-crop fungicide spray at Z39. However, the yield benefit obtained with at sowing + Z39 spray options was generally comparable to a two in-crop spray strategy (Z32 + Z39) with either of the three fungicide options examined in this study.

Hence, when sowing moderately susceptible varieties, the choice and balance between at sowing versus in-crop fungicide options, is more about expected timing of stripe rust appearance within districts, logistics of spraying large acreages, capacity to treat seed or fertiliser and as always cost.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Project (DAN00109). Thanks to Paul Nash for field assistance, Karen Cassin and Kay Warren for laboratory assistance and Alan Bowring for statistical analysis.

Cereal Pathogen Survey of Central and Northern NSW

Steven Simpfendorfer[1], Elizabeth Farrell[1] and Alan McKay[2]

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Background

PreDicta B is a DNA based soil test developed by the South Australian Research and Development Institute (SARDI) to detect and quantify a range of important cereal pathogens. Each cereal pathogen has a unique DNA code so the PreDicta B test is very selective and sensitive for the individual pathogens detected. Risk categories have been developed for DNA levels of a range of cereal pathogens in South Australian and Victorian cropping systems but these categories have not been validated or calibrated for central and northern NSW.

Pathogens detected by PreDicta B:

1. *Pratylenchus thornei* and *Pratylenchus neglectus* are two important species of root-lesion nematodes (RLN). Nematodes are microscopic worms that feed and reproduce inside plant roots which can lead to yield loss in intolerant cereal and pulse crops. There is limited information on the distribution and importance of RLN in central and northern NSW farming systems.
2. *Fusarium pseudograminearum* (*Fp*) is the stubble-borne fungus which causes crown rot in winter cereals.
3. *Fusarium culmorum/F. graminearum.* This DNA test detects both *Fusarium culmorum* which can cause crown rot but is generally considered to be uncommon in northern NSW from previous studies and *F. graminearum* which is the main pathogen causing Fusarium head blight in winter cereals. However, this test cannot differentiate between these two fungal species.
4. *Bipolaris sorokiniana* is a soil and stubble-borne fungal pathogen which causes common root rot in winter cereals. *Bipolaris* has a dark thick wall spore which can survive up to two years in soil. Common root rot infects the sub-crown internode (joins seed to crown) and generally causes ill-thrift in infected plants.
5. *Pythium* spp. This test detects a wide range of *Pythium* species which can cause damping-off (death) of winter cereal seedlings. *Pythium* spp. can also infect older plants and generally reduces the production of lateral roots which can lead to minor yield reductions which are often difficult to attribute to a cause.
6. *Rhizoctonia* (AG8) is the causal fungus of what is commonly referred to as 'bare-patch'. Infected plants are generally stunted with a spiky appearance. Infected roots have characteristic 'spear-tips'. Infection occurs in patches which are roughly circular within a paddock. Plants at the margin of the 'bare-patch' rapidly go from infected to perfectly healthy plants as this is the margin of where the *Rhizoctonia* hyphae (fungal growth) has extended in the soil.

Survey details

In collaboration with NSW DPI District Agronomists, 132 focus paddocks were assessed around sowing in 2010 in twelve agronomy districts (10–12 paddocks/district) ranging from Dubbo in the south up to the Qld border in the north and west to Warren, Walgett and Mungindi. A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis.

Nematode distribution and importance

- *Pratylenchus thornei* (*Pt*) was widespread, being detected in 11 of the 12 agronomy districts (except Nyngan), and distributed in 40 to 100% of random paddocks within a district.
- The Qld based threshold for yield loss in intolerant wheat varieties is 2,000 *Pt*/kg soil.
- A lower percentage of random paddocks in 9 of the 12 agronomy districts, especially Moree East (60% of paddocks) and Moree West (50% of paddocks) had high *Pt* populations indicating a risk of yield loss in 2010 if intolerant varieties were sown.
- *Pratylenchus neglectus* (*Pn*) was widespread being detected in 10 of the 12 agronomy districts but generally had a lower distribution within districts than *Pt* of between 10 to 75% of random paddocks.

- The Qld based threshold for yield loss in intolerant wheat varieties is 2,000 *Pn*/kg soil.
- Only one paddock in the Warren district and two paddocks in the Wellington district had high *Pn* populations indicating a risk of yield loss in 2010 if intolerant varieties were sown.

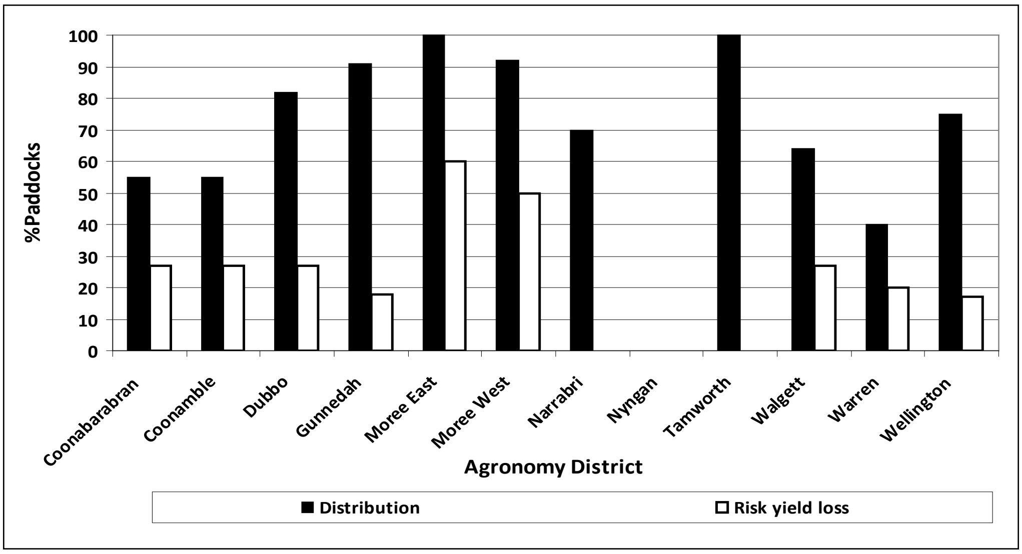

Figure 1. Distribution and potential importance of Pratylenchus thornei in central and northern NSW

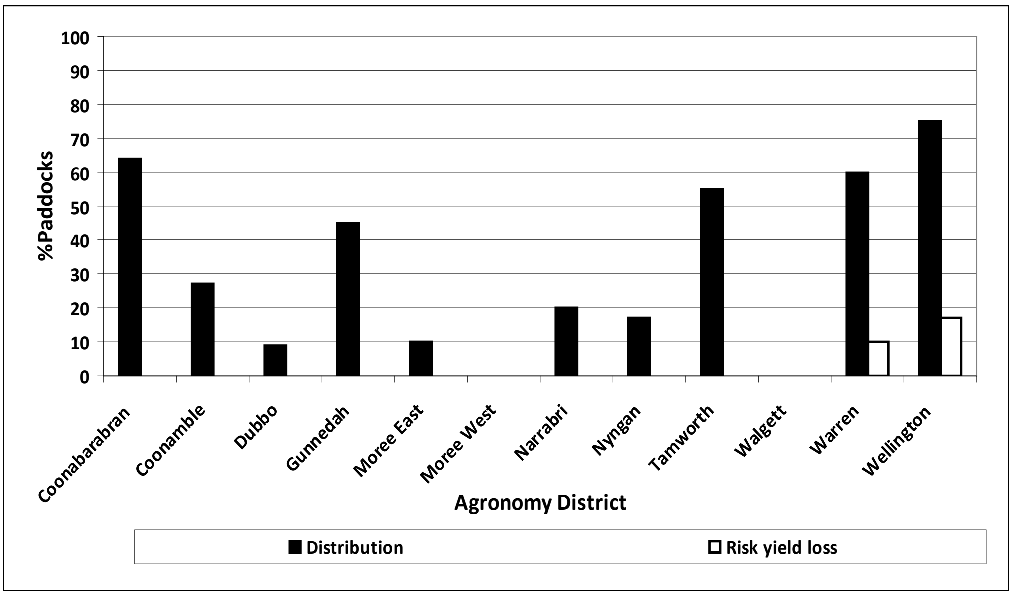

Figure 2. Distribution and potential importance of Pratylenchus neglectus in central and northern NSW

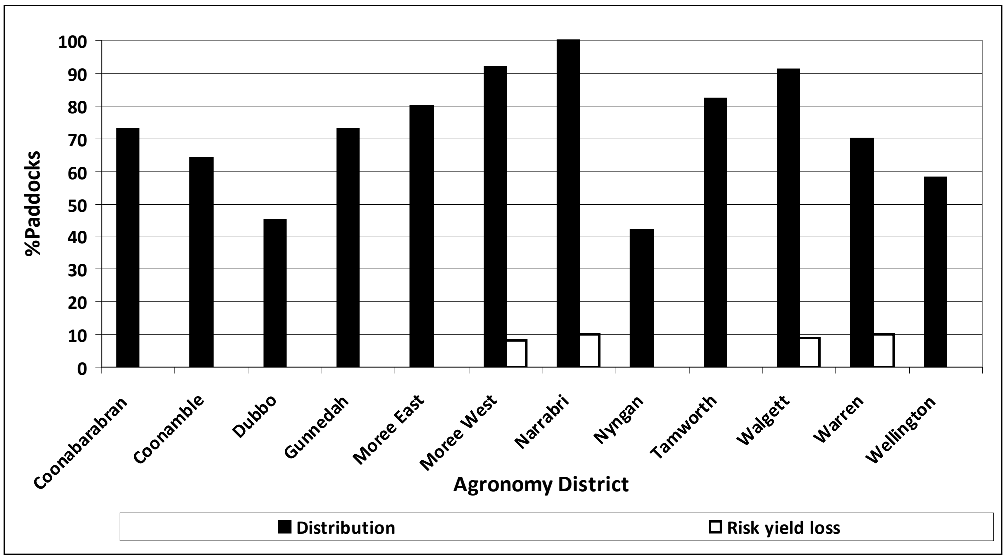

Figure 3. Distribution and potential importance of common root rot in central and northern NSW

Common root rot distribution and importance

- *Bipolaris sorokiniana* (*Bs*), the cause of common root rot (CRR), was very widespread being detected in all 12 agronomy districts and distributed in between 40–100% of random paddocks within each district.
- However, *Bs* populations were generally low with populations in only one paddock in four separate districts being high enough to represent a medium or high risk of yield loss from CRR in 2010.

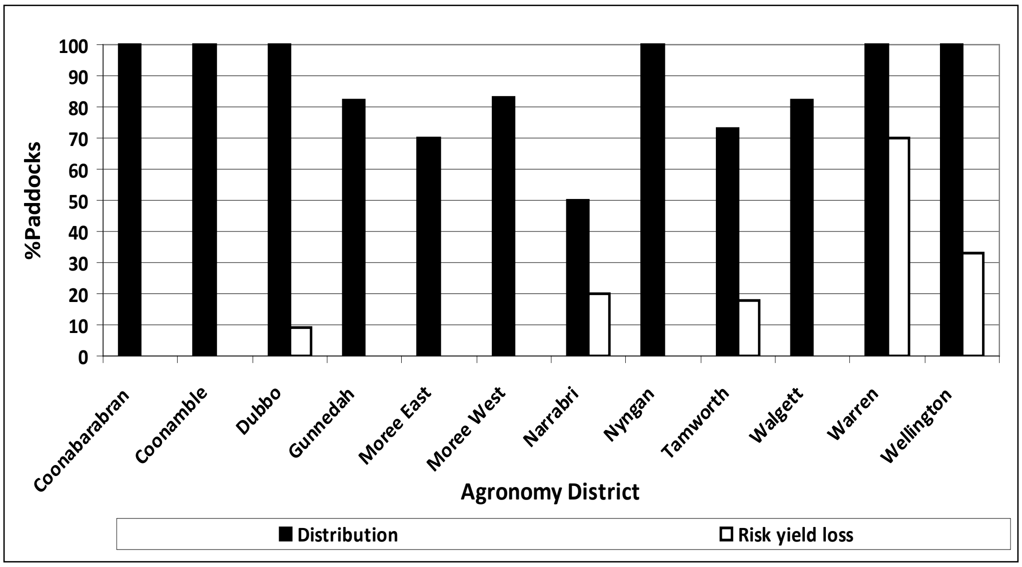

Figure 4. Distribution and potential importance of Pythium in central and northern NSW

Pythium distribution and importance

- *Pythium* was extremely widespread being detected in all 12 agronomy districts and distributed in between 50–100% of random paddocks within each district.
- *Pythium* populations were generally low with populations in only one to four paddocks in the Dubbo, Narrabri, Tamworth and Wellington districts being high enough to represent a medium or high risk of yield loss from *Pythium* infection in 2010.
- The Warren district was an exception with 70% of paddocks having a medium or high risk of yield loss from *Pythium* in 2010 based on southern thresholds.

Summary

Root lesion nematodes (RLN) are widespread in central and northern NSW with Pt generally having a much higher distribution (69% random paddocks) than Pn (32% random paddocks). Soil populations of Pt were also generally higher with 23% of paddocks having Pt levels representing a risk of yield loss in 2010 compared to only 2% of random paddocks with Pn. RLN need to become a consideration in rotation sequences within central and northern NSW to maintain, and reduce where needed, populations of both nematode species below damaging levels.

Bs is also widespread in central and northern NSW being detected in around 73% of the 132 random paddocks surveyed in 2010. Fortunately, Bs populations around sowing were generally low and only represented a risk for yield loss from common root rot in 3% of paddocks.

Pythium was similarly widespread in the region being detected in around 87% of the 132 random paddocks surveyed in 2010. Fortunately, *Pythium* populations around sowing were generally low and only represented a risk for yield loss in 13% of paddocks based on southern thresholds. The PreDicta B tests also clearly indicated that *Pythium* may be a bigger issue in some agronomy districts (e.g. Warren) than others.

Bs and *Pythium* are both soil-borne fungal pathogens which particularly thrive under wet soil conditions. Hence, it can be reasonably expected that their populations may have increased dramatically given widespread rainfall throughout the 2010 season across pretty much all agronomy districts.

Acknowledgements

Assistance of NSW DPI District Agronomists in co-ordinating survey paddocks and sampling is gratefully acknowledged. The assistance of Robyn Shapland, Russell Carty and Ben Webber (NSW DPI) in sampling is also appreciated. Finally we thank all the growers who allowed us access to their paddocks for this survey.

Coonabarabran District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], James Fleming[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

2 NSW DPI, Coonabarabran

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Coonabarabran district is shown below (Figure 1).

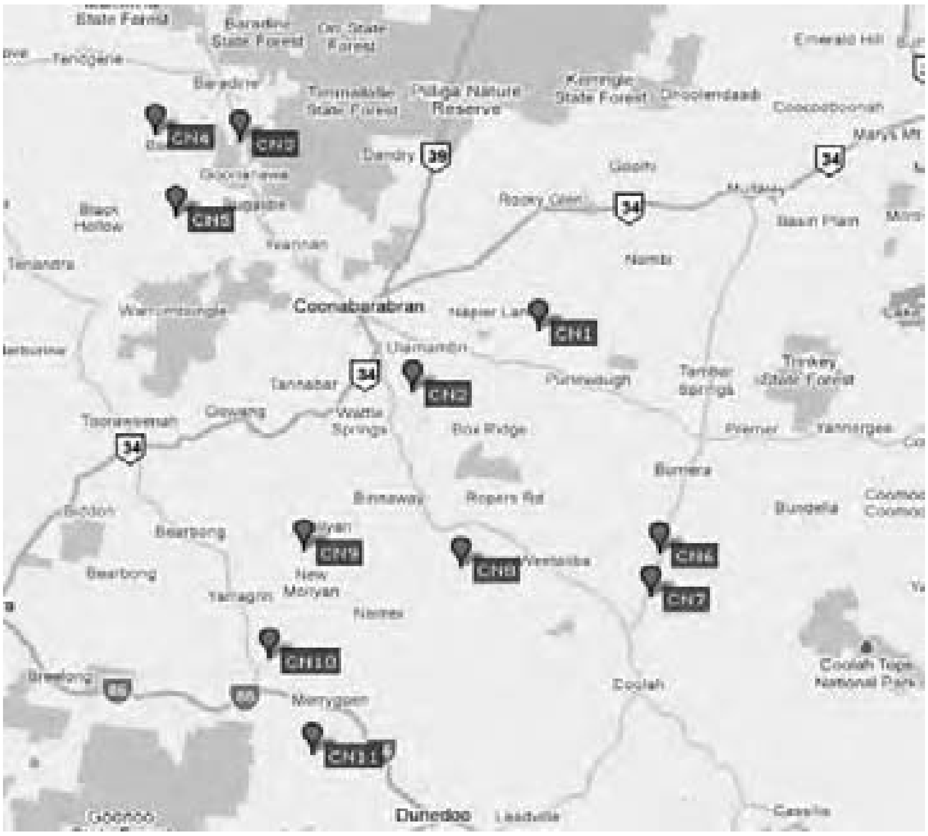

Figure 1. Coonabarabran district paddocks – 2010

Results – Sowing

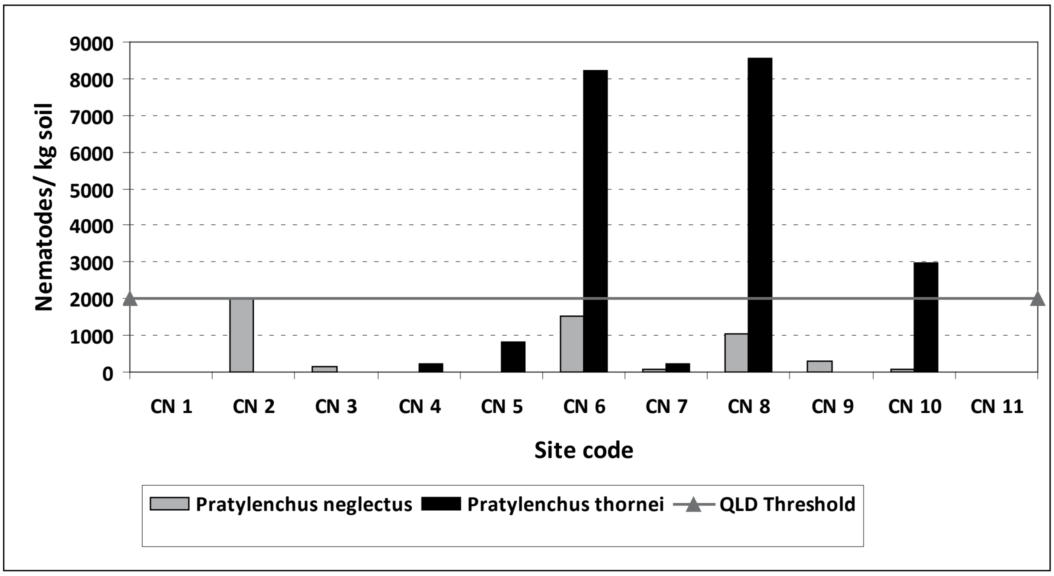

Figure 2. Populations of root lesion nematodes in Coonabarabran district – sowing 2010

- *Pratylenchus neglectus* was present in 7 out of 11 paddocks. All populations are below the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. Site CN 2 with 1,993 *P. neglectus*/kg soil, has numbers very close to the threshold. *P. neglectus* populations at CN 6 (1,507/kg) and CN 8 (1,029/kg) also appear to be developing to concerning levels.
- *Pratylenchus thornei* was present in 6 out of 11 paddocks. Sites CN 6 (8,212/kg) and CN 8 (8,569/kg) have populations four times greater than the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. Site CN 10 (2,988/kg) is the only other site above the threshold for yield loss.

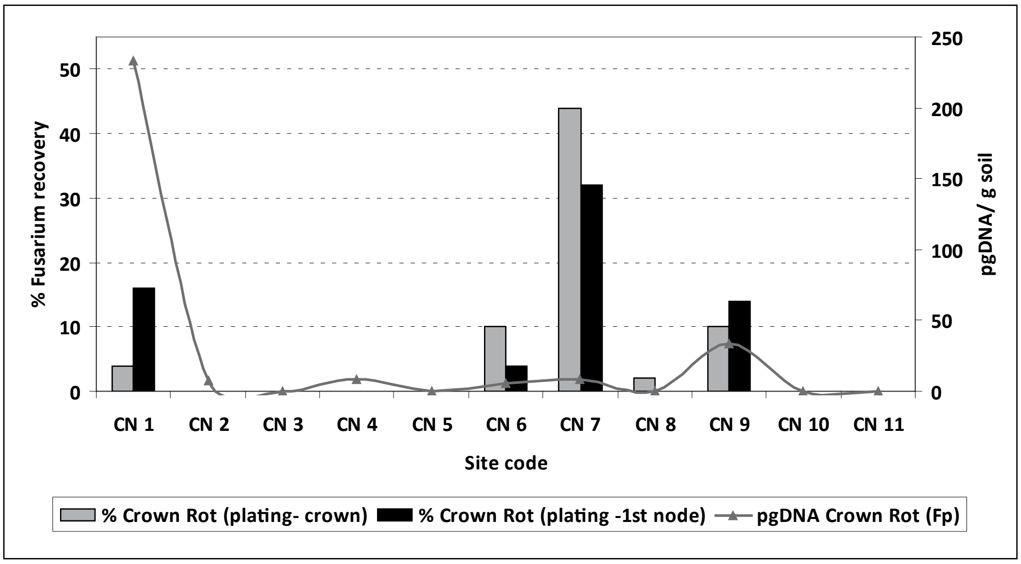

Figure 3. Crown rot incidence Coonabarabran district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories (red line) site CN 1 has a medium risk of crown rot (233 pg *Fp* DNA/g soil). Sites CN 2, CN 4, CN 6, CN 7 and CN 9 all have a low risk of crown rot from *Fp* infection with the remaining sites being below the detectable limit.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Site CN 7 has a high risk of yield loss from crown rot infection based on recovery from both the crown and the 1st node. Sites CN 1 and CN 9 have a medium risk of losses to crown rot infection based only on recovery from the 1st node. All remaining sites where stubble was collected have a low risk based on Fusarium recovery from both the crown and 1st node. Stubble was not collected from sites CN 4, CN 5 and CN 11.

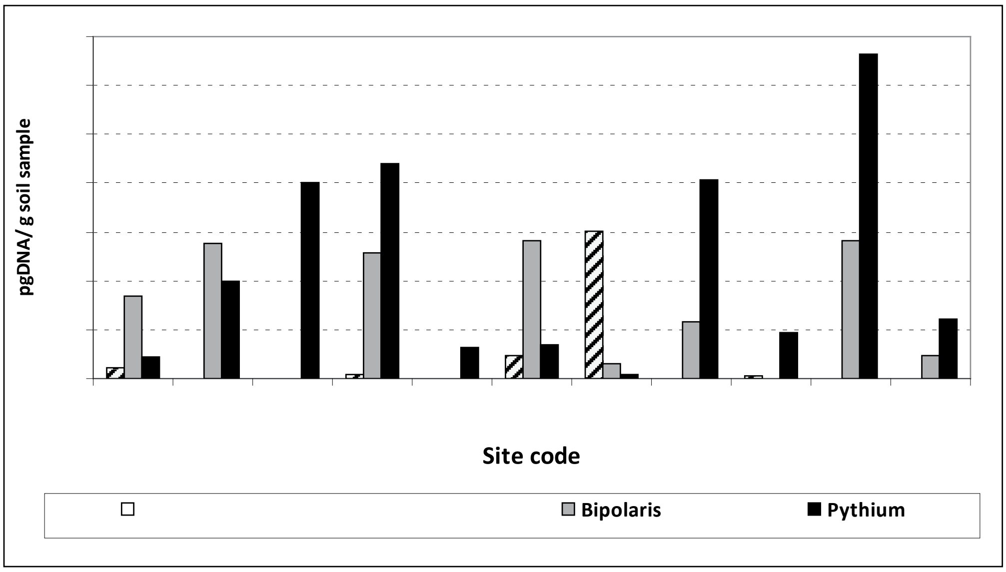

Figure 4. Incidence of other fungal pathogens in the Coonabarabran district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Sites CN 1, CN 6 and CN 7 have a low risk of losses from crown rot infection by *F. culmorum/F. graminearum* in 2010. The remaining sites are all below detection.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. Bipolaris is widespread in the Coonabarabran district being detected in 8 of the 11 paddocks but all sites are a low risk for losses to common root rot (Bipolaris) in 2010.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in all 11 paddocks in the Coonabarabran district but appears to be at levels representing only a low risk of yield loss to this pathogen in 2010. *Pythium* levels were highest at site CN 10 (133 pg/g soil) which is approaching a medium risk level.
- Rhizoctonia was not detected in soil collected from any of the 11 sites.

Conclusions

This was a random sample of 11 paddocks in the Coonabarabran district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Coonabarabran district.

Nematodes were widespread in the Coonabarabran district with *P. neglectus* detected in 64% of paddocks and *P. thornei* in 55% of paddocks. Four paddocks (36%) had mixed populations of both RLN species. Sites CN 6, CN 8 and CN 10 had populations of *P. thornei* above the QLD threshold for yield loss in intolerant wheat varieties. Sowing of winter cereal varieties with tolerance to RLN would assist in limiting yield loss at sites with high levels of RLN. For example, EGA Gregory has been sown at site CN 10 which is moderately tolerant to *P. thornei* and should limit yield loss compared to what might be expected if an intolerant wheat variety had been sown. Conversely, Cunningham was sown at site CN 6 which is moderately intolerant to *P. thornei* and therefore represents a higher risk of yield loss to RLN in 2010. It appears that RLN needs to become a consideration in rotation sequences within the Coonabarabran district to maintain, and reduce where needed, populations below damaging levels.

Fusarium was less widespread in the Coonabarabran district being detected at varying risk levels in collected cereal stubbles. Based on plating, one paddock has a high risk (CN 7) and two paddocks a medium risk (CN 1 and CN 9) of developing damaging levels of crown rot in 2010. The PreDicta B Fp test identified only one site (CN 1) as having a medium risk of crown rot from Fusarium pseudograminearum (Fp). This correlated with the stubble plating for CN 1. However, the DNA based test did not detect Fp for the other two sites which had either high (CN 7) or medium (CN 9) risk detected in the stubble plating.

PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. This may be a particular issue with crown rot where very wet fallow periods can limit the survival of Fp in crowns below ground due to decomposition yet significant levels may still be present in standing stubble which takes much longer to decompose (e.g. CN 1). Although the PreDicta B test did not detect Fp at significant levels at site CN 7, it did detect the highest level of F. culmorum/F. graminearum at this site. The plating is based on the appearance of fungal growth from the crown or 1st node which is definitive for Fusarium but due to the similar appearance of the different Fusaria in culture is not always definitive for species. Fp is generally considered the major species causing crown rot in the northern region but this limited survey indicates that other Fusarium species may also be important causes of crown rot in the Coonabarabran district.

Bipolaris, which causes common root rot, was widespread in the Coonabarabran district being detected in 73% of paddocks. However, in all paddocks Bipolaris populations were only at a low risk level for yield loss in 2010. *Pythium* was even more widespread being detected by PreDicta B in 100% of paddocks in the Coonabarabran district. In all paddocks *Pythium* was detected at levels which represent only a low risk of yield loss but with four paddocks the populations are at least half way towards reaching a medium risk level. *Pythium* spp. infect plant roots through a spore that swims in water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection when soil populations are at a medium or high risk level.

Coonamble District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Rohan Brill[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Coonamble

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Coonamble district is shown below (Figure 1).

Figure 1. Coonamble district paddocks – 2010

Results – Sowing

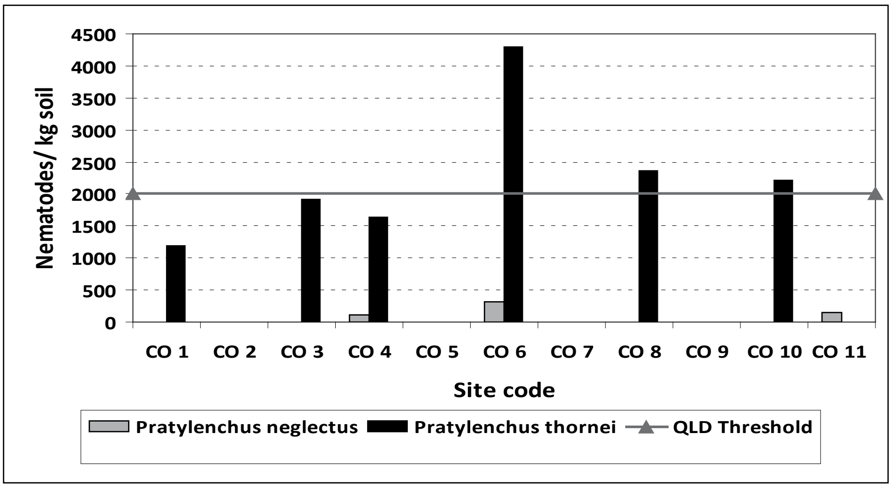

Figure 2. Populations of root lesion nematodes in Coonamble district – sowing 2010

- *Pratylenchus neglectus* was present in 3 out of 11 (27%) paddocks but populations were all below the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties.
- *Pratylenchus thornei* was present in 6 out of 11 (55%) paddocks. Three sites (CO 6, CO 8 and CO 10) had populations above the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. Sites CO 3 (1,922 *Pt*/kg soil) and CO 4 (1,633 *Pt*/kg soil) had populations approaching the threshold for yield loss.

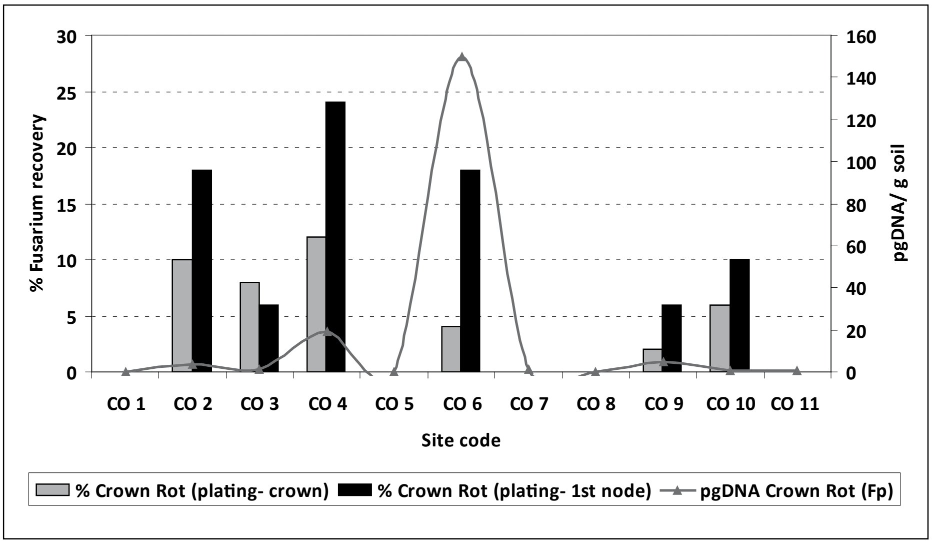

Figure 3. Crown rot incidence Coonamble district – sowing 2010

- *Fusarium pseudograminearum* (*Fp*) PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories (red line) sites CO 2, CO 4 and CO 9 have a low risk of crown rot from *Fp*. Site CO 6 has a medium risk of yield loss to crown rot with 150 pg *Fp* DNA/g soil. All other sites were below the detectable limit.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Site CO 4 has a medium risk of crown rot infection based on recovery from both the crown and the 1st node. Sites CO 2 and CO 6 had a medium risk of yield loss to crown rot based only on recovery from the 1st node with lower recovery from the crowns. All other sites where stubble was collected have a low risk of crown rot infection based on recovery of *Fusarium* from both the crown and 1st node. Stubble was not collected at sites CO 5, CO 8 and CO 11.

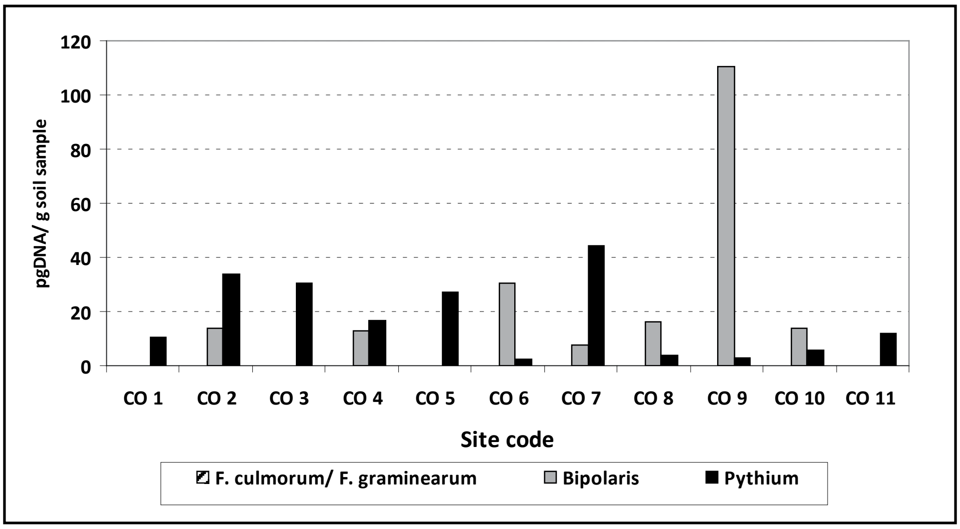

Figure 4. Incidence of other fungal pathogens in the Coonamble district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. All 11 sites were below detection limits.

- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris,* which causes CRR, was detected in 7 of the 11 paddocks (64%) but populations were all at a low risk for yield loss to CRR in 2010. Site CO 9 had the highest levels of *Bipolaris* (CRR fungus) with 111 pg *Bipolaris*/kg soil.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected at all 11 sites in the Coonamble district but was at populations that represent only a low risk of yield loss to *Pythium* in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 11 sites in the Coonamble district.

Conclusions

This was a random sample of 11 paddocks in the Coonamble district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Coonamble district.

Nematodes were present to varying degrees in the Coonamble district with *P. neglectus* detected in 27% (3 of 11) of paddocks and *P. thornei* in 55% (6 of 11) of paddocks. Two paddocks (CO 4 and CO 6, 18% paddocks) had mixed populations of both RLN species. Of the two nematode species, *P. neglectus* appears to be less of an issue in the Coonamble district in regards to both distribution and populations sizes within paddocks. Populations of *P. neglectus* were well below the expected threshold for yield loss in intolerant wheat varieties in all paddocks where it was detected. Conversely, *P. thornei* was detected in twice as many paddocks and had populations above the Queensland based threshold for yield loss in intolerant wheat varieties at half of these sites (CO 6, CO 8 and CO 10). At site CO 6 the *P. thornei* population of 4,297 *Pt*/kg soil was over double the threshold for yield loss. The remaining three sites at which *P. thornei* were detected all had quite high *Pt* populations which were just below the threshold at site CO 3 (1,922 *Pt*/kg soil) and over half way to the threshold at sites CO 4 (1,633 *Pt*/kg soil) and CO 1 (1,191 *Pt*/kg soil). Information has not currently been collected on the actual winter cereal variety sown in each of these paddocks but planting a wheat variety with some level of tolerance to *P. thornei* would help minimise yield losses from RLN infection in 2010. RLN clearly needs to become a consideration in rotation sequences within the Coonamble district to maintain, and reduce where needed, populations below damaging levels.

Fusarium pseudograminearum (*Fp*), the fungus that causes crown rot, was also widespread in the Coonamble district being recovered at varying levels from cereal stubble collected from 6 of 8 sites (75% paddocks). Based on plating, three sites (CO 2, CO 4 and CO 6) were identified as having a medium risk of developing damaging levels of crown rot in 2010. The risk was identified only in the 1st node (above ground stubble) at sites CO 2 and CO 6. The PreDicta B *Fp* test only identified one of these three sites (CO 6) as having a medium risk of yield loss from crown rot. However, sites CO 2 and CO 4 were identified as being at a low risk level of crown rot, so there was some correlation between the DNA based test and the stubble plating. PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground (i.e. 1st node). This may be a particular issue with crown rot where very wet fallow periods can limit the survival of *Fp* in crowns below ground due to decomposition yet significant levels may still be present in standing stubble which takes much longer to decompose (e.g. CO 2, CO 4 and CO 6 and to a lesser extent CO 9 and CO 10).

F. culmorum/*F. graminearum* was not detected by PreDicta B at any of the 11 sites suggesting *Fp* remains the major species causing crown rot in the Coonamble district.

Bipolaris, which causes common root rot, was widespread in the Coonamble district being detected in 64% of paddocks. However, in all paddocks *Bipolaris* populations were only at a low risk level for yield loss in 2010. *Pythium* was even more widespread being detected by PreDicta B in 100% of paddocks in the Coonamble district. In all paddocks *Pythium* was detected at levels which represent only a low risk of yield loss. *Pythium* spp. infect plant roots through a spore that swims in water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection when soil populations are at a medium or high risk level.

Dubbo District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Kathi Hertel[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

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[2] NSW DPI, Dubbo

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Dubbo district is shown below (Figure 1).

Figure 1. Dubbo district paddocks – 2010

Results – Sowing

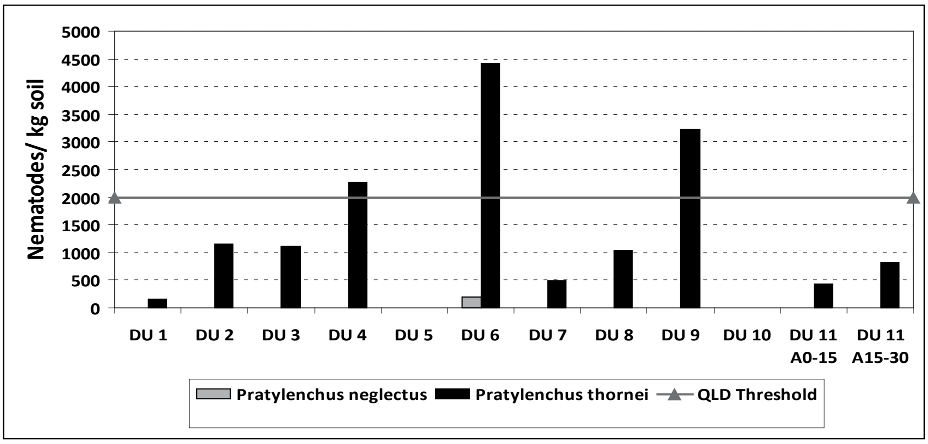

Figure 2. Populations of root lesion nematodes in Dubbo district – sowing 2010

- *Pratylenchus neglectus* was detected in only 1 out of the 11 paddocks (DU 6). The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. The population of *P. neglectus* at site DU 6 was well below the threshold.
- *Pratylenchus thornei* was detected in 9 out of 11 paddocks. Populations of *P. thornei* at three sites (DU 4, DU 6 and DU 9) were above the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. At site DU 11 soil samples were collected at two depths (0–15 cm and 15–30 cm) to look at distribution of nematodes within the soil. The population of *P. thornei* was lower (434/kg soil) in the top soil than in the 15–30 cm soil layer (824 *P. thornei*/kg soil).

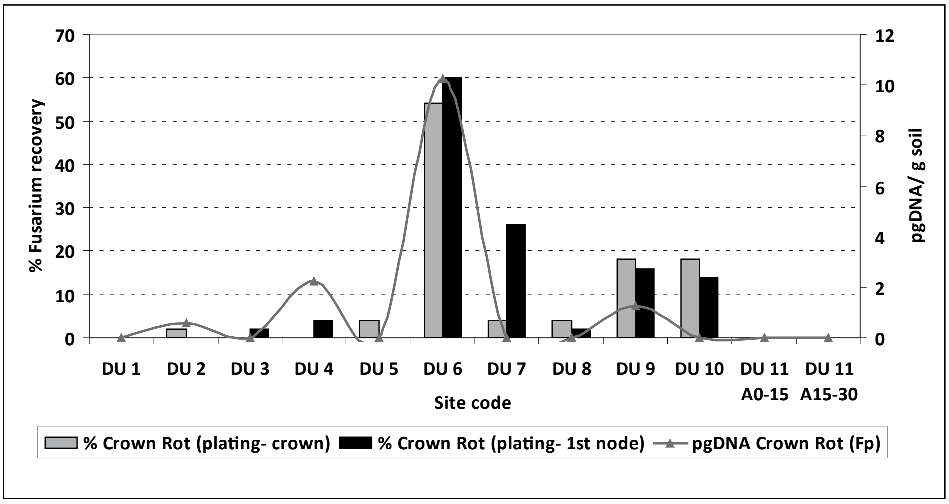

Figure 3. Crown rot incidence Dubbo district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), with the exception of DU 6, are below the detectable limit. DU 6 has a low risk of yield loss from crown rot in 2010 based on the PreDicta B result.
- With plating of crowns and 1st nodes based on % recovery of *Fusarium* on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Site DU 6 has a high risk of crown rot infection based on recovery of *Fusarium* from both the crown and 1st node. Site DU 7 has a high risk of crown rot infection based on recovery from the 1st node and a low risk based on recovery from the crown. Sites DU 9 and DU 10 have a medium risk of crown rot infection in 2010 based on *Fusarium* recovery from both the crown and 1st node. All remaining sites have a low risk of crown rot infection in 2010. Stubble was not collected at site DU 11.

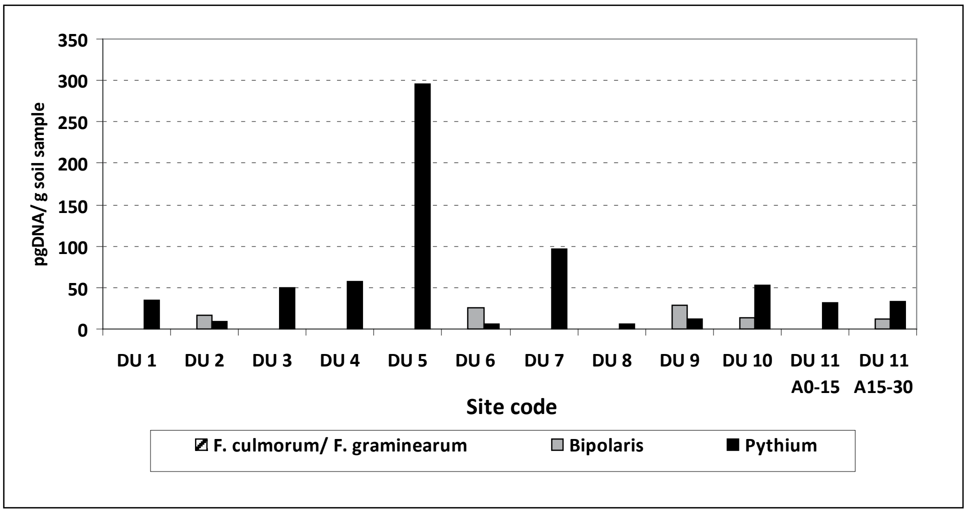

Figure 4. Incidence of other fungal pathogens in the Dubbo district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. *Fusarium culmorum/F. graminearum* was not detected in any of the 11 sites in the Dubbo district.

- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected in soil collected from 5 of the 11 sites but only at low risk levels for yield loss to common root rot (*Bipolaris*) in 2010.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected at varying levels at all 11 sites but was generally at a low risk level. The exception was site DU 5 which had a *Pythium* population representing a high risk of yield loss in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 11 sites in the Dubbo district.

Conclusions

This was a random sample of 11 paddocks in the Dubbo district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Dubbo district.

Pratylenchus thornei were widespread in the Dubbo district being detected in 82% of paddocks. However, *P. neglectus* appears to have a more limited distribution, being detected at a low level in only 1 of the 11 sites (9% paddocks). Only one site (DU 6) had mixed populations of both RLN species. Three sites (DU 4, DU 6 and DU 9) had populations of *P. thornei* above the Qld threshold for yield loss in intolerant wheat varieties. Sowing winter cereal varieties with tolerance to *P. thornei* would minimise yield loss at these sites in 2010. RLN needs to become a consideration in rotation sequences within the district to maintain, or reduce where necessary, populations below damaging levels.

Crown rot also appears to be widespread in the Dubbo district being detected at varying levels in collected cereal stubble. Based on plating 20% of paddocks (DU 6 and DU 7) have a high risk and 20% (DU 9 and DU 10) a medium risk of developing damaging levels of crown rot in 2010 (calculations based only on sites where cereal stubble was collected). However, the PreDicta B *Fp* test only identified one site (DU 6) as having a low risk of crown rot infection, with all remaining sites being below the detectable limit. PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. This may be a particular issue with crown rot where very wet fallow periods can limit the survival of *Fp* in crowns below ground due to decomposition yet significant levels may still be present in standing stubble which takes much longer to decompose (e.g. DU 7).

Fusarium culmorum/F. graminearum was not detected in any of the 11 paddocks in the Dubbo district indicating there is negligible risk of developing Fusarium head blight from these pathogens in 2010. *Bipolaris* was detected at low levels in 45% of paddocks with all having a low risk of infection by common root rot in 2010. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen.

Pythium was detected at varying levels across the Dubbo district being present in 100% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. The DNA test indicated that only one site (DU 5) has a high risk of *Pythium* infection in 2010. *Pythium* infects plant roots through a spore that swims through water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection when soil populations are at a medium or high risk level.

Acknowledgement

Thanks to Ben Weber for field assistance.

Gunnedah District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Bill Manning[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Gunnedah

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Gunnedah district is shown below (Figure 1).

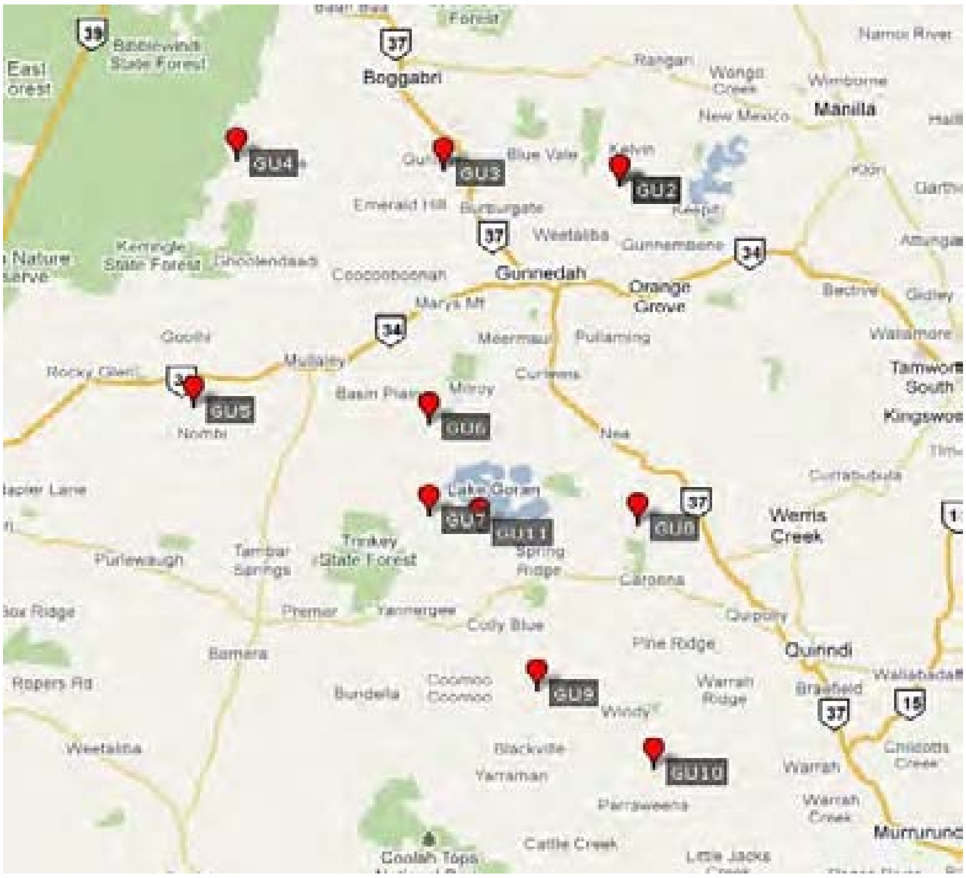

Figure 1. Gunnedah district paddocks – 2010

RESULTS – SOWING

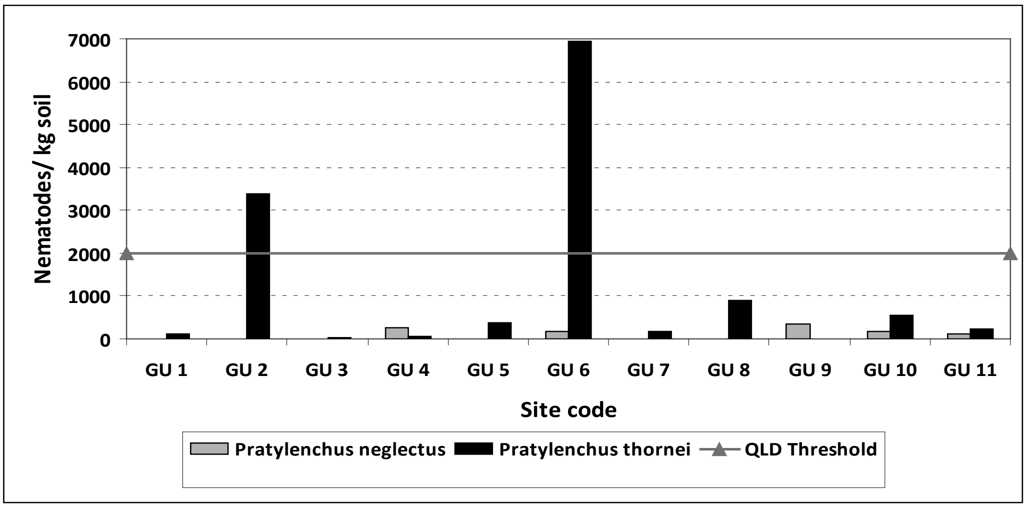

Figure 2. Populations of root lesion nematodes in Gunnedah district – sowing 2010

- *Pratylenchus neglectus* was detected in 5 out of the 11 paddocks surveyed in the Gunnedah district. The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. All population were well below this threshold.
- *Pratylenchus thornei* was detected in 10 out of the 11 paddocks. However, only two sites (GU 2 and GU 6) had *P. hornei* populations above the QLD threshold of 2000 nematodes/kg for yield loss in intolerant wheat varieties. Populations of *P. thornei* at the remaining sites were all below the threshold for yield loss.

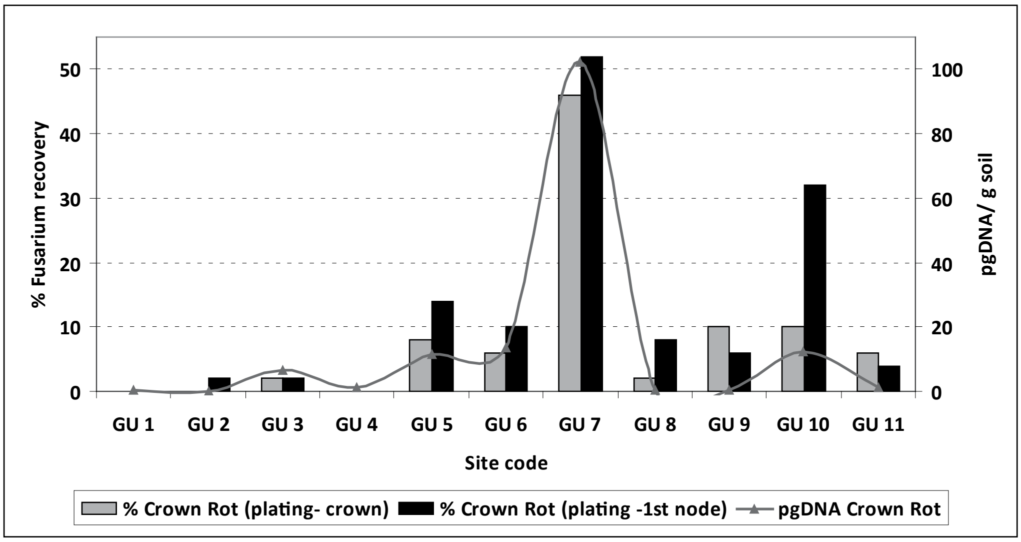

Figure 3. Crown rot incidence Gunnedah district – sowing 2010

- *Fusarium pseudograminearum* (*Fp*) PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), four sites (GU 3, GU 5, GU 6 and GU 10) are low risk of yield loss from crown rot in 2010. Site GU 7 has a medium risk of yield loss from crown rot (102 pg *Fp* DNA/g soil) while the remaining six sites were below detection limits.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Site GU 7 has a high risk of crown rot infection in 2010 based on *Fusarium* recovery from both the crown and 1st node. Site GU 10 has a high risk of crown rot infected based on *Fusarium* recovery from the 1st node but only a low risk based on recovery from the crown. Site GU 5 has a medium risk of crown rot based recovery from the 1st node and a low risk based on *Fusarium* recovery from crowns. All other sites where stubble was collected were low risk of developing crown rot in 2010. Stubble was not collected from site GU 1.

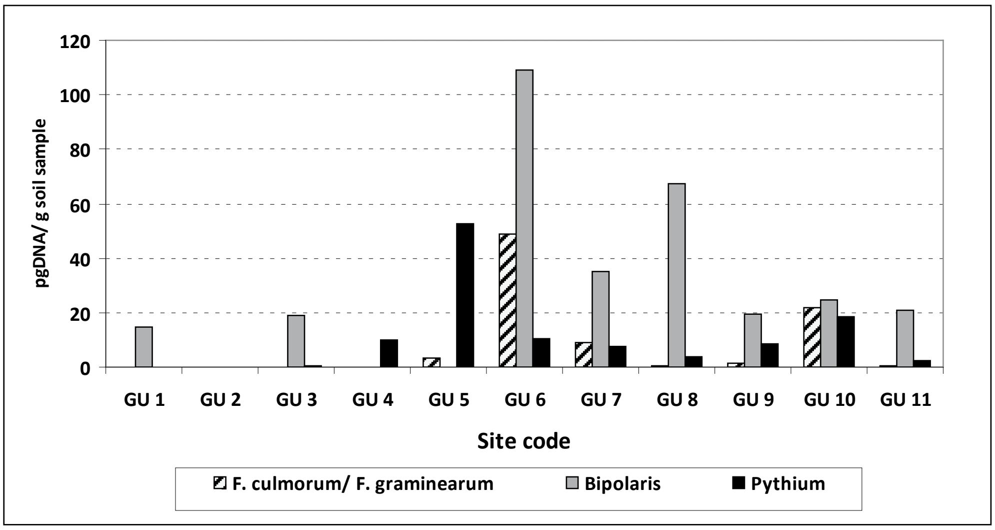

Figure 4. Incidence of other fungal pathogens in the Gunnedah District – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. *Fusarium culmorum/F. graminearum* was detected at a low risk level at four sites (GU 5, GU 6, GU 7 and GU 10) and was below detection limits at the other seven sites.

- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* (CRR fungus) was detected at 8 of the 11 sites but all were at a low risk level for yield loss to CRR in 2010. Site GU 6 had the highest levels of *Bipolaris* (109 pg DNA/g soil), which is approaching a medium risk of CRR.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in soil collected from 9 of the 11 sites (all except GU 1 and GU 2) with levels all representing a low risk for losses from *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 11 sites in the Gunnedah district.

Conclusions

This was a random sample of 11 paddocks in the Gunnedah district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Gunnedah district.

Nematodes were widespread in the Gunnedah district with *P. neglectus* detected in 45% of paddocks and *P. thornei* in 91% of paddocks. Four of the 11 paddocks had mixed populations of both RLN species. Populations of *P. neglectus* were below the expected threshold for yield loss in intolerant wheat varieties at all sites. Two sites (GU 2 and GU 6; 18% paddocks) had populations of *P. thornei* above the threshold for yield loss. Site GU 6 had a particularly high *P. thornei* population (6,941 *Pt*/kg soil) which was around 3.5 times the threshold for yield loss in *Pt* intolerant wheat varieties. Use of cereal varieties with tolerance to *P. thornei* will help minimise yield loss at these two sites. All other sites had *P. thornei* population below the expected threshold for yield loss. Management of nematodes needs to become a consideration in rotation sequences within the district to maintain, or reduce where necessary, both *P. thornei* and *P. neglectus* populations below damaging levels.

Fusarium pseudograminearum (*Fp*) is widespread in the Gunnedah district being detected at varying levels in 9 out of 10 paddocks from which cereal stubble was collected. Based on plating two paddocks (GU 7 and GU 10) have a high risk and one paddock (GU 5) a medium risk of developing damaging levels of crown rot in 2010. However, the PreDicta B *Fp* test only identified one of these sites (GU 7) as having a medium risk of yield loss from crown rot.

PreDicta B is a soil based DNA test, so it may provide a less reliable indication of pathogen levels in stubble above ground (i.e. 1st node). This may be a particular issue with crown rot where very wet fallow periods can limit the survival of *Fp* in crowns below ground due to decomposition yet significant levels may still be present in standing stubble which takes much longer to decompose (e.g. site GU 5 and GU 10). The *Fp* PreDicta B test correlated well with plating levels of Fusarium recovered from the crown of the previous cereal stubble. However, it did not detect *Fp* at significant levels at sites GU 5 or GU 10 which both had low Fusarium levels in the crown based on plating but medium or high levels of recovery from the 1st nodes (above ground).

Fusarium culmorum/F. graminearum was detected at low levels in 45% of paddock in the Gunnedah district. This indicates that Fusarium head blight infection could be an issue in the district as these Fusarium species are the primary causes of this disease if wet conditions occur during flowering.

Pythium was detected at low levels across the Gunnedah district being present in 82% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. However, the DNA test indicated that in all paddocks *Pythium* levels were well below thresholds for expected yield loss in 2010. *Bipolaris* was also widespread in the Gunndah district being detected at low levels in 73% of paddocks. Site GU 6 has *Bipolaris* levels approaching a medium risk for losses from CRR infection. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen.

Moree East District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Rebecca Byrne[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Moree

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 10 paddocks tested in the Moree East district is shown below (Figure 1).

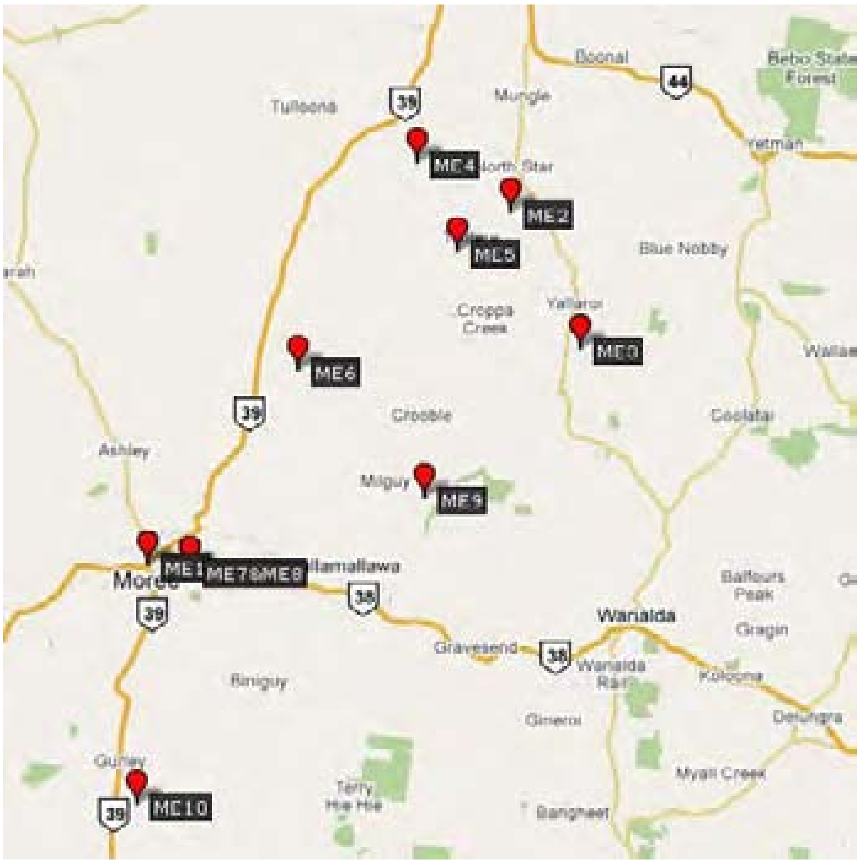

Figure 1. Moree East district paddocks – 2010

Results – Sowing

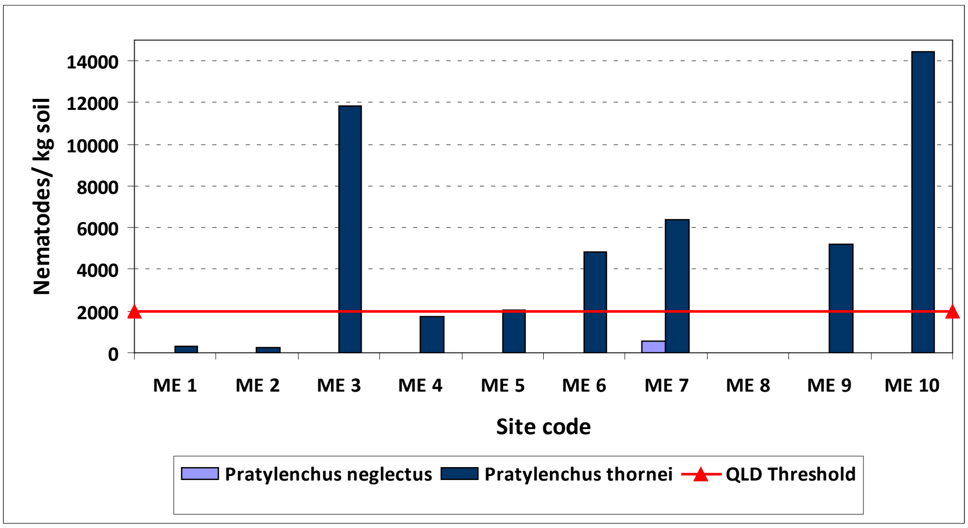

Figure 2. Populations of root lesion nematodes in Moree East district – sowing 2010

- *Pratylenchus neglectus* was detected in only 1 of the 10 paddocks (ME 7). The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. The population of *P. neglectus* at site ME 7 was only one quarter of this threshold.
- *Pratylenchus thornei* (*Pt*) was present in all 10 paddocks at varying levels. Sites ME 3, ME 5, ME 6, ME 7, ME 9 and ME 10 all have populations above the QLD threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. *Pt* populations at sites ME 3 (11,852 *Pt*/kg soil) and ME 10 (14,463 *Pt*/kg soil) were particularly high being around six to seven times the threshold for yield loss in intolerant varieties. Sites ME 1, ME 2, ME 4 and ME 8 are all below the Qld threshold for yield loss. *Pt* population was very low at ME 8 (22 *Pt*/kg soil) but was still detectable by PreDicta B.

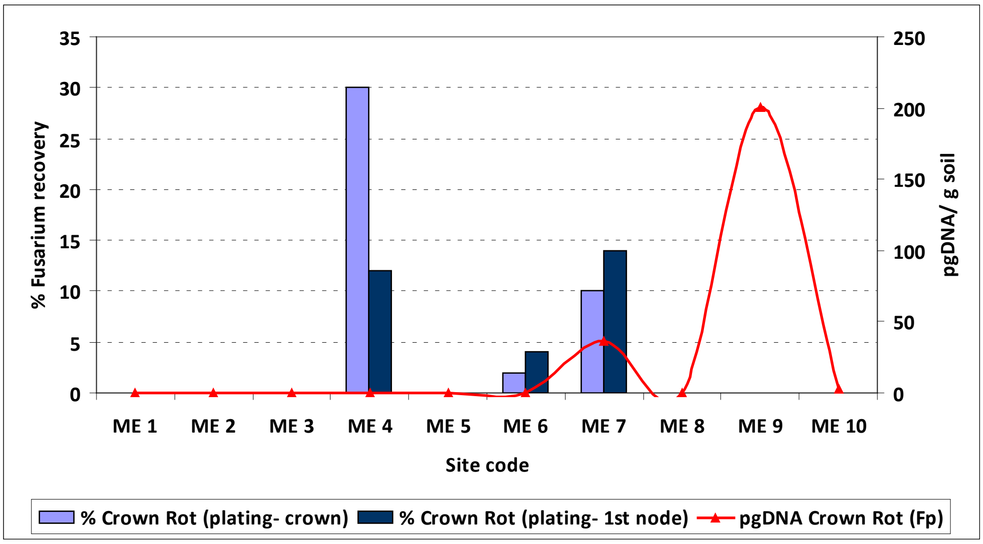

Figure 3. Crown rot incidence Moree East district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), with exception of site ME 9, are low risk for yield loss to crown rot from *Fp* in 2010 or below the limit of detection. Site ME 9 has a medium risk for yield loss to crown rot with 200 pg *Fp* DNA/g soil detected.

- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Stubble was only collected at three sites (ME 4, ME 6 and ME 7). Site ME 4 is high risk of yield loss to crown rot based on Fusarium recovery from the crown and medium risk based on levels in the 1st node. Site ME 7 is medium risk based on recovery levels from the 1st node and low risk based on the crown. Site ME 6 is low risk for yield loss to crown rot at based on Fusarium recovery from both the crown and the 1st node.

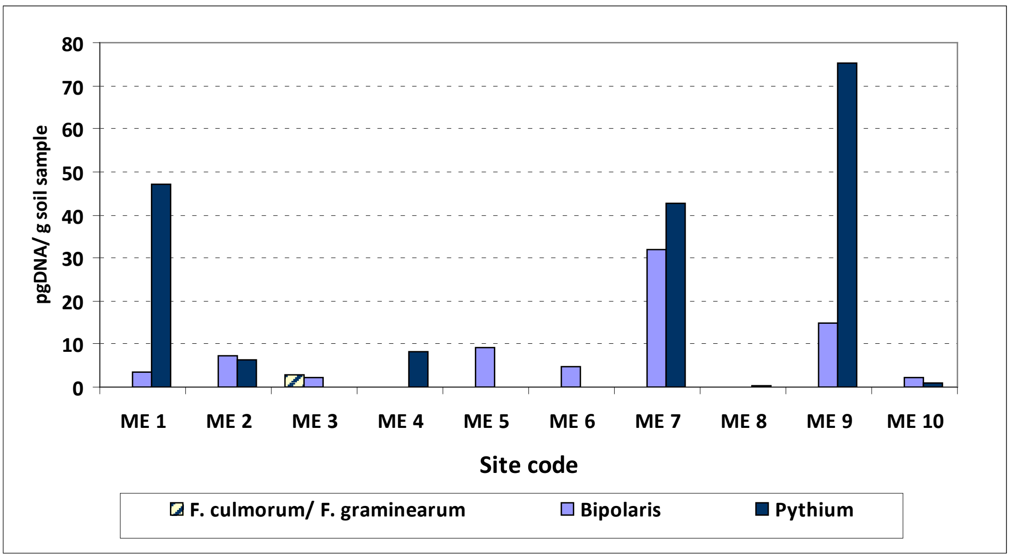

Figure 4. Incidence of other fungal pathogens in the Moree East district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. *Fusarium culmorum/F. graminearum* was only detected at one site (ME 3) which represented a low risk of yield loss in 2010.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* which causes CRR was detected in 8 of the 10 paddocks but was at levels which represent only a low risk of yield loss from CRR in 2010.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in 7 of the 10 paddocks but was at levels which represent only a low risk of yield loss from *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in at any of 10 sites within the Moree East district.

Conclusions

This was a random sample of 10 paddocks in the Moree East district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Moree East district.

Pratylenchus neglectus does not appear to be a major issue in the Moree East district being detected at low levels in only one of the 10 paddocks surveyed. However, the other RLN species *P. thornei* was very widespread being detected in 100% of the surveyed paddocks. Hence, by default only one paddock had mixed populations of both RLN species. Sites ME 3, ME 5, ME 6, ME 7, ME 9 and ME 10 (60% of sites) had populations of *P. thornei* above the Qld threshold for yield loss in intolerant wheat varieties. Fortunately, only one of these sites has been sown to a *Pt* moderately intolerant (MI) variety (EGA Bellaroi). The other five sites have been sown to either a moderately tolerant (MT) variety (2 x EGA Gregory) or MT-MI varieties (EGA Kidman, Sunzell or Livingston), which will help minimise yield loss to *Pt* in 2010. RLN needs to become a bigger consideration in rotation sequences within the Moree East district to maintain, or reduce where necessary, populations of particularly *Pt* below damaging levels.

Fp was only detected at two sites based on the PreDicta B *Fp* test with one site (ME 7) being low risk and one site (ME 9) being medium risk of yield loss from crown rot infection in 2010. Unfortunately, winter cereal stubble was collected from only three sites. Based on plating one site (ME 4) has a high risk, one has a medium risk (ME 7) while the third site (ME 6) has a low risk of developing damaging levels of crown rot in 2010. Based on the small sample size, it is difficult to make a correlation between the DNA based test and the stubble plating, however the PreDicta B test did not identify significant *Fp* levels at site ME 4, which had a high risk of crown rot based on plating of stubble. Sites ME 6 and ME 7 were the only two survey paddocks to have a winter cereal crop in 2009 (i.e. wheat-on-wheat) with the remaining sites either having a winter break crop or fallow in 2009. This highlights the effectiveness of crop rotation in limiting the build-up of crown rot inoculum levels within paddocks.

F. culmorum/F. graminearum was detected at low levels at only one site (ME 3). This is consistent with previous studies which have similarly found *Fp* to be the dominant Fusarium species causing crown rot infection in northern NSW. The Moree East district also appears to have a low risk of developing Fusarium head blight from these two Fusarium species given their very low distribution within the region.

Bipolaris was widespread in the Moree East district (80% of paddocks) but all sites had a low risk of developing damaging levels of common root rot in 2010. *Pythium* was similarly detected at low levels across the Moree East district being present in 70% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. However, the DNA test indicated that in all paddocks *Pythium* levels were below thresholds for expected yield loss in 2010.

Moree West District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Tim Burley[2], Russell Carty[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Moree

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 12 paddocks tested in the Moree West district is shown below (Figure 1).

Figure 1. Moree West district paddocks – 2010

Results – Sowing

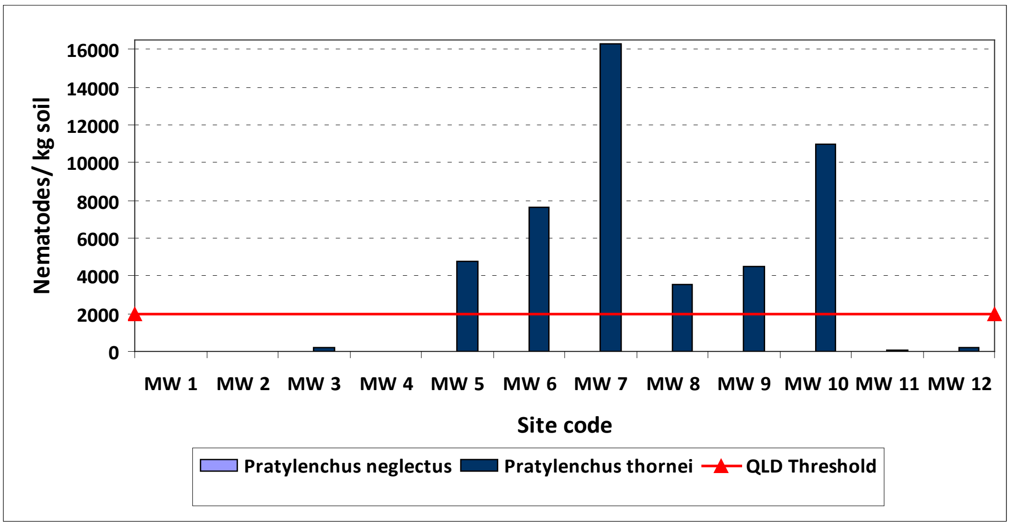

Figure 2. Populations of root lesion nematodes in Moree West district – sowing 2010

- *Pratylenchus neglectus* was not detected in any of the 12 paddocks surveyed.
- *Pratylenchus thornei* was present in 11 of the 12 paddocks (all except MW 4). Populations were low (<250 *Pt*/kg soil) at sites MW 1, MW 2, MW 3, MW 11 and MW 12. At the remaining 6 sites (MW 5, MW 6, MW 7, MW 8, MW 9 and MW 10) *P. thornei* populations were above the Qld threshold of 2000 *Pt*/kg soil for yield loss in intolerant wheat varieties. Site MW 7 had the highest population with 16,286 *Pt*/kg soil.

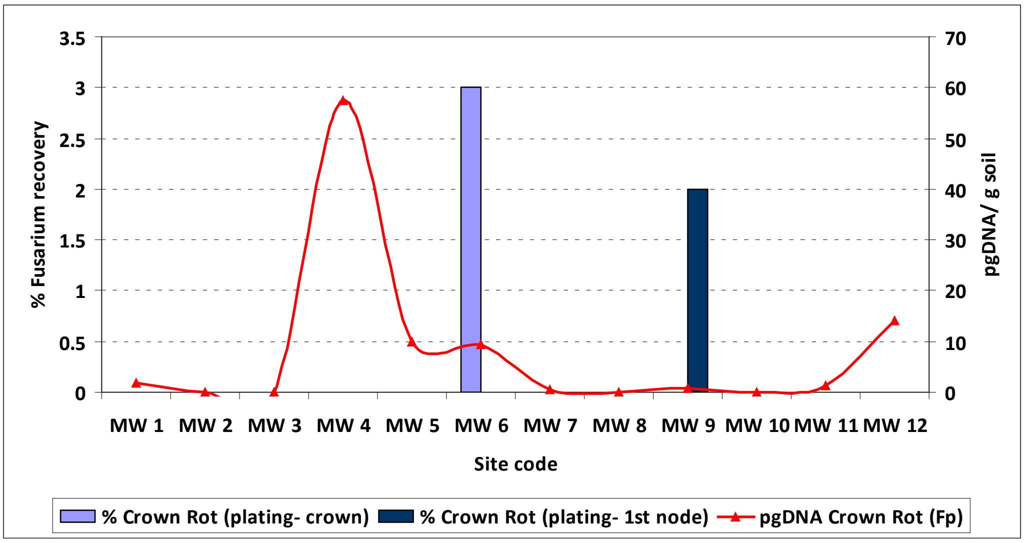

Figure 3. Crown rot incidence Moree West district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line) were below the detectable limit.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Stubble was only collected from sites MW 3, MW 6, MW 9 and MW 12. All have a low risk of crown rot infection in 2010 based on Fusarium recovery from both the crown and 1st node.

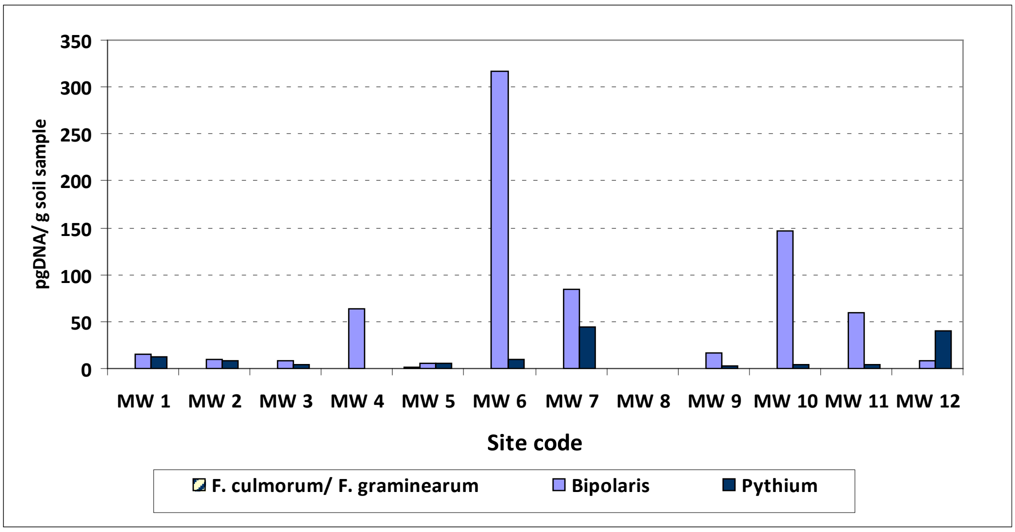

Figure 4. Incidence of other fungal pathogens in the Moree West district – sowing 2010

- *Fusarium culmorum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. All 12 sites were below detection limits.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected at 11 of the 12 sites (all except MW 8) but all were at a low risk level for yield loss to CRR in 2010 with the exception of MW 6 which has a medium risk for CRR (317 pg *Bipolaris*/g soil) but is approaching a high risk. Site MW 10 (146 pg *Bipolaris*/g soil) is approaching a medium risk of CRR.

- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in soil collected from 10 of the 12 sites (all except MW 4 and MW 8) with levels all representing a low risk for losses from *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 12 sites in the Moree West district.

Conclusions

This was a random sample of 12 paddocks in the Moree West district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Moree West district.

There was no evidence of *P. neglectus* in any of the 12 paddocks surveyed in the Moree West district. However, *P. thornei* were widespread being detected in 92% of paddocks. Half of the surveyed paddocks have populations of *P. thornei* above the expected threshold for yield loss in intolerant wheat varieties. Generally the *P. thornei* populations were quite high being around two (sites MW 5, MW 8 and MW 9) up to eight times (site MW 7) higher than the threshold for yield loss. Fortunately, all sites have been sown to winter cereal varieties with either moderate tolerance-moderate intolerant (MT-MI) to *P. thornei* infection (Hyperno durum) or MT (EGA Gregory, EGA Wylie or 2 x Grout barley) which should limit yield loss to this pathogen in 2010. Site MW 7, which has the highest levels of *P. thornei,* was sown to Sunbrook which has a very high level of tolerance (T-MT) to this nematode species. All other sites had *P. thornei* populations below the expected threshold for yield loss in intolerant wheat varieties. Management of nematodes needs to become a consideration in rotation sequences within the district to maintain, or reduce where necessary, *P. thornei* populations below damaging levels.

Crown rot does not appear to be a major issue in the 12 paddocks surveyed in the Moree West district in 2010. However, stubble was only collected from 4 of the 12 sites which were all found to have a low risk of crown rot infection in 2010 based on Fusarium recovery from both the crown and 1st nodes. This correlated well with the PreDicta B DNA based test with *Fp* levels at all sites being below the detection limit.

Bipolaris was widespread in the Moree West district being detected at low levels in 11 of the 12 sites (92% paddocks), but only one site (MW 6) had levels representing a medium risk to losses from CRR infection in 2010. EGA Gregory was planned for sowing in this paddock which has moderate resistance to CRR which should limit any potential losses. Site MW 10 has *Bipolaris* levels approaching a medium risk for losses from CRR infection. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen.

Fusarium culmorum/F. graminearum was not detected in any paddocks in the Moree West district indicating there is a low risk within the region of developing Fusarium head blight from these two Fusarium species. *Pythium* was detected at low levels across the Moree West district being present in 83% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. However, the DNA test indicated that in all paddocks *Pythium* levels were well below thresholds for expected yield loss in 2010.

Narrabri District Cereal Pathogen Report – 2010

Elizabeth Farrell, Loretta Serafin, Robyn Shapland and Steven Simpfendorfer

NSW DPI, Tamworth

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 10 paddocks tested in the Narrabri district is shown below (Figure 1).

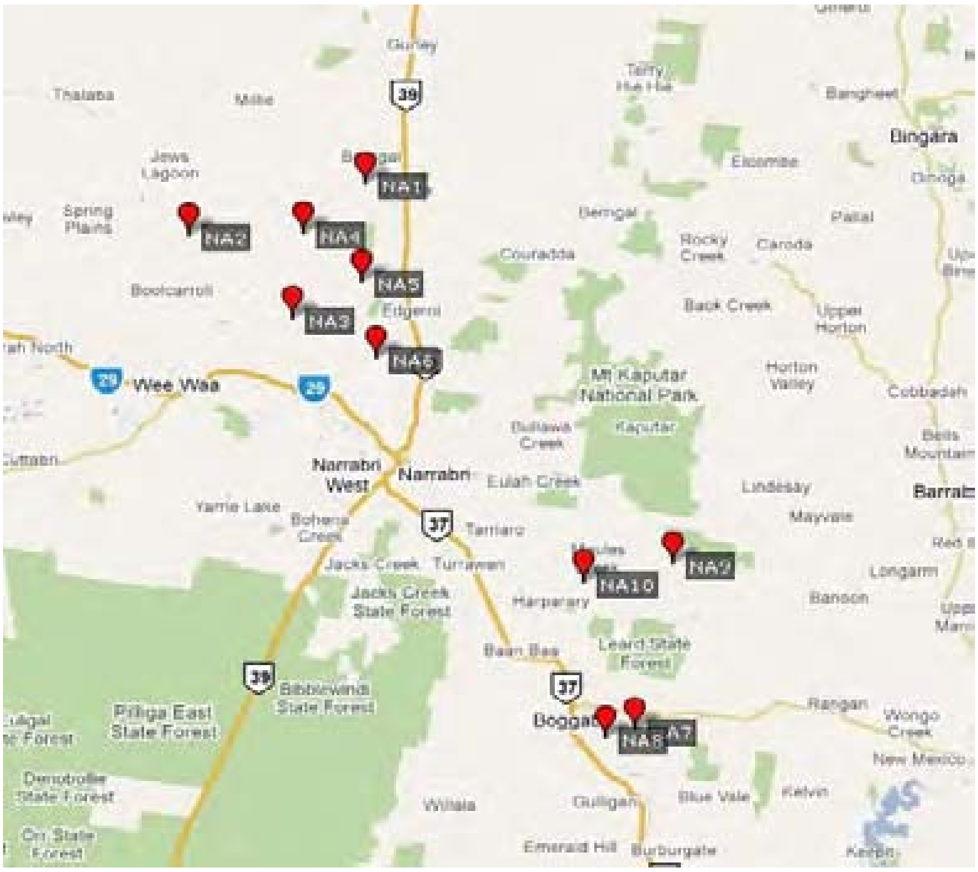

Figure 1. Narrabri district paddocks – 2010

Results – Sowing

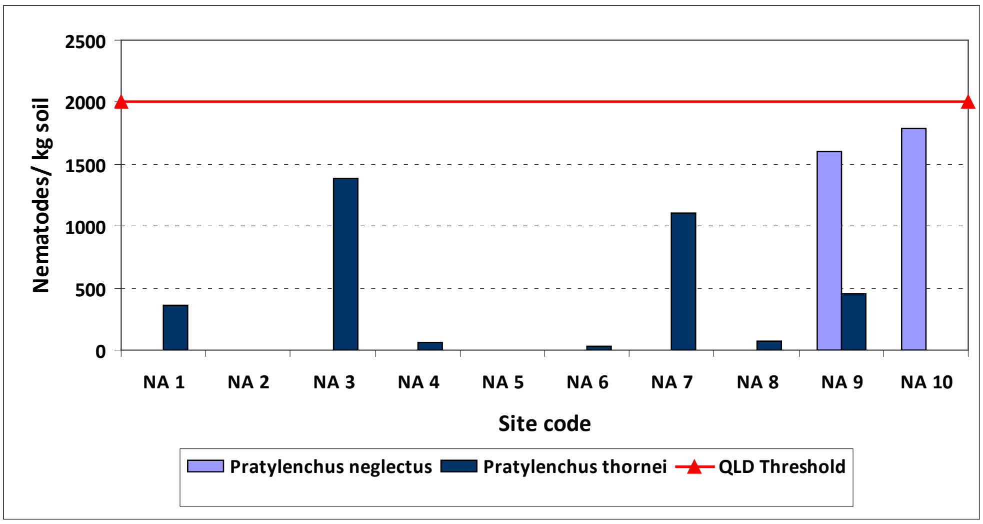

Figure 2. Populations of root lesion nematodes in Narrabri district – sowing 2010

- *Pratylenchus neglectus* was detected in only 2 out of the 10 paddocks surveyed. Both populations are below the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. However, both sites (NA 9 with 1,603 *P. neglectus*/kg soil and NA 10 with 1,792 *P. neglectus*/kg soil) have numbers approaching the threshold for yield loss.
- *Pratylenchus thornei* was deteceted in 7 out of 10 paddocks. All populations are below the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties.
- Site NA 9 is the only site to have mixed populations of both RLN species.

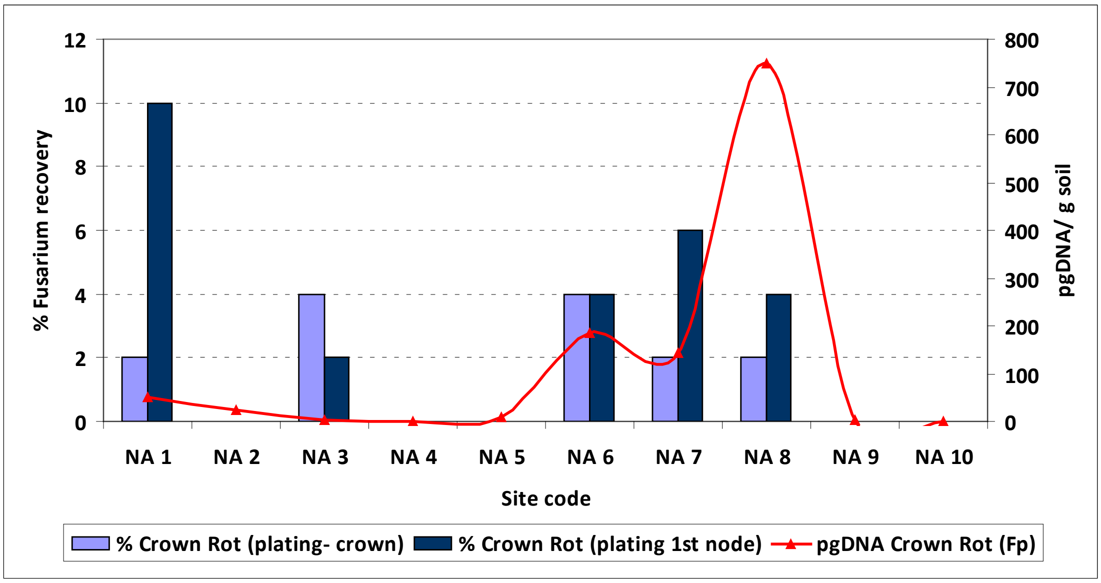

Figure 3. Crown rot incidence Narrabri district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories (red line), three site (NA 3, NA 4 and NA 10) were below detectable limits and four sites (NA 1, NA 2, NA 5 and NA 9) were low risk of yield loss from crown rot in 2010. Two sites (NA 6 and NA 7) are medium risk while site NA 8 (748 pg *Fp*/kg soil) has a high risk of yield loss from crown rot in 2010.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. All sites where stubble was collected have a low risk of crown rot infection in 2010 based on Fusarium recovery from both the crown and 1st node. Stubble was not collected at sites NA 2, NA 4 and NA 9.

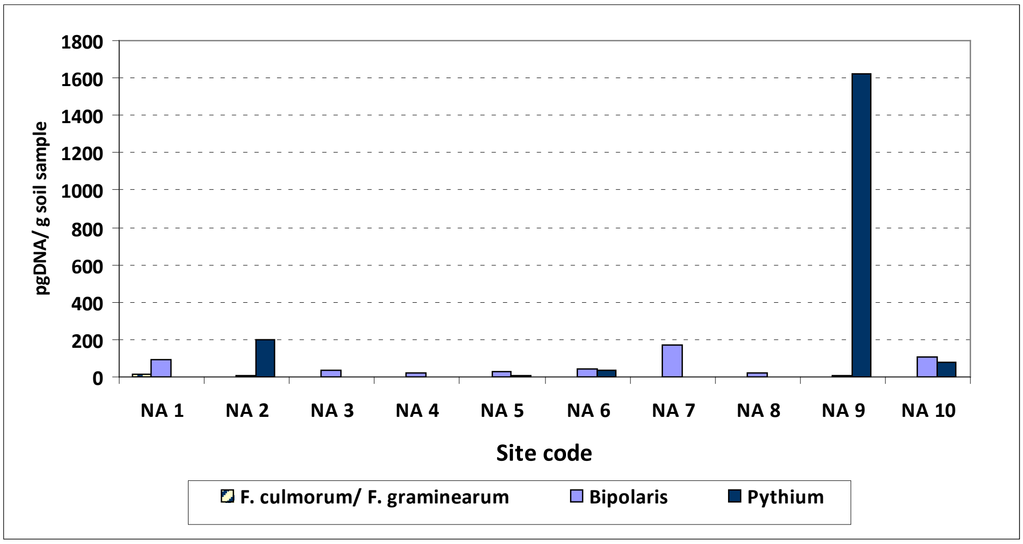

Figure 4. Incidence of other fungal pathogens in the Narrabri district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. *Fusarium culmorum/F. graminearum* was only detected at a low risk level at sites NA 1.

- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected in soil collected from all 10 sites. Only one site (NA 7) has a medium risk of yield loss from common root rot in 2010 (172 pg *Bipolaris*/g soil). All other sites are low risk of yield loss from common root rot in 2010.
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in soil from 5 of the 10 sites. Site NA 9 has a high risk while site NA 2 has a medium risk of yield loss from *Pythium* infection in 2010. The remaining sites are all low risk of *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 10 paddocks surveyed.

Conclusions

This was a random sample of 10 paddocks in the Narrabri district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Narrabri district.

Nematodes were widespread in the Narrabri district with *P. thornei* detected in 70% of paddocks and *P. neglectus* in 20% of paddocks. Only 1 of the 10 paddocks (NA 9) had mixed populations of both RLN species. Populations of both nematode species were below the expected threshold for yield loss in intolerant wheat varieties but were approaching damaging population levels at some sites (*P. negectlus* at NA 9 and NA 10, *P. thornei* at NA 3). RLN needs to become a consideration in rotation sequences within the district to maintain populations below damaging levels.

Fusarium was less widespread in the Narrabri district being detected at varying risk levels in collected cereal stubbles. Based on plating, all paddocks (note: stubble not collected NA 2, NA 4 and NA 9) have a low risk of developing damaging levels of crown rot in 2010. This is in contrast to the PreDicta B *Fp* test which identified two sites (NA 6 and NA 7) as having a medium risk of crown rot from *Fusarium pseudograminearum* (*Fp*) and one site (NA 8) as having a high risk.

Fusarium culmorum/F. graminearum was only detected at a low level in one paddock (NA 1) in the Narrabri district indicating there is a low risk of developing Fusarium head blight from these two Fusarium species. *Bipolaris* was widespread in the Narrabri district being detected at low levels at all sites (100% of paddocks), but only one site (NA 7) had levels representing a medium risk to losses from CRR infection in 2010. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen.

Pythium was detected in 50% of paddocks in the Narrabri district. At one site (NA 9) the *Pythium* population represented a high risk of yield loss to *Pythium* infection while a second site (NA 2) had a medium risk level. *Pythium* spp. infect plant roots through a spore that swims in water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection when soil populations are at a medium or high risk level.

Nyngan District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Greg Brooke[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth
[2] NSW DPI, Wellington

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of some of the 12 paddocks tested in the Nyngan district is shown below (Figure 1).

Figure 1. Nyngan district paddocks – 2010

Results – Sowing

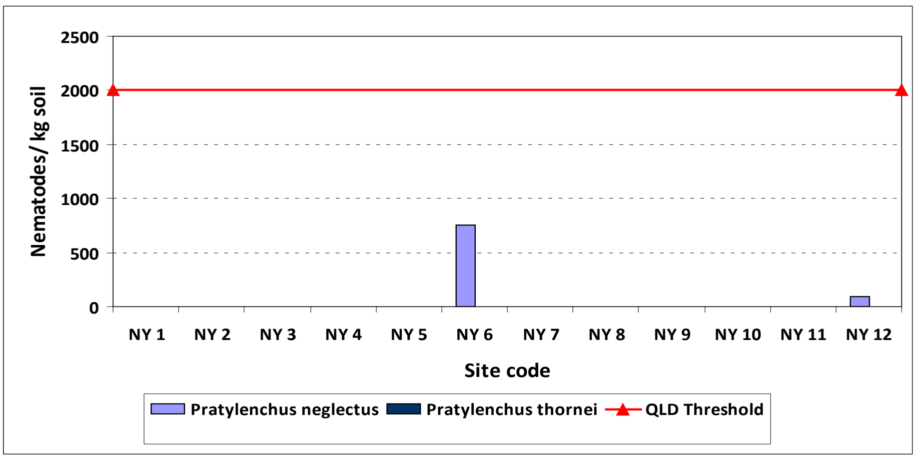

Figure 2. Populations of root lesion nematodes in Nyngan district – sowing 2010

- *Pratylenchus neglectus* was present in only 2 out of the 12 paddocks surveyed. The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. Populations at both sites (NY 6 and NY 12) were below this threshold.
- *Pratylenchus thornei* was not detected in soil collected from any of the 12 paddocks sampled in the Nyngan district.

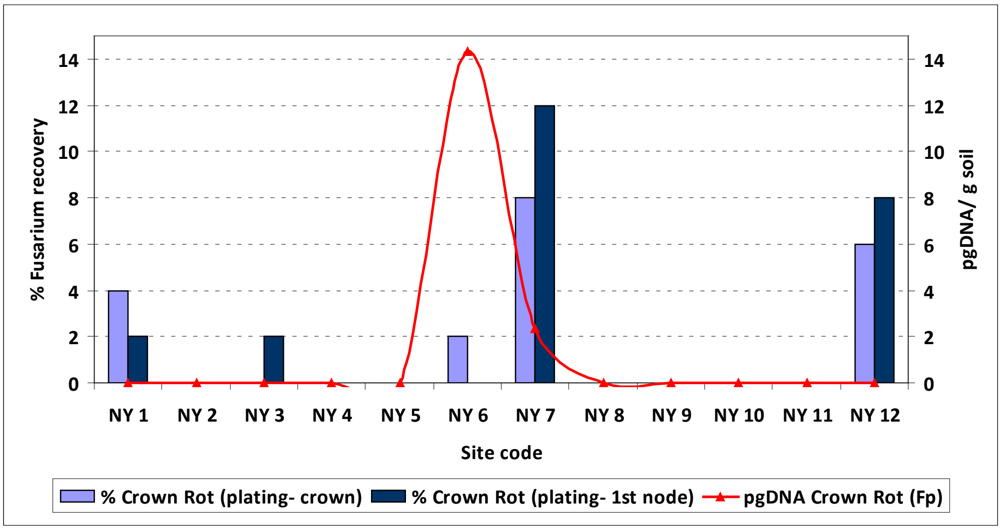

Figure 3. Crown rot incidence Nyngan district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), with the exception of site NY 6, are below the detectable limit. NY 6 has a low risk of yield loss from crown rot in 2010 (14 pg *Fp* DNA/g soil).
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. All sites where stubble was collected, with the exception of site NY 7, have a low risk from crown rot based on recovery from both the crown and the 1st node. Site NY 7 has a medium risk of crown rot infection in 2010 based on Fusarium recovery from the 1st node and is a low risk based on levels in the crown. Stubble was not collected at sites NY 5 and NY 10.

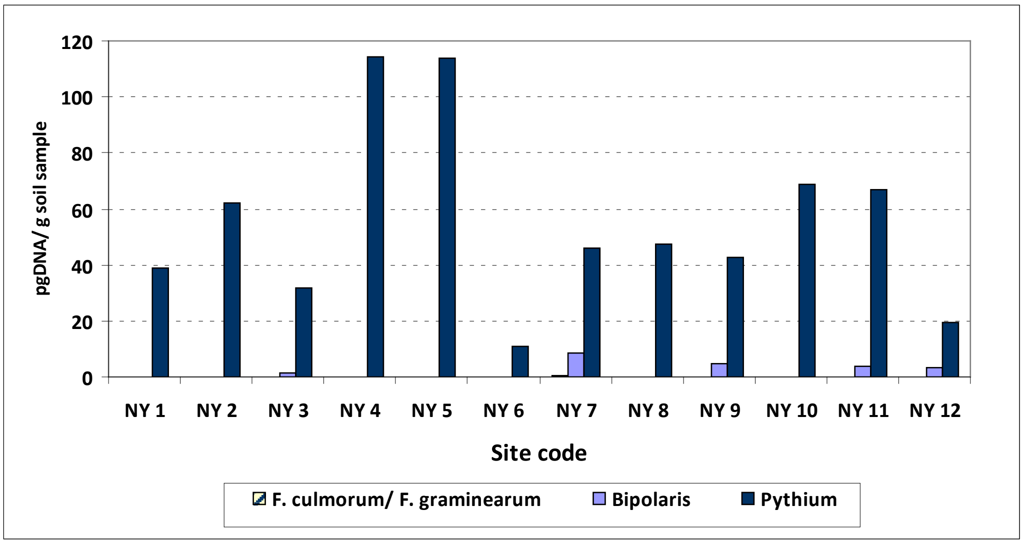

Figure 4. Incidence of other fungal pathogens in the Nyngan district – sowing 2010

- *Fusarium culmorum/F. graminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. All 12 sites are below detectable limits.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected in soil collected from 5 of the 12 sites but was at levels that represent only a low risk for common root rot in 2010.

- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in soil from all 12 sites but was at levels that represent a low risk for losses from *Pythium* infection in 2010 at all sites. Sites NY 4 and NY 5 had the highest levels (both 114 pgDNA *Pythium*/g soil) which are approaching a medium risk of losses from *Pythium* infection.
- *Rhizoctonia* was not detected in soil collected from any of the 12 sites in the Nyngan district.

Conclusions

This was a random sample of 12 paddocks in the Nyngan district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Nyngan district.

Nematodes were limited in their spread across the Nyngan district with *P. neglectus* detected in only 2 out of 12 paddocks (17%) while *P. thornei* was not detected in any of the survey paddocks. Populations of *P. neglectus* in both paddocks were below the expected threshold for yield loss in intolerant wheat varieties. While RLN does not appear to be a major issue in the Nyngan district consideration should still be given to farm hygiene and rotation sequences within the district to maintain populations below damaging levels and avoid introduction of nematodes into clean paddocks through the movement of infected soil.

Crown rot also did not appear to be a major issue in the 12 surveyed paddocks. Based on stubble plating, all sites, except NY 7, were identified as having a low risk of developing damaging levels of crown rot in 2010. Site NY 7 had moderate levels of Fusarium recovery from the 1st node, indicating a medium risk of crown rot infection in 2010. The PreDicta B *Fp* test also only detected low levels of *Fp* across the Nyngan district consistent with the stubble plating results. PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. Although there was a medium risk of crown rot detected based on the stubble plating at site NY 7, significant levels were not detected by the PreDictaB DNA test. This may be a result of a medium risk level being detected from recovery from the 1st node (above ground) whereas there were only low levels of Fusarium recovery from the crowns (in soil).

Fusarium culmorum/F. graminearum was not detected in any paddocks in the Nyngan district indicating there is negligible risk within the region of developing Fusarium head blight from these pathogens. *Pythium* was detected at low levels across the Nyngan district being present in 100% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. However, the DNA test indicated that in all paddocks *Pythium* levels were below thresholds for expected yield loss in 2010. However, two sites (NY 4 and NY 5) had levels approaching a medium risk of yield loss from *Pythium*. *Pythium* infect plant roots through a spore that swims through water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection. *Bipolaris* (common root rot) was detected at very low levels in soil collected from 42% of paddocks. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is also a common soil-borne pathogen.

Tamworth District Cereal Pathogen Report – 2010

Elizabeth Farrell, Loretta Serafin, Robyn Shapland and Steven Simpfendorfer

NSW DPI, Tamworth

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Tamworth district is shown below (Figure 1).

Figure 1. Tamworth district paddocks – 2010

Results – Sowing

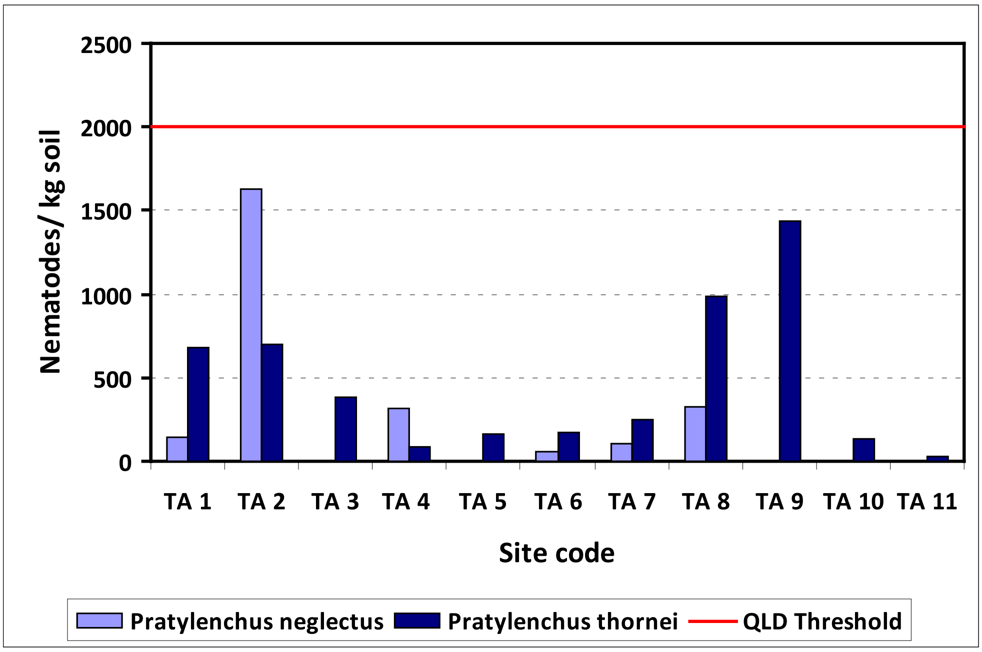

Figure 2. Populations of root lesion nematodes in Tamworth district – sowing 2010

- *Pratylenchus neglectus* was present in 6 out of 11 paddocks but populations are all below Qld threshold of 2000 nematodes/kg soil. Site TA 2 with 1,628 *P. neglectus*/kg soil has numbers approaching threshold for yield loss in intolerant wheat varieties.
- *Pratylenchus thornei* was present in all 11 paddocks but populations are all below Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties. Sites TA 8 and TA 9 had the highest populations.

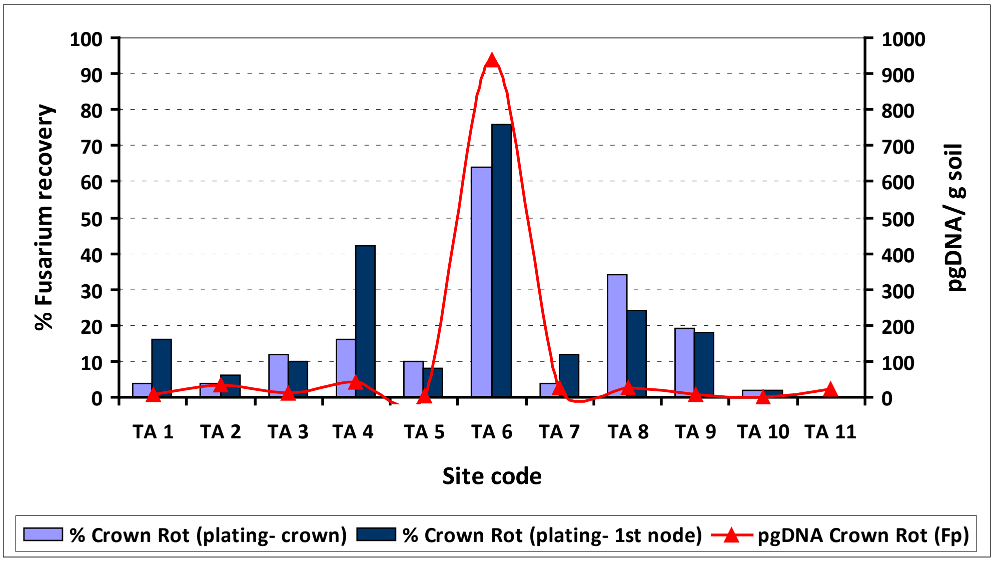

Figure 3. Crown rot incidence Tamworth district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), with exception of TA 6, had a low risk crown rot from *Fp* (i.e. < 100 pg DNA/g soil). TA 6 has a high risk for crown rot with 938 pg *Fp* DNA/g soil.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Sites TA 2, TA 3, TA 5, TA 7 and TA 10 low risk. Sites TA 1 and TA 9 medium risk. Sites TA 4, TA 6 and TA 8 high risk crown rot. Stubble was not collected at site TA 11 as there was none present in the paddock.

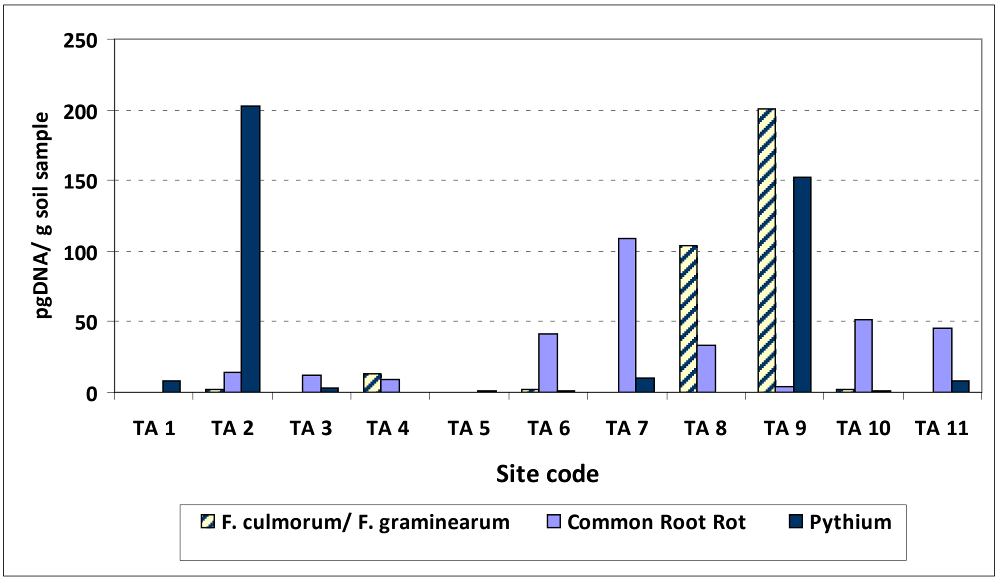

Figure 4. Incidence of other fungal pathogens in the Tamworth district – sowing 2010

- *Fusarium culmorum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Sites TA 8 and TA 9 medium risk crown rot from infection by *F. culmorum* (black and white hashed bars). Other sites all low risk or below detection.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. All sites low risk common root rot in 2010. Site TA 7 highest levels of *Bipolaris* (CRR fungus, light blue bars).

- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. Sites TA 2 and TA 9 medium risk of yield loss to *Pythium* (dark blue bars), remaining sites all low risk *Pythium*.
- *Rhizoctonia* was not detected in soil collected from any of the 11 sites.

Conclusions

This was a random sample of 11 paddocks in the Tamworth district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Tamworth district.

Nematodes were widespread in the Tamworth district with *P. neglectus* detected in 55% of paddocks and *P. thornei* in 100% of paddocks. Hence, by default 6 of the 11 paddocks had mixed populations of both RLN species. However, populations of both nematode species were below the expected threshold for yield loss in intolerant wheat varieties. RLN needs to become a consideration in rotation sequences within the district to maintain populations below damaging levels.

Fp is also widespread in the Tamworth district being detected at varying levels in cereal stubble collected from all sites. Based on plating 20% of paddocks have a medium risk and 30% a high risk of developing damaging levels of crown rot in 2010 (calculations based only on sites where stubble was collected). However, the PreDicta B *Fp* test only identified one site (TA 6) as having a high risk of crown rot from *Fp* with the levels being extreme in both the stubble plating and DNA based (PreDicta B) tests. Notably, TA 6 has had durum crops in the last two seasons, which is the most susceptible of all the winter cereal crops to crown rot. In contrast, TA 10 which was bread wheat in 2009 but had sorghum as the preceding crop species, highlights the importance of crop rotation in limiting the build-up of *Fp*.

PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. This may be a particular issue with crown rot where very wet fallow periods can limit the survival of *Fp* in crowns below ground due to decomposition, yet significant levels may still be present in standing stubble which takes much longer to decompose (e.g. TA 1 and TA 4). The *Fp* PreDicta B test correlated well with plating levels of Fusarium recovered from the crown of the previous cereal stubble at TA 6. However, it did not detect *Fp* at significant levels at TA 4, TA 8 or TA 9 which all had moderate Fusarium levels in the crown based on plating. Interestingly, both TA 8 and TA 9 had moderate *F. culmorum/F. graminearum* PreDicta B risk levels for crown rot with TA 4 being low risk but the only other site at which *F. culmorum/F. graminearum* was detected. The plating is based on the appearance of fungal growth from the crown or 1st node which is definitive for Fusarium but due to the similar appearance of the different Fusaria in culture is not always definitive for species. *Fp* is generally considered the major species causing crown rot in the northern region but this limited survey indicates that other Fusarium species may also be important causes of crown rot in the Tamworth district.

Finally, two sites (TA 2 and TA 9) had a medium risk of *Pythium*. *Pythium* infect plant roots through a spore that swims through water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection.

Walgett District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Myles Parker[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Orange

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 11 paddocks tested in the Walgett district is shown below (Figure 1).

Figure 1. Walgett district paddocks – 2010

Results – Sowing

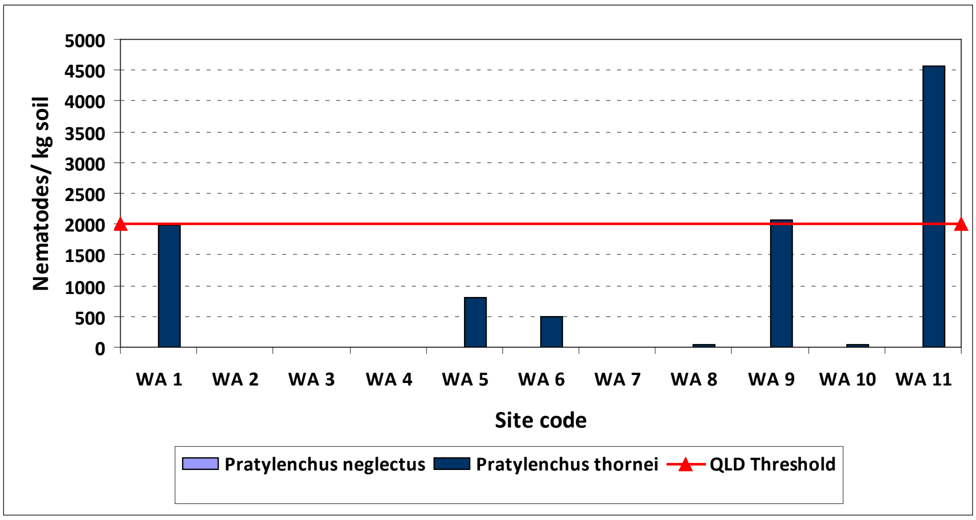

Figure 2. Populations of root lesion nematodes in Walgett district – sowing 2010

- *Pratylenchus neglectus* was not detected in any of the 11 paddocks in the Walgett district.
- *Pratylenchus thornei* was present in 7 out of 11 paddocks. The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. Sites WA 9 and site WA 11 are both above this threshold while WA 1 has numbers very close to the threshold with 1982 *P. thornei*/kg soil.

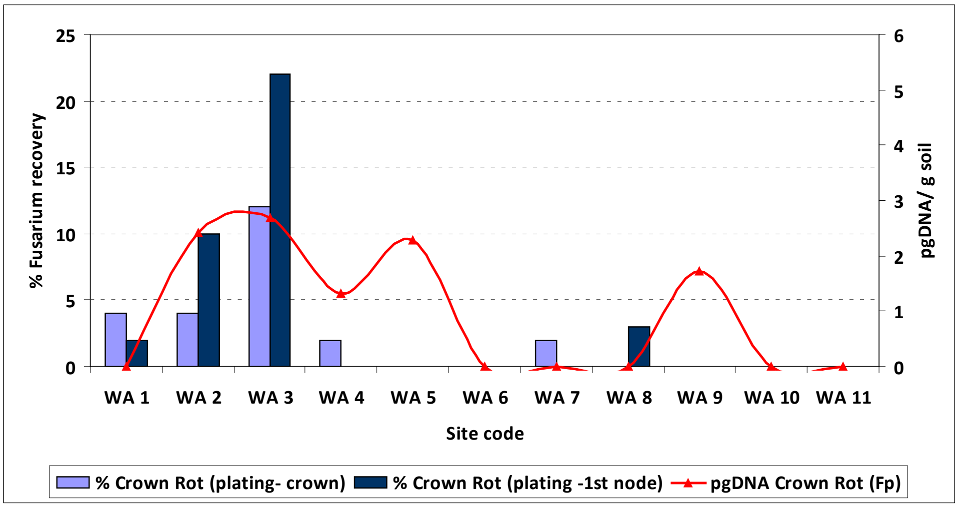

Figure 3. Crown rot incidence Walgett district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line) are below the detectable limit.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. All sites where stubble was collected, with the exception of WA 3, have a low risk for crown rot based on recovery both from the crown and the 1st node. WA 3 has a medium risk of crown rot infection from *Fp* based on recovery from both the crown and the 1st node. Stubble was not collected at sites WA 9 and WA 10.

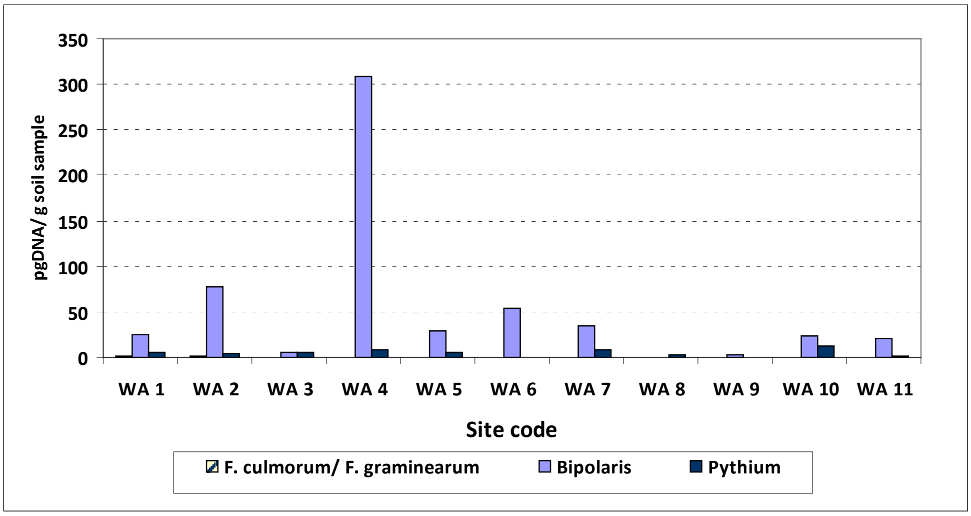

Figure 4. Incidence of other fungal pathogens in the Walgett district – sowing 2010

- *Fusarium culmorum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. All sites are below detection limits.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected at 10 of the 11 sites (all except WA 8) but all sites are a low risk for yield loss to common root rot in 2010 with the exception of WA 4 which is a medium risk for CRR (308 pg DNA *Bipolaris*/g soil).
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in 9 of 11 sites with all sites being low risk for losses from *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in any of the 11 sites in the Walgett district.

Conclusions

This was a random sample of 11 paddocks in the Walgett district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Walgett district.

There was no evidence of *P. neglectus* in any of the paddocks surveyed in the Walgett district. However, *P. thornei* were widespread being detected in 64% of paddocks. Sites WA 9 and WA 11 had populations of *P. thornei* above the expected threshold for yield loss in intolerant wheat varieties. Both sites have been sown to wheat varieties with either moderate tolerance-moderate intolerant (MT-MI) to *P. thornei* infection (Crusader) or MT (EGA Gregory) which should limit yield loss to this pathogen in 2010. All other sites had population levels of *P. thornei* below the expected threshold for yield loss in intolerant wheat varieties. Management of nematodes needs to become a consideration in rotation sequences within the district to maintain, or reduce where necessary, *P. thornei* populations below damaging levels.

Fp was only present at low levels in the 11 paddocks surveyed in the Walgett district and was not detected by Precicta B in any of the sites. However, based on plating *Fp* was recovered from the 1st node or crowns in 6 of 9 paddocks from which stubble was collected. Based on plating, Site WA 3 has a medium risk of developing damaging levels of crown rot in 2010. All sites had a winter cereal crop in 2008 but only WA 6 and WA 8 had a wheat crop also in 2009. All other paddocks had varying winter break crops in 2009 (4 x Canola, 3 x Chickpea or 2 x Faba beans). This use of rotation highlights the effectiveness of crop rotation in limiting the build-up of crown rot inoculum levels within paddocks.

Bipolaris was detected at low levels across 10 of the 11 sites (91% paddocks) sampled in the Walgett district, but only site WA 4 indicated a medium risk to losses from common root rot infection in 2010. EGA Gregory was planned for sowing in this paddock which has moderate resistance to common root rot which should limit any potential losses.

Fusarium culmorum/F. graminearum was not detected in any paddocks in the Walgett district indicating there is negligible risk within the region of developing Fusarium head blight from these pathogens. *Pythium* was detected at low levels across the Walgett district being present in 82% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. However, the DNA test indicated that in all paddocks *Pythium* levels were well below thresholds for expected yield loss in 2010.

Warren District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Leigh Jenkins[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Warren

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of the 10 paddocks tested in the Warren district is shown below (Figure 1).

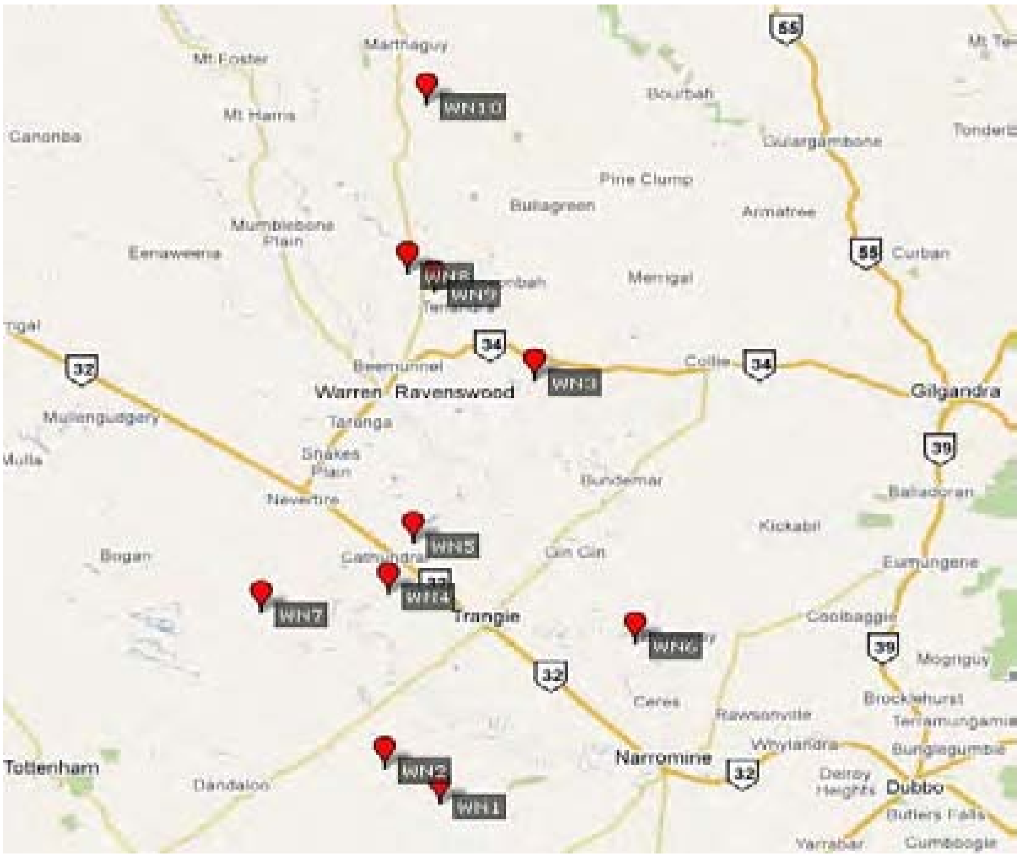

Figure 1. Warren district paddocks – 2010

Results – Sowing

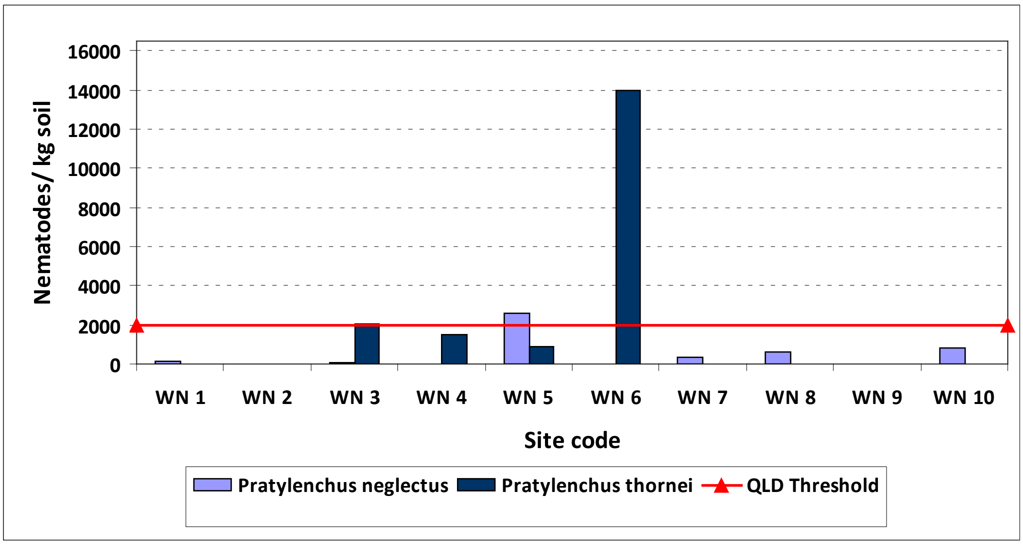

Figure 2. Populations of root lesion nematodes in Warren district – sowing 2010

- *Pratylenchus neglectus* was detected in 6 out of the 10 paddocks (WN 1, WN 3, WN 5, WN 7, WN 8 and WN 10). The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. Populations of *P. neglectus* were above this threshold only at site WN 5 (2,575 *P. neglectus*/kg soil).
- *Pratylenchus thornei* was detected in 4 out of the 10 paddocks. The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. Site WN 3 is just above this threshold (2,069 *P. thornei*/kg soil) while site WN 6 was well above the threshold (13,988 *P. thornei*/kg soil). Both sites WN 4 and WN 5 are below the threshold for expected yield loss in intolerant wheat varieties.
- Two sites (WN 3 and WN 5) had mixed populations of both RLN species.

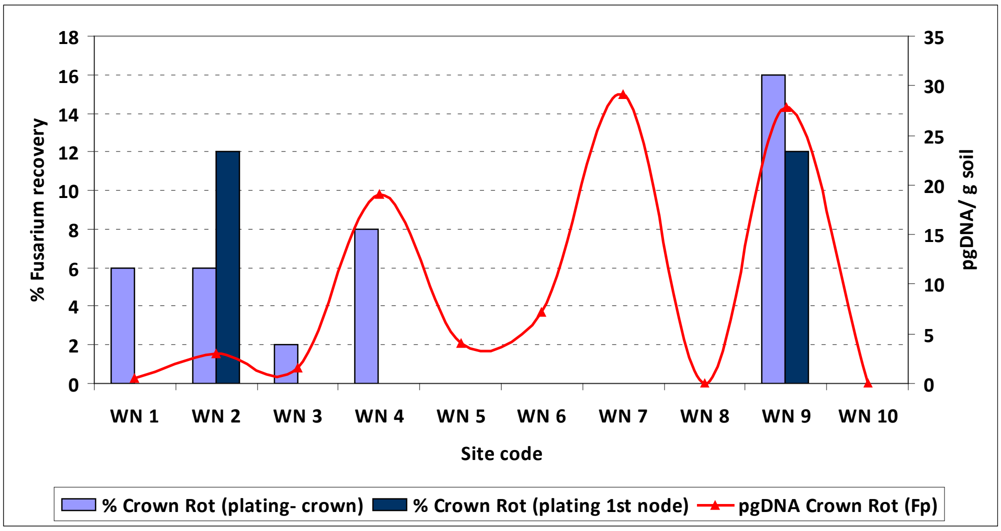

Figure 3. Crown rot incidence Warren district – sowing 2010

- *Fusarium pseudograminearum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories (red line) six sites are at low risk of crown rot infection in 2010 with the other four sites below the detectable limit.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. Site WN 9 has a medium risk of crown rot in 2010 based on recovery from both the crown and 1st node. Site WN 2 has medium risk based on recovery from the 1st node but a low risk based on levels in the crown. Stubble was not collected at sites WN 5, WN 8 and WN 10. The remaining sites where stubble was collected had a low risk of developing damaging levels of crown rot in 2010.

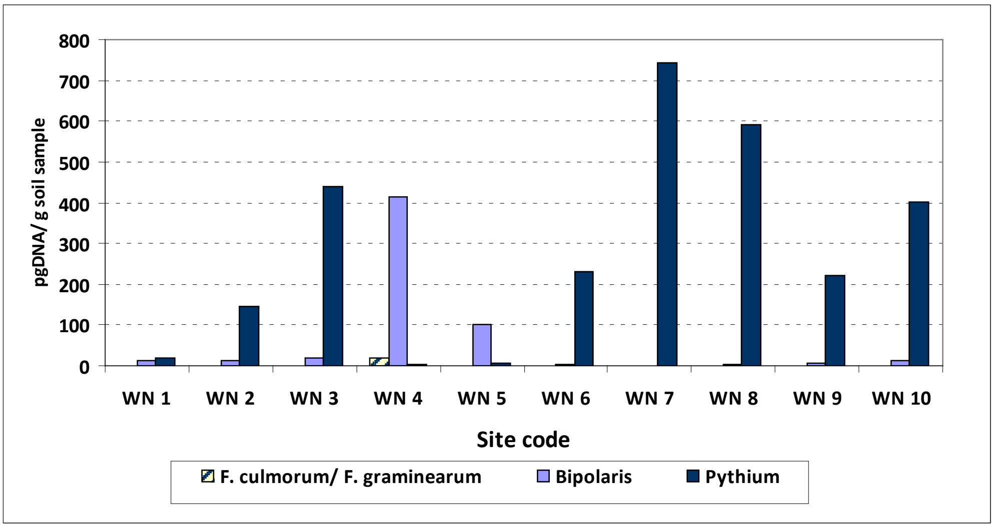

Figure 4. Incidence of other fungal pathogens in the Warren district – sowing 2010

- *Fusarium culmorum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. *Fusarium culmorum/F. graminearum* was detected at a low risk level only at site WN 4.

- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected at 7 of the 10 sites (all except WN 6, WN 7 and WN 8) but all were at a low risk level for yield loss to CRR in 2010 with the exception of site WN 4 which has a high risk for CRR (414 pg *Bipolaris*/g soil).
- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected in soil from all 10 sites in the Warren district at varying levels. Four sites (WN 1, WN 2, WN 4 and WN 5) are low risk, two sites (WN 6 and WN 9) are medium risk and four sites (WN 3, WN 7, WN 8 and WN 10) are a high risk of yield loss from *Pythium* infection in 2010.
- *Rhizoctonia* was not detected in soil collected from any of the 10 sites in the Warren district.

Conclusions

This was a random sample of 10 paddocks in the Warren district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Warren district.

Nematodes were widespread in the Warren district with *P. neglectus* detected in 60% of paddocks and *P. thornei* in 40% of paddocks. Two of the 10 paddocks had mixed populations of both RLN species. Only one site (WN 5) had a *P. neglectus* population and two sites (WN 3 and WN 6) had *P. thornei* populations above the QLD threshold for yield loss in intolerant wheat varieties. Sites WN 3 and WN 6 have both been sown to EGA Gregory which is moderately tolerant to *P. thornei* while site WN 5 was sown to Strzelecki which is moderately tolerant to *P. neglectus*. Note, Strzelecki is moderately intolerant-intolerant to *P. thornei* which highlights the importance of correctly identifying which RLN species is present in a paddock. This is important when considering variety selection, as tolerance can vary dramatically to the two nematode species. The use of varieties with moderate tolerance to the different RLN species should minimise yield loss to RLN in these paddocks in 2010. RLN needs to become a consideration in rotation sequences within the district to maintain, and reduce where needed, populations of both nematode species below damaging levels.

The crown rot fungus was recovered at varying levels from 71% of paddocks in the Warren district from which cereal stubble was collected. Based on plating, site WN 9 has a medium risk of developing damaging levels of crown rot in 2010 based on Fusarium recovery from both the crown and 1st node. Site WN 2 has a medium risk based on recovery from the 1st node but only low risk based on recovery from the crown. The PreDicta B *Fp* test also only detected low levels of *Fp* across the Warren district fairly consistent with the stubble plating results. PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. Although there was a medium risk of crown rot detected based on the stubble plating at sites WN 9 and WN 2, significant levels were not detected by the PreDictaB DNA test. This may be a result of a higher Fusarium levels being present at both sites in the 1st node (above ground) whereas there were lower levels of Fusarium recovery from the crowns (in soil).

Fusarium culmorum/F. graminearum was detected at low levels only at site WN 4 indicating there is negligible risk within the region of developing Fusarium head blight or crown rot from these pathogens. *Bipolaris* was widespread in the Warren district being detected at low levels in 70% of paddocks, but only one site (WN 4) had levels representing a high risk of losses from CRR infection in 2010. EGA Gregory was planned for sowing in this paddock which has moderate resistance to CRR which should limit any potential losses. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen.

Pythium was detected at varying levels across the Warren district being present in 100% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. The DNA test indicated that four sites (WN 3, WN 7, WN 8 and WN 10) have a high risk and two sites (WN 6 and WN 9) have a medium risk of *Pythium* infection in 2010. Additionally, site WN 2 has *Pythium* levels (146 pg *Pythium*/g) approaching a medium risk. That is, 70% of paddocks in the Warren district appear to have concerning levels of *Pythium* that could potentially be impacting on crop establishment and growth. *Pythium* infects plant roots through a spore that swims through water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection.

Wellington District Cereal Pathogen Report – 2010

Elizabeth Farrell[1], Greg Brooke[2], Robyn Shapland[1] and Steven Simpfendorfer[1]

[1] NSW DPI, Tamworth

[2] NSW DPI, Wellington

Background

A one hectare area was established in each focus paddock. Each paddock was to be sown to a winter cereal in 2010. Twenty-four small cores were collected in a grid across the trial area targeting the previous crop rows to a depth of 0–15 cm either prior to or shortly after sowing. Soil samples were sent to SARDI for PreDicta B analysis. At each point where soil cores were collected a small handful of winter cereal stubble was taken for plating. The location of some of the 12 paddocks tested in the Wellington district is shown below (Figure 1).

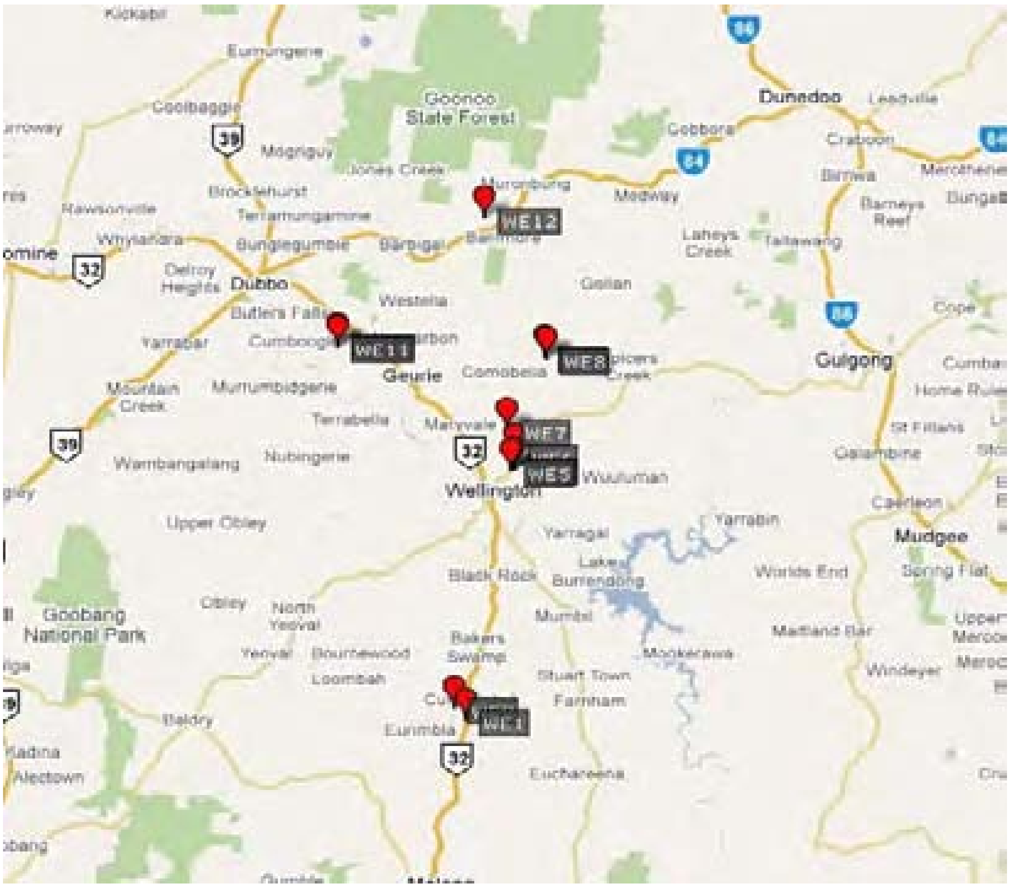

Figure 1. Wellington district paddocks – 2010

Results – Sowing

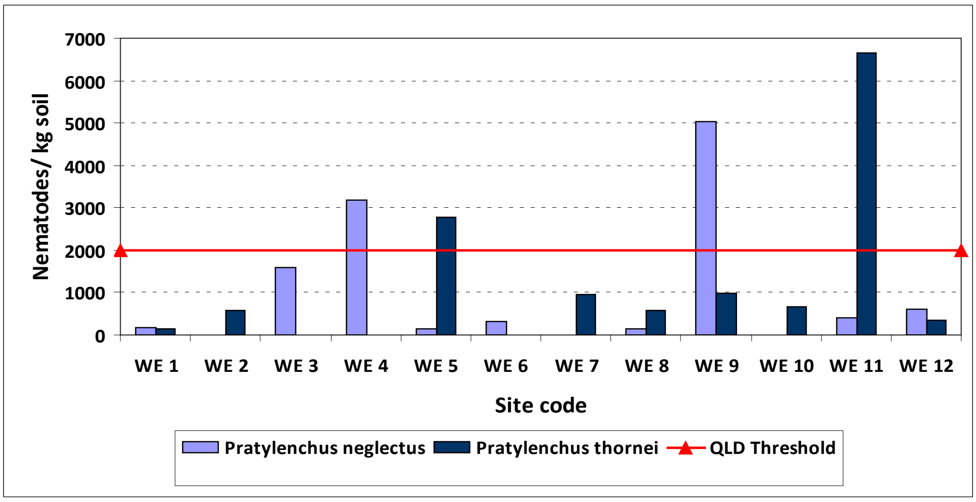

Figure 2. Populations of root lesion nematodes in Wellington district – sowing 2010

- *Pratylenchus neglectus* was detected in 9 out of the 12 paddocks surveyed in the Wellington district. The QLD threshold for yield loss in intolerant wheat varieties is 2000 nematodes/kg soil. Sites WE 4 and WE 9 were both above this threshold. Site WE 3 is approaching the threshold with 1,592 *P. neglectus*/kg soil.
- *Pratylenchus thornei* was also detected in 9 out of the 12 paddocks surveyed. Two sites (WE 5 and WE 11) were above the Qld threshold of 2000 nematodes/kg soil for yield loss in intolerant wheat varieties.
- Six of the 12 paddocks in the Wellington district had mixed populations of both nematode species.

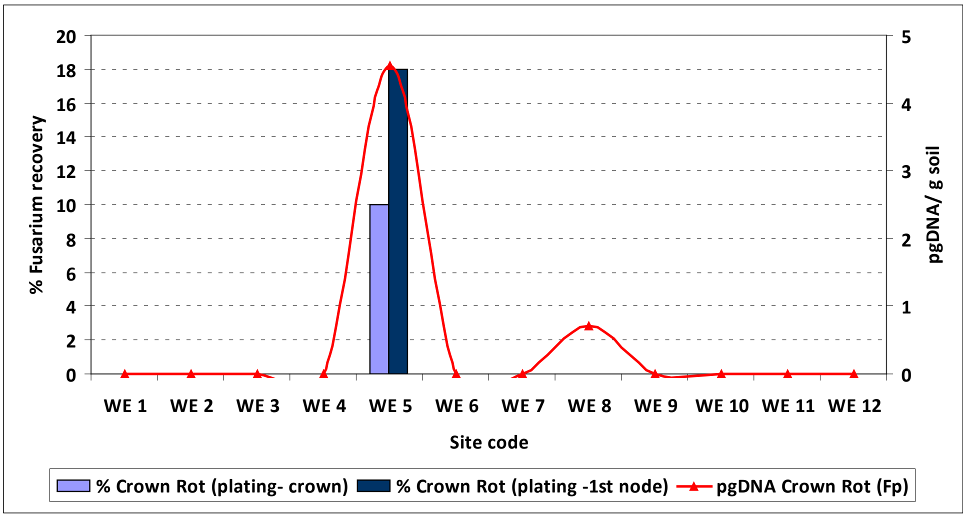

Figure 3. Crown rot incidence Wellington district – sowing 2010

- *Fusarium pseudograminearum (Fp)* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. Based on these categories all sites (red line), with exception of WE 5, are below the detectible limit for *Fp* (i.e. < 3 pg DNA/g soil). Site WE 5 has a low risk of crown rot infection in 2010.
- With plating of crowns and 1st nodes based on % recovery of Fusarium on semi-selective laboratory medium risk categories are Low 0 to 11%, Medium 12 to 24% and High ≥ 25%. All sites (except WE 5) where stubble was collected are at a low risk of developing crown rot in 2010. Site WE 5 has a low risk of developing crown rot based on Fusarium recovery from crowns but a medium risk based on Fusarium recovery from the 1st node. Stubble was not collected at sites WE 1, WE 2, WE 6, WE 9, WE 10, WE 11 and WE 12.

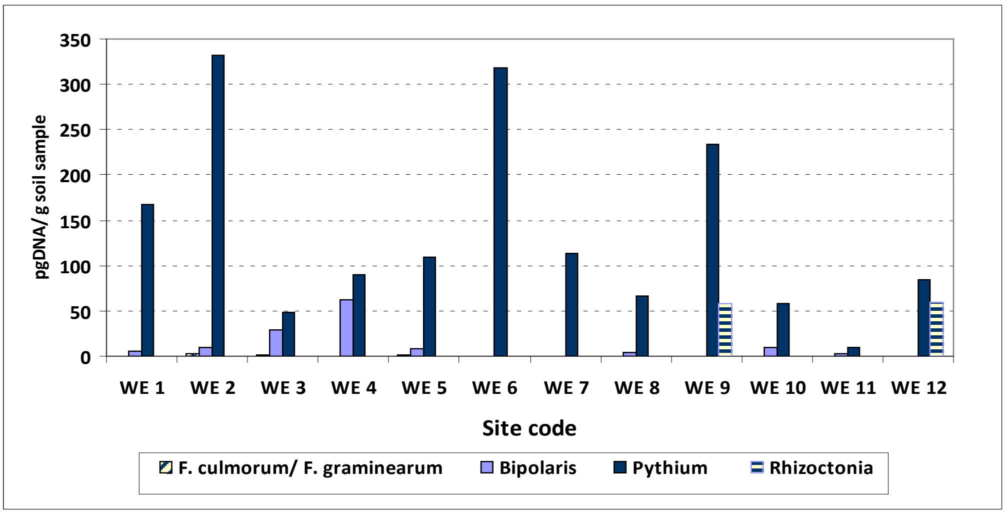

Figure 4. Incidence of other fungal pathogens in the Wellington district – sowing 2010

- *Fusarium culmorum* PreDicta B risk categories for crown rot are below detection < 3 pg DNA/g soil, Low 3 to 100 pg DNA/g soil, Medium 100 to 315 pg DNA/g soil, High > 315 pg DNA/g soil based on southern data. All sites were below the detection limit.
- Provisional common root rot (CRR) risk categories are Low 5 to 157, Medium 157 to 339 and High > 339 pg DNA/g soil. *Bipolaris* was detected in soil collected from 7 of the 12 sites in the Wellington district. All sites are at a low risk of yield loss from CRR in 2010.

- Provisional *Pythium* risk categories based on southern data are Low < 150, Medium 150 to 250 and High > 250 pg DNA/g soil. *Pythium* was detected at varying levels in soil collected from all 12 paddocks surveyed. Two sites (WE 2 and WE 6) have *Pythium* levels indicating a high risk of yield loss while another two sites (WE 1 and WE 9) have *Pythium* levels indicating a medium risk of yield loss to *Pythium* infection in 2010. The remaining sites are all at a low risk of yield loss from *Pythium* infection.
- Sites WE 9 and WE 12 are both at a medium risk level for *Rhizoctonia* infection in 2010. *Rhizoctonia* was not detected in soil collected from the remaining sites.

Conclusions

This was a random sample of 12 paddocks in the Wellington district that have been sown to a winter cereal in 2010. Paddocks were NOT selected because they were expected to have an underlying soil/stubble-borne disease issue. However, this is a limited survey size so caution should be taken in extrapolating these findings across the entire Wellington district.

Nematodes were widespread in the Wellington district with all paddocks containing at least one of the two species of RLN. Both *Pratylenchus neglectus* and *P. thornei* were detected in 75% of paddocks with half of the paddocks having mixed populations of both RLN species. Sites WE 4 and WE 9 had populations of *P. neglectus* above the QLD threshold for yield loss in intolerant wheat varieties while sites WE 5 and WE 11 had populations of *P. thornei* above the threshold for yield loss. This situation highlights the importance of correctly identifying which RLN species is present in a paddock (or is dominant) as it is critical when considering variety selection, as tolerance can vary dramatically to the two nematode species. For example, Strzelecki is moderately tolerant to *P. neglectus* but is moderately intolerant-intolerant to *P. thornei.* The use of varieties with moderate tolerance to the different RLN species should minimise yield loss to RLN in these paddocks in 2010. RLN needs to become a consideration in rotation sequences within the district to maintain, and reduce where needed, populations of both nematode species below damaging levels.

Crown rot does not appear to be a major issue in the 12 paddocks surveyed in 2010. Based on stubble plating, all sites (except WE 5) were identified as having a low risk of developing damaging levels of crown rot in 2010. Site WE 5 had moderate levels of Fusarium recovery from the 1st node, indicating a medium risk of crown rot infection in 2010. The PreDicta B *Fp* test also only detected low levels of *Fp* across the Wellington district consistent with the stubble plating results. PreDicta B is a soil based test, so it may provide a less reliable indication of pathogen levels in stubble above ground. Although there was a medium risk of crown rot based on the stubble plating at site WE 5, significant levels were not detected by the PreDicta B DNA test. This may be a result of a medium risk level being detected from recovery from the 1st node (above ground) whereas there were only low levels of Fusarium recovery from the crowns (in soil).

Fusarium culmorum/F. graminearum was not detected in any paddocks in the Wellington district indicating there is negligible risk within the region of developing Fusarium head blight from these pathogens. *Pythium* was detected at varying levels across the Wellington district being present in 100% of paddocks. *Pythium* has a long lived (5–7 years) survival structure (oospore) in the soil so is a very common soil pathogen. The DNA test indicated that two sites (WE 2 and WE 6) have a high risk and two sites (WE 1 and WE 9) have a medium risk of *Pythium* infection in 2010. Consequently, 33% of paddocks in the Wellington district appear to have concerning levels of *Pythium* that could potentially be impacting on crop establishment and growth. *Pythium* infects plant roots through a spore that swims through water, so infection is favoured by wet soil conditions. Seed treatments containing metalaxyl can assist in limiting seedling death associated with *Pythium* infection.

Bipolaris was widespread in the Wellington district being detected only at low levels in 58% of paddocks. *Bipolaris* has a thick walled spore that can survive around 2 years in the soil so is a common soil-borne pathogen. Finally, two sites (WE 9 and WE 12) had a medium risk of *Rhizoctonia* infection in 2010. There is no varietal resistance to *Rhizoctonia* with control mainly relying on soil disturbance below the seed depth at sowing using modified tynes.

Chickpea Ascochyta – matching management to varietal reaction

Kevin Moore, Ted Knights, Paul Nash, Gail Chiplin

NSW DPI, Tamworth

Introduction

Ascochyta blight, caused by the fungus Ascochyta rabiei, is a major threat to production and adoption of chickpeas in the Northern GRDC region. In years that favour the disease such as 2010, susceptible varieties can be rapidly killed if Ascochyta is not managed properly.

In 1998 when Ascochyta caused, for the first time, widespread damage to the eastern Australian chickpea industry, all varieties were highly susceptible to the disease and needed protection from foliar fungicides. In wet seasons, crops of susceptible varieties require repeated applications of Ascochyta fungicides. Spraying crops with fungicides has several disadvantages:

(i) fungicides, and their application, cost money e.g. a single spray of 1.0 L/ha chlorothalonil (720 g/L active) costs $16/ha for the product and $5/ha to apply if the grower is using his own ground gear.

(ii) in years when fungicides are most needed, paddocks can be too wet for ground rigs and the only way to protect the crop is from the air. Application by plane or helicopter is expensive.

(iii) when an Ascochyta epidemic is widespread and large areas of crop are sprayed repeatedly, fungicide supply can run out (as it did in 2010), leaving crops vulnerable to new infections.

Since 1998, chickpea breeding programs throughout Australia have focused on developing varieties with improved resistance to diseases. In 2005, the National desi breeding program based at Tamworth, released two varieties Yorker and Flipper, both with improved resistance to Ascochyta. However, in seasons favourable to disease, Yorker and Flipper still needed fungicides. In 2009, the same program released PBA HatTrick, which provided a quantum leap in Ascochyta resistance – in most years HatTrick would require no Ascochyta sprays.

However 2010, the first time HatTrick was grown commercially on a wide scale, was not a typical year. Mild temperatures, long cloudy periods and frequent rainfall events were ideal for Ascochyta epidemics. These conditions provided an opportunity to evaluate Ascochyta management strategies for HatTrick and soon to be released varieties under extreme disease pressure.

Site details

Location:	Tamworth Agricultural Institute
Sowing Date:	19 May 2010
First fungicide sprays:	17 June 2010
Inoculation with Ascochyta:	17 June 2010
Desiccation:	28 November 2010
Harvest:	22 December 2010
Rain 17 Jun–28 Nov 2010:	430mm
Rain days 17 Jun–28 Nov:	67 (46 days > 1.0mm)
LTA rain Jun–Nov:	313mm
LTA rain days Jun–Nov:	44 (34 days > 1.0mm)

Treatments

Five varieties: Jimbour , Kyabra , PBA HatTrick and two new desi lines CICA0511 and CIAC0913

Three fungicide treatments, 4 reps: a low disease scenario with regular applications of 1.0 L/ha chlorothalonil (720g/L active), a high disease scenario with Nil sprays and a treatment (VMP) with low and off label rates of chlorothalonil. The first VMP spray for Jimbour and Kyabra was applied before inoculation. The first Variety Management Package (VMP) spray for the other entries was applied after three infection events.

NOTE: Whilst biomass was higher than in previous years and some plots lodged partially, Botrytis Grey Mould (BGM) was not a problem in the trial.

Ascochyta development

The trial was inoculated during a rainfall event with a cocktail of nine isolates of A. rabiei collected from commercial chickpea crops in 2008 and 2009 at a rate of 1 million spores per mL in 200 L/ha water. This early (plants at the 3 leaf stage) and heavy rate of inoculation combined with extremely favourable conditions resulted in high levels of Ascochyta,blight so much so that the unprotected susceptible varieties were dead by the end of July. So great was the disease pressure that the VMP treatment, which is normally effective on all varieties, did not adequately control the disease on the susceptible entries Jimbour and Kyabra (Figure 1).

Grain yield

There were large differences in yield among varieties and between fungicide treatments (Figure 1).

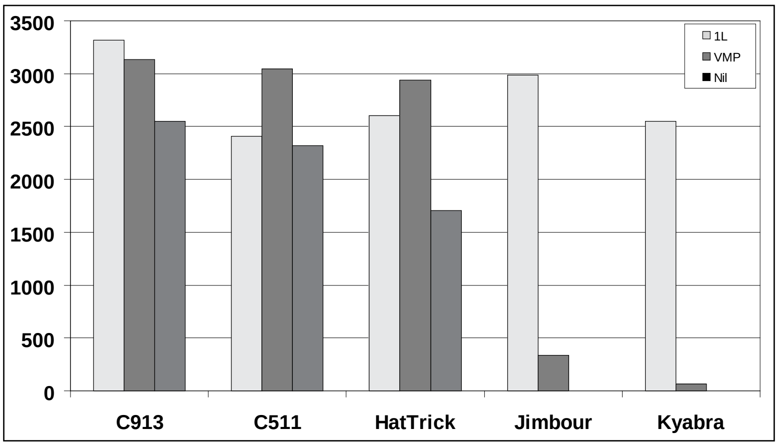

Figure 1. Grain yield, kg/ha of five desi chickpea varieties under three Ascochyta management scenarios.

The lower yield of the 1L C511 reflects Phytophthora root rot developing in two of the reps of that variety x treatment cohort.

Gross margins

Gross margins take into account other production costs estimated at $300/ha; chickpea price $450/t.

Table 1. Number of chlorothalonil sprays, cost of spraying, grain yield, and gross margin for five desi chickpea varieties in the Tamworth VMP10 trial

Variety and treatment	No. Sprays	Cost $/ha	Yield kg/ha	GM $/ha
Jimbour 1.0 L	14	294	2988	750
[a]Kyabra 1.0 L	14	294	2549	553
HatTrick 1.0 L	14	294	2604	578
CICA511 1.0 L	14	294	2410	491
CICA913 1.0 L	14	294	3317	899
Jimbour VMP	12	156	337	–304
Kyabra VMP	12	156	67	–426
HatTrick VMP	11	142	2941	882
CICA511 VMP	11	143	3044	927
CICA913 VMP	11	143	3132	966
Jimbour Nil	0	0	0	–300
Kyabra Nil	0	0	0	–300
HatTrick Nil	0	0	1707	468
CICA511 Nil	0	0	2320	744
CICA913 Nil	0	0	2548	846

[a]Kyabra 1.0L one of the four reps was severely affected by water logging which (i) compromised Ascochyta control and (ii) impacted on yield

Summary

Note – this trial evaluated a lower and off-label rate of fungicide in order to capture data for consideration to have that rate included on the Label.

Key findings of VMP10 were:

- Under extreme disease pressure, Ascochyta can be successfully managed on susceptible varieties with registered rates of chlorothalonil
- Well managed Jimbour yielded nearly 3t/ha with a GM of $750/ha
- Under extreme disease pressure, a lower rate of chlorothalonil (i.e. VMP) was a waste of money on susceptible varieties, but was very cost effective on varieties with an Ascochyta rating as good as or better than PBA HatTrick
- Under extreme disease pressure, unsprayed HatTrick still gave a profitable yield
- The new CICA lines, 511 and 913 performed exceptionally well, yielding over 2t/ha without any foliar fungicide.

Acknowledgements

This project is funded by NSW DPI and GRDC Northern Grains Pathology Projects (DAN00143).

Weeds

Important Use of Pesticides

Pesticides must only be used for the purpose for which they are registered and must not be used in any other situation or in any manner contrary to the directions on the label.

Some chemical products have more than one retail name. All retail products containing the same chemical may not be registered for use on the same crops. Registration may also vary between states. Check carefully that the label on the retail product carries information on the crop to be sprayed.

This publication is only a guide to the use of pesticides. The correct choice of chemical, selection of rate and method of application is the responsibility of the user. Pesticides may contaminate the environment. When spraying, care must be taken to avoid spray drift on to adjoining land and waterways. Residues may accumulate in animals fed any crop product, including crop residues, which have been sprayed with pesticides. In the absence of any specified grazing withholding period(s), grazing of any treated crop is at the owner's risk.

In-crop (wheat) late post-emergence control options for fleabane

Tony Cook

NSW DPI, Tamworth

Introduction

Fleabane is known to be a difficult to control weed of summer fallows. Establishment of the weed often occurs in the later periods of the winter crop rotation including cereals such as wheat. The weed can persist beyond harvesting of winter cereals as the plant is drought tolerant and thus survives periods when crops have significantly depleted soil moisture reserves. Control of this weed in the winter cereal phase is critical for keeping summer fallow infestations very low.

The purpose of this study was to assess a range of selective post-emergence herbicides and to determine optimal control options for the management of fleabane.

Site details

Location: Bellata

Note: Some treatments were selected as 'lucerne' friendly treatments, as a proportion of cereal grower's under-sow winter cereals with Lucerne.

Treatments

Please refer to Table 1 below for the list of treatments. Treatments were applied on 10th August 2009.

Table 1. Herbicide treatments including rate, group and suitability for use in intercropped lucerne

Trt #	Herbicide	Rate per hectare	Herbicide Group	Suitable for under-sown lucerne
1	control	–	–	–
2	Hotshot	715 mL	I	No
3	Starane 200	500 mL	I	No
4	Lontrel	100 mL	I	No
5	2,4-D amine 625	800 mL	I	No
6	2,4-D Esteron 680	735 mL	I	No
7	MCPA amine	1 L	I	No
8	MCPA LVE	1 L	I	No
9	dicamba 500	280 mL	I	No
10	Glean	20 g	B	No
11	2,4-DB 500	1 L	I	Yes
12	bromoxynil	1.4 L	C	Yes
13	Tordon 75-D	300 mL	I	No
14	Ally	7 g	B	No
15	Torpedo	100 mL	I + B	No
16	Broadstrike	25 g	B	Yes
17	Tordon 242	1 L	I	No

Note: Uptake spraying oil was added to all treatments at 500 mL per 100 L

Results

Table 2. Fleabane weed control data

Treatment (Rate product / ha)	Fleabane plants per plot 10.8.09	Brownout (0–5) 18.8.09	Brownout (0–5) 18.9.09	Fleabane plants per plot 3.11.09	% reduction fleabane 23.12.09
control	35.0	0.0	0.9	29.7	23.0
Hotshot (715 mL)	26.7	2.2	3.4	0.0	100.0
Starane 200 (500 mL)	36.7	2.1	3.0	0.0	100.0
Lontrel (300) (100 mL)	25.0	1.9	2.7	3.3	87.2
2,4-D amine 625 (800 mL)	38.3	1.9	2.3	1.3	96.8
2,4-D Esteron 680 (735 mL)	58.3	2.2	2.9	0.0	100.0
MCPA amine (1 L)	15.0	1.8	2.3	0.3	97.8
MCPA LVE (1 L)	43.3	1.9	2.7	2.7	96.7
dicamba 500 (280 mL)	31.7	2.1	2.9	1.0	97.1
Glean (20 g)	31.7	0.3	1.0	12.3	57.4
2,4-DB 500 (1 L)	38.3	2.1	2.3	5.7	86.3
bromoxynil (1.4 L)	31.7	1.8	4.0	2.0	93.7
Tordon 75-D (300 mL)	35.0	2.2	3.3	0.0	100.0
Ally (7 g)	43.3	0.7	1.1	13.3	75.8
Torpedo (100 mL)	61.7	1.4	1.8	2.7	95.2
Broadstrike (25 g)	26.7	0.0	0.7	16.3	41.0
Tordon 242 (1 L)	40.0	2.0	3.2	2.3	93.8

Summary

Fleabane control

- Excellent control was achieved with several treatments 2½ months after treatment. Treatments that resulted in 100% control were, Tordon 75-D (300 mL), 2,4-D LVE ester (735 mL), Starane 200 (500 mL) and Hotshot (715 mL).
- The following best treatments (those obtaining between 95 and 100% control) were, dicamba 500 (280 mL), MCPA LVE amine (1L), MCPA amine (1L), 2,4-D amine 625 (800 mL).
- The sulfonyl urea herbicides, Ally and Glean had some activity against fleabane, but should be used in a tank mix with other more effective herbicides to improve control.
- If lucerne is under-sown, the best option for fleabane control would be bromoxynil (93.7% control). An alternative option would be to use 2,4-DB at 1 L/ha. The use of Broadstrike is not recommended.

Acknowledgements

This project is funded by NSW DPI and GRDC Improved Options for Fleabane Control in NR (DAQ000137). Thanks to Bill Davidson and Rebecca Miller for field assistance.

Impact of fleabane weed age and growth stage on efficacy of herbicides – glasshouse experiment

Tony Cook

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Introduction

Fleabane may survive after herbicide application due to its well developed taproot. It is hypothesised that fleabane growing under cold, moisture-stressed conditions may develop large taproots whilst not developing much foliage. Therefore, these plants could survive herbicide application better than younger fleabane (similar foliage with less root biomass). To prove this hypothesis correct, a glasshouse experiment was initiated under controlled conditions so that 'old' and 'young' fleabane could be treated with herbicides (with similar rosette size). These age comparisons were tested over three fleabane growth stages.

The purpose of this study was to:

- Evaluate the impact of fleabane age on the efficacy of commonly-used wheat herbicide treatments – keeping level of foliage similar for both age categories.
- Investigate the impact of fleabane age over three growth stages.
- Determine biomass differences between young and old categories at each spraying application time.

Site details

Location: Tamworth Agricultural Institute – Glasshouse

Pots were kept in a glass-house with natural light and regulated temperatures (via a thermostatically controlled evaporative air conditioner – set to approx. 26°C).

Methodology: Pots (20 cm diameter) were sown with seed of population sourced from the Bellata region, and seedlings were sown at 5 plants per pot but thinned down to 'uniform sized' 3 plants.

Three weed sizes at spraying (*one size of each application time)*:

1. 5 cm diameter
2. 10 cm diameter
3. Early mid stem elongating

Two weed ages:

1. Young plants. These plants will be grown without and limitations (ideal moisture, temperature and sun light). They will be sown approx 2 months after the 'older' plants – probably when they are 3 cm diameter. It is anticipated that these plants will rapidly grow and catch up the slower growing 'older' plants at the 5 cm diameter stage.
2. Old plants. These plants will be grown under limiting conditions to slow their growth rate down by reducing moisture, temperature and possibly sun light. These plants will be given non-limiting growing conditions once the younger plants have similar growth stages. This will 'align' their growing conditions and physiology/habit to those of the younger plants.

Four herbicides (refer to Table 1 for rates)

1. Untreated
2. Amicide 625
3. Glyphosate + 2,4-D ipa amine 300
4. Tordon 75D

Additional pots for destructive biomass sampling:

Five pots of from the 'young' and 'old' categories will be sampled for fleabane rosette diameter (Table 2) and biomass (Table 3) to determine if there are differences in biomass between age categories. Potting mix will be separated from the root mass and weighed immediately for fresh weight. Photos will be taken of similar sized rosettes with the aim of showing differences in root density, mass, structure etc between the two age categories. Samples will be dehydrated and biomass of shoots and roots will be measured.

Spraying

Pots were sprayed on 25/8/10 to '5 cm diameter rosette fleabane', 27/8/10 for '10 cm rosette fleabane' and finally on 15/9/10 for the 'elongating fleabane'.

Table 1. Herbicide treatments

Treatment	Herbicide	Rate (per hectare)
1	Untreated	
2	Amicide 625 (dma salt)	600 mL
3	Glyphosate 450 + 2,4-D 300 (ipa salt)	750 mL + 750 mL
4	Tordon 75-D	150 mL

Note: These herbicide rates are half the rates commonly used in other experiments. The rationale for doing this is to aim for sub-lethal rates that may discriminate between 'age' effects in fleabane plants.

Table 2. Fleabane rosette diameters (cm) for each growth/age category

Growth stage	'Old'	'Young'
'5 cm'	12	9
'10 cm'	16	12
'Stem elongating'	22	25

Figure 1. Stem elongating fleabane at the time of application ('Old' fleabane left, 'young' right). Although 'young' plants had wider rosettes, root biomass was considerably lower (Figure 2; Table 3).

Table 3. Fleabane biomass (grams – dry weight) at the time of application for each growth/age category

Growth stage	'Old'	'Young'
'5 cm'	6.78	5.67
'10 cm'	6.82	5.53
'Stem elongating'	9.34	8.57

Results

Synchronisation of fleabane growth stages, irrespective of weed age, was a difficult task (Table 2). For the first two growth stage categories ('5 cm' and '10 cm') the 'older' plants were larger than the 'younger' weeds. The aim was to have these weeds more closely matched, however fleabane plants grown under moisture stressed and cold conditions (ie 'old' fleabane) put on more foliage than anticipated and the 'younger' fleabane plants could not grow fast enough to match growth stages. These two size categories were unfairly biased towards the 'older' plants as these plants had greater biomass and rosette diameter. However, 'stem elongating' fleabane plants were better matched as the 'older' plants were smaller (less diameter) than 'younger' plants but weighed more due to the bigger root biomass (Figure 1, Tables 2 and 3). Therefore, this category would be best suited for comparing the effects of fleabane age.

Despite the reduction in herbicide rates used, almost all herbicide treatments resulted in 100% biomass reduction of fleabane regardless of weed size or age (Table 4). The one exception was fleabane in the '10 cm – old' category that was treated with Tordon 75-D. However, it was noted that the few plants surviving this treatment were unlikely to survive to produce seed as it was a distorted mass of tissue without leaves.

Figure 2. Differences in root development between 'old' (left) and 'young' (right) fleabane plants at the time of application. The older fleabane roots tended to be thicker and longer compared to the younger fleabane roots

Table 4. Fleabane biomass (grams – dry weight) at the completion of the experiment.

Growth stage	Herbicide Treatment	'Old'	'Young'
'5 cm'	untreated	31.8	42.2
'5 cm'	2,4-D (dma salt)	0	0
'5 cm'	Glyphosate + 2,4-D (ipa salt)	0	0
'5 cm'	Tordon 75-D	0	0
'10 cm'	untreated	70.2	48.8
'10 cm'	2,4-D (dma salt)	0	0
'10 cm'	Glyphosate + 2,4-D (ipa salt)	0	0
'10 cm'	Tordon 75-D	2.42	0
'Stem elongating'	untreated	70.2	80.2
'Stem elongating'	2,4-D (dma salt)	0	0
'Stem elongating'	Glyphosate + 2,4-D (ipa salt)	0	0
'Stem elongating'	Tordon 75-D	0	0

Table 5. Fleabane biomass reduction assessment estimates (%) made during the experiment.

Growth stage	Herbicide Treatment	'Old'			'Young'		
		1st	2nd	Last	1st	2nd	Last
'5 cm'	untreated	0	0	0	0	0	0
'5 cm'	2,4-D (dma salt)	79.6	91.0	100	94.2	99.0	100
'5 cm'	Glyphosate + 2,4-D (ipa salt)	82.6	88.4	100	90.6	97.2	100
'5 cm'	Tordon 75-D	78.8	85.8	100	88.4	90.6	100
'10 cm'	untreated	0	0	0	0	0	0
'10 cm'	2,4-D (dma salt)	75.4	83.8	100	93.4	97.4	100
'10 cm'	Glyphosate + 2,4-D (ipa salt)	88.8	93.8	100	96.8	99.6	100
'10 cm'	Tordon 75-D	73.6	77.4	100	79.6	90.0	100
'Stem elongating'	untreated	0	0	0	0	0	0
'Stem elongating'	2,4-D (dma salt)	74.0	100	100	65.0	94.8	100
'Stem elongating'	Glyphosate + 2,4-D (ipa salt)	81.8	100	100	86.2	100	100
'Stem elongating'	Tordon 75-D	71.0	99.6	92.8	71.0	96.8	100

Summary

Fleabane control

It appears that fleabane age does not have any influence on herbicide efficacy when compared at similar growth stages and growing conditions at the time application. Despite halving the herbicide rates and treating fleabane over three different growth stages, it appears herbicide effects surpass any possible influence of weed age.

Acknowledgements

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Impact of fleabane size and soil moisture on herbicide efficacy – glasshouse experiment

Tony Cook

NSW DPI, Tamworth

Introduction

Fleabane emerges mostly in late autumn or early winter, and can be a major weed in winter cereal crops. Therefore, more information is required on the efficacy of a wide variety of selective herbicides used in winter cereal crops on fleabane. As well, herbicide efficacy is often influenced by weed age / size and moisture stress. Therefore, this experiment aimed to determine the impact of moisture stress and fleabane size on the efficacy of 11 herbicide treatments commonly used in winter cereal production systems.

Site details

Location: Tamworth Agricultural Institute

Pots were kept in a glasshouse with natural light and regulated temperatures (via a thermostatically controlled evaporative air conditioner set to approx. 26°C.)

Fleabane plants were transplanted, 5 plants per pot, and hand weeded down to 4 uniform sized plants per pot. Moisture stresses were imposed on half the potted fleabane plants by reducing soil moisture content down to 25% of available moisture content. The remaining plants had no moisture stress and were grown at or near field capacity (100% available soil moisture).

Treatments were applied on 28.10.09, using Hardi 110-14 nozzles with a water rate of 100 L/ha (Table 1). Fleabane rosette diameters were measured two days prior to the application of herbicide treatments (Table 2).

On 25th November 2009 (28 Days after treatment) the number of surviving fleabane plants was recorded. All fleabane plants with green shoot material were harvested, dried at 40°C for 7 days then weighed to determine biomass.

Treatments

Table 1. Herbicide treatments

Trt #	Herbicide	Rate (per ha)	Wetter
1	Untreated		
2	Ally	5 g	Non-ionic (1 mL/L water)
3	Amicide 625	1200 mL	
4	Hotshot	750 mL	
5	Starane Advance	600 mL	Uptake (500 mL/100 L)
6	Tordon 242	1 L	
7	Tordon 75D	300 mL	
8	Ally + MCPA LVE	5 g + 750 mL	Non-ionic (1 mL/L water)
9	Hotshot + MCPA LVE	750 mL + 750 mL	
10	Starane + MCPA	600 mL + 750 mL	Uptake (500 mL/100 L)
11	Tordon 242 + Ally	1 L + 5 g	Non-ionic (1 mL/L water)
12	Tordon 75D + 24D	300 mL + 375 mL	

Table 2. Fleabane rosette diameter measurements taken 2 days prior to the application of herbicides

Size and moisture treatment	Herbicide treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
	Rosette diameter (cm)											
Small 25%	3.87	4.90	4.00	4.07	5.50	3.73	4.77	4.47	5.33	3.63	4.40	3.90
Small 100%	4.60	4.90	5.90	4.80	5.20	5.30	5.60	5.03	5.03	5.43	4.93	5.50
Large 25%	9.90	7.93	9.77	9.33	10.27	9.47	10.63	10.20	10.60	9.63	9.10	9.57
Large 100%	12.23	11.80	10.87	9.30	10.40	10.63	10.57	10.40	11.40	9.10	10.20	10.63

The average rosette diameters for the small fleabane across herbicides were 4.4 and 5.2 cm for 25% and 100% moistures, and for large fleabane treatments 9.7 and 10.6 cm for 25% and 100% moistures.

Results

Overall, Tordon 242 + Ally (#11) was the most effective herbicide for controlling fleabane with the least number of survivors and lowest biomass production (Table 3).

A complete statistical analysis is occurring, however there appears to be a large herbicide effect and possibly weed age/size effect on efficacy. Soil moisture tended to less effect of herbicide efficacy (Table 4).

When small weeds were sprayed, all herbicide treatments significantly reduced biomass, resulting in 76 to 100% control (Table 4).

However when larger weeds were sprayed, there were small to moderate differences in herbicide efficacy, ranging from 72 to 99% control. The best treatments were Tordon 242 + Ally (#11) followed by Hotshot (#4).

Table 3. The impact of herbicides, weed age and soil moisture on number of survivors, seedling biomass and % control (28 DAT)

Size and moisture treatment	Herbicide treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
	Number of survivors (per pot)											
Small 25%	3.7	2.3	2.7	2.7	2.0	3.3	1.3	3.3	3.7	2.3	1.7	2.3
Small 100%	3.0	3.0	1.0	1.0	1.7	1.3	1.7	3.3	2.7	2.3	0.7	2.0
Large 25%	3.7	3.3	3.3	4.0	4.0	4.0	4.0	4.0	3.3	3.3	4.0	2.7
Large 100%	3.7	3.7	3.3	2.7	3.3	2.3	3.0	3.3	3.0	2.3	1.0	4.0
Average	3.53	3.08	2.58	2.58	2.75	2.75	2.50	3.50	3.17	2.58	1.83	2.75
	Biomass (mg/pot)											
Small 25%	647	107	67	73	77	77	100	57	157	63	17	57
Small 100%	1723	60	63	0	107	73	60	60	93	70	17	37
Large 25%	2173	350	310	357	443	413	613	510	530	580	273	397
Large 100%	5083	887	537	297	447	617	623	257	783	373	43	660
Average	2406.50	350.83	244.17	181.67	268.33	295.00	349.17	220.83	390.83	271.67	87.50	287.50
	% control (using biomass – mg/pot)											
Small 25%	0	84	90	89	88	88	85	91	76	90	97	91
Small 100%	0	97	96	100	94	96	97	97	95	96	99	98
Large 25%	0	84	86	84	80	81	72	77	76	73	87	82
Large 100%	0	83	89	94	91	88	88	95	85	93	99	87
Average	0.00	86.62	90.30	91.60	88.19	88.18	85.14	89.81	82.64	88.03	95.76	89.47

Table 4. The impact of moisture and weed size on some measured control variables (data presented as averages across all herbicide treatments)

	Moisture stress status	Low	High
Plant size		**Number of survivors (per pot)**	
Small		2.81	2.29
Large		2.89	3.31
		Biomass (mg/pot)	
Small		388.0	160.8
Large		655.0	731.5
		% control (using biomass – mg/pot)	
Small		81.0	84.6
Large		82.0	78.0

Summary

Fleabane should be sprayed when small (< 5 cm diameter) when most herbicides commonly used in winter cereal crops are highly effective. For larger weeds (> 10 cm diameter) 1 L/ha of Tordon 242 + 5g/ha of Ally was the most effective herbicide option. Increasing soil moisture from 25% to 100% of available moisture had no consistent effect on herbicide efficacy irrespective of weed age. That is, fleabane size had a much greater influence of herbicide efficacy than moisture stress.

These herbicides treatments were evaluated without the effects of crop competition, therefore control maybe higher under realistic field conditions where competitive effects from winter cereal crops may keep fleabane growth checked. Furthermore, it was noted that many plants were seriously affected on the last assessment date and were likely to die if assessments were made much later. Applying herbicides in winter crops is likely to result in less actual herbicide hitting the targeted small fleabane plants due to shading from the cereal crop. This reduced contact between applied herbicide and the target may lead to lower levels of fleabane control than experienced in this glasshouse experiment where there was no impediment to the contact of herbicide with the target. Therefore, the better treatments identified in this glasshouse experiment need to be tested under field conditions at various application timings to confirm or refute suggested efficacies.

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Double knocking large glyphosate resistant awnless barnyard grass (BYG) plants and glyphosate rate response experiment

Tony Cook

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Introduction

There are many options to control small glyphosate resistant BYG but no chemical treatments for larger plants. The critical BYG growth stage where most chemical options become ineffective is approximately the mid-tillering stage, from previous research. However it does not take long in warm, wet summer months to get large BYG plants. Furthermore, if effective pre – or early post-emergence herbicide options are successful, there are always a few surviving plants. These plants will quickly become large plants capable of producing at least 10-fold more seed than smaller plants. Therefore, they easily re-set the seed bank. A tactic must be developed to combat these large BYG plants and prevent them from re-setting the seed bank.

Site details

Location:	Bellata
Spray dates:	1st application on 23.2.09 and 2nd application on 6.3.09 (11 day gap)
BYG resistance status:	Moderate 7-fold resistance
BYG growth stage:	10 to 20 tillers per plant – early panicle emergence
BYG density:	approx 1 to 2 plants per m^2
Spraying water rate:	100 L/ha

Treatments

This experiment was a spilt block design with glyphosate rates and paraquat as treatment effects (sprayed 23.2.09) and ± paraquat as a 2nd knock as the split block effect (sprayed 6.3.09)(Table 1). For the split block treatments without the paraquat 2nd knock, these treatments comprised a glyphosate rate response component and those with the paraquat 2nd knock comprised the double knock component of the experiment.

Table 1. Treatment list

1st Knock herbicide and rate/ha	2nd Knock herbicide and rate/ha	1st Knock herbicide and rate/ha	2nd Knock herbicide and rate/ha
Rate response component of experiment		**Double knock component of experiment**	
Paraquat 2.4 L	Nil	Paraquat 2.4 L	Paraquat 2.4 L
Nil	Nil	Nil	Paraquat 2.4 L
Glyphosate 450 2 L	Nil	Glyphosate 450 2 L	Paraquat 2.4 L
Glyphosate 450 4 L	Nil	Glyphosate 450 4 L	Paraquat 2.4 L
Glyphosate 450 6 L	Nil	Glyphosate 450 6 L	Paraquat 2.4 L
Glyphosate 450 8 L	Nil	Glyphosate 450 8 L	Paraquat 2.4 L
Glyphosate 450 10 L	Nil	Glyphosate 450 10 L	Paraquat 2.4 L

NB: Knocks applied 11 days apart.

Results

This population of awnless barnyard grass is capable of surviving 10 L/ha of glyphosate 450, proving that this BYG population is moderately resistant to glyphosate (Table 2). A once off application of paraquat is ineffective (Table 2) but another follow up application of paraquat improves control to 100% (Table 3). Another treatment that achieved 100% control of BYG was the initial application of glyphosate 10 L/ha followed up with paraquat at 2.4 L/ha.

Glyphosate resistance in field is patchy, as shown by the rate response data in Table 2. Greater reductions in BYG numbers appeared in the glyphosate 4 L/ha plots compared to the higher rates of 6 L and 8 L/ha. However, this effect is a likely consequence of having more susceptible plants in the 4 L/ha plots due the patchy distribution of glyphosate resistance.

Table 2. Glyphosate rate response on glyphosate resistant BYG + paraquat treatment. Data presented as a reduction in plant numbers (%) from initial counts to numbers recorded 42 days after treatment (DAT).

1st Knock herbicide and rate /ha	2nd Knock herbicide and rate/ha	% reduction in BYG plants per m^2 (17.4.09–42 DAT)
Nil	Nil	–3.8
Paraquat 2.4 L	Nil	50.6
Glyphosate 450 2 L	Nil	15.4
Glyphosate 450 4 L	Nil	80.3
Glyphosate 450 6 L	Nil	55.6
Glyphosate 450 8 L	Nil	68.5
Glyphosate 450 10 L	Nil	95.7

Table 3. Double knocking glyphosate resistant BYG. Data presented as a reduction in plant numbers (%) from initial counts to numbers recorded 42 days after treatment (DAT).

1st Knock herbicide and rate /ha	2nd Knock herbicide and rate/ha	% reduction in BYG plants per m^2 (17.4.09–42 DAT)
Paraquat 2.4 L	Paraquat 2.4 L	100.0
Nil	Paraquat 2.4 L	10.5
Glyphosate 450 2 L	Paraquat 2.4 L	60.5
Glyphosate 450 4 L	Paraquat 2.4 L	80.2
Glyphosate 450 6 L	Paraquat 2.4 L	79.1
Glyphosate 450 8 L	Paraquat 2.4 L	97.3
Glyphosate 450 10 L	Paraquat 2.4 L	100.0

NB: Knocks applied 11 days apart.

Summary

It is possible to kill moderately large BYG (up to 20 tillers) with high rates of glyphosate followed by paraquat or a double hit with paraquat. The second option is a riskier long-term management option as it is a practice with much higher risk of developing paraquat resistance.

The success of the glyphosate + paraquat double knock is dependent on the plant's relative resistance to glyphosate. If BYG populations are slightly resistant to glyphosate the level of control should be greater.

There are currently no options for control of large BYG in-crop (as a blanket spray) but there are inter-row options available.

Data presented demonstrated that herbicide resistance is very patchy and can vary from plot to plot.

In a demonstration plot, it was found that larger BYG plants (70 tillers) were harder to kill with paraquat + paraquat. These 'monster' plants develop layers of tillers so that lower tillers are protected by the upper ones.

The difficulty in achieving near 100% control of large BYG emphasises the need for better pre- or early post-emergence control of this weed.

A good 'get out of gaol' option in most cases is to cultivate – if plants develop to having greater than 20 tillers before considering herbicide options.

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Group A herbicide options for glyphosate resistant awnless barnyard grass control in fallows

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Introduction

Selective grass herbicides (Group A) are registered for controlling grass weeds in broadleaf crops and winter cereals. **They are not registered for fallow weed control.** However, there can be a need to use these herbicides in fallow situations to control glyphosate resistant grasses. The purpose of this experiment was to determine which Group A herbicides are most effective at controlling glyphosate resistant awnless barnyard grass (BYG). Results of this study will be compared to those generated from an experiment investigating similar treatments on BYG grown under glasshouse conditions.

Site details

Location: Bellata

Spraying Date: 12th January 2010 to BYG at the 4 leaf to panicle emergence stage.

1st Assessment: 27th January 2010, biomass reduction estimates

2nd Assessment: 4th February 2010, biomass reduction estimates and BYG plants per plot

Treatments

Table 1. Treatment List

Herbicide	Rate of product per hectare + adjuvant	Herbicide	Rate of product per hectare + adjuvant
1. Untreated control	–	10. Untreated control 2	–
2. Verdict 520	75 mL + uptake 0.5%	11. Select	190 mL + uptake 0.5%
3. Verdict 520	150 mL + uptake 0.5%	12. Select	380 mL + uptake 0.5%
4. Fusilade	500 mL + NI wetter 0.1%	13. Topik 240 EC	160 mL + uptake 0.5%
5. Fusilade	1 L + NI wetter 0.1%	14. Untreated control 3	–
6. Falcon WG	90 g + Supercharge 1%	15. Axial	300 mL + uptake 0.5%
7. Falcon WG	180 g + Supercharge 1%	16. Achieve WG	500 g + Supercharge 1%
8. Sertin 186 EC	500 mL + uptake 0.5%	17. Wildcat	500 mL
9. Sertin 186 EC	1 L + uptake 0.5%	18. Glyphosate 450	2 L + uptake 0.5 %

Where: NI = non-ionic wetter Chemwett 1000
Falcon WG is now sold as Factor WG

Results

Table 2. 1st assessment, estimates of BYG biomass reduction (%) 27.01.10 (15 Days after treatment)

Treatment	% Biomass Reduction 27.1.10	Treatment	% Biomass Reduction 27.1.10
Untreated control	0	Untreated control 2	0
Verdict 520 75 mL + uptake 0.5%	75	Select 190 mL + uptake 0.5%	28
Verdict 520 150 mL +uptake 0.5%	88	Select 380 mL + uptake 0.5%	75
Fusilade 500 mL + NI wetter 0.1%	78	Topik 240 EC 160 mL + uptake 0.5%	81
Fusilade 1 L + NI wetter 0.1%	88	Untreated control 3	0
Falcon WG 90 g + Supercharge 1%	85	Axial 300 mL + uptake 0.5%	68
Falcon WG 180 g + Supercharge 1%	92	Achieve WG 500 g + Supercharge 1%	37
Sertin 186 EC 500mL + uptake 0.5%	63	Wildcat 500mL	77
Sertin 186 EC 1L + uptake 0.5%	85	Glyphosate 450 2L + uptake 0.5 %	82

Note: Falcon WG is now sold as Factor WG. Where: NI = non-ionic wetter Chemwett 1000.

The initial assessment of BYG biomass reduction made 15 days after treatment application provided some indication of the longer term activity of the various treatments. The better treatments were Falcon WG (sold as Factor WG), Verdict 520, Fusilade and the higher rate of Sertin (Table 2). These treatments remained the best options at the time of the second assessment, 23 days after treatment application (Figure 1).

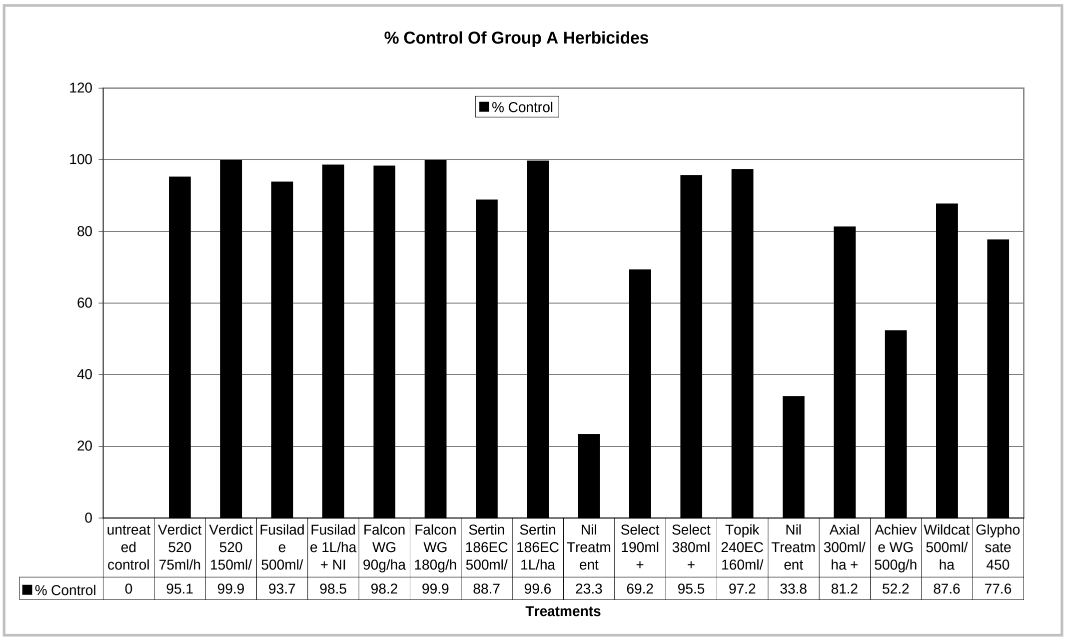

Figure 1. 2nd assessment, estimates of BYG biomass reduction (%) 4.2.10 (23 days after treatment)

There were rate responses for all the herbicides assessed using both a low and high rate treatment with substantial reductions in BYG survival using the higher application rate. Verdict 520, Falcon (Factor) WG and Sertin at the higher rate were the treatments achieving excellent levels of control (≤ 1 plants surviving per plot). Approximately 54 plants survived an application of glyphosate 450 at 2 L/ha, indicating moderate levels of glyphosate resistance in the BYG population in this trial area.

Of the grass selective herbicides which can be used in winter cereal crops, Topik was the most effective. There may be a need to control BYG in winter cereal crops as unseasonal warm weather may cause emergence of BYG in the early establishment or later maturity of these crops. However, it is unlikely that applications of Topik will be allowed to late maturing winter cereals as there are pre-harvest intervals that must be adhered too.

Table 3. 2nd assessment of BYG plants per plot (30 m^2) on 4.2.10 (23 days after treatment)

Treatment	BYG per plot	Treatment	BYG per plot
Untreated control	239.3	Untreated control 2	183.7
Verdict 520 75 mL + uptake 0.5%	11.7	Select 190 mL + uptake 0.5%	73.7
Verdict 520 150 mL + uptake 0.5%	0.3	Select 380 mL + uptake 0.5%	10.7
Fusilade 500 mL + NI wetter 0.1%	15	Topik 240 EC 160 mL + uptake 0.5%	6.7
Fusilade 1 L + NI wetter 0.1%	3.7	Untreated control 3	158.3
Falcon WG 90 g + Supercharge 1%	4.3	Axial 300 mL + uptake 0.5%	45
Falcon WG 180 g + Supercharge 1%	0.3	Achieve WG 500 g + Supercharge 1%	114.3
Sertin 186 EC 500 mL + uptake 0.5%	27	Wildcat 500 mL	29.7
Sertin 186 EC 1 L + uptake 0.5%	1	Glyphosate 450 2 L + uptake 0.5 %	53.7

Where: NI = non-ionic wetter Chemwett 1000.

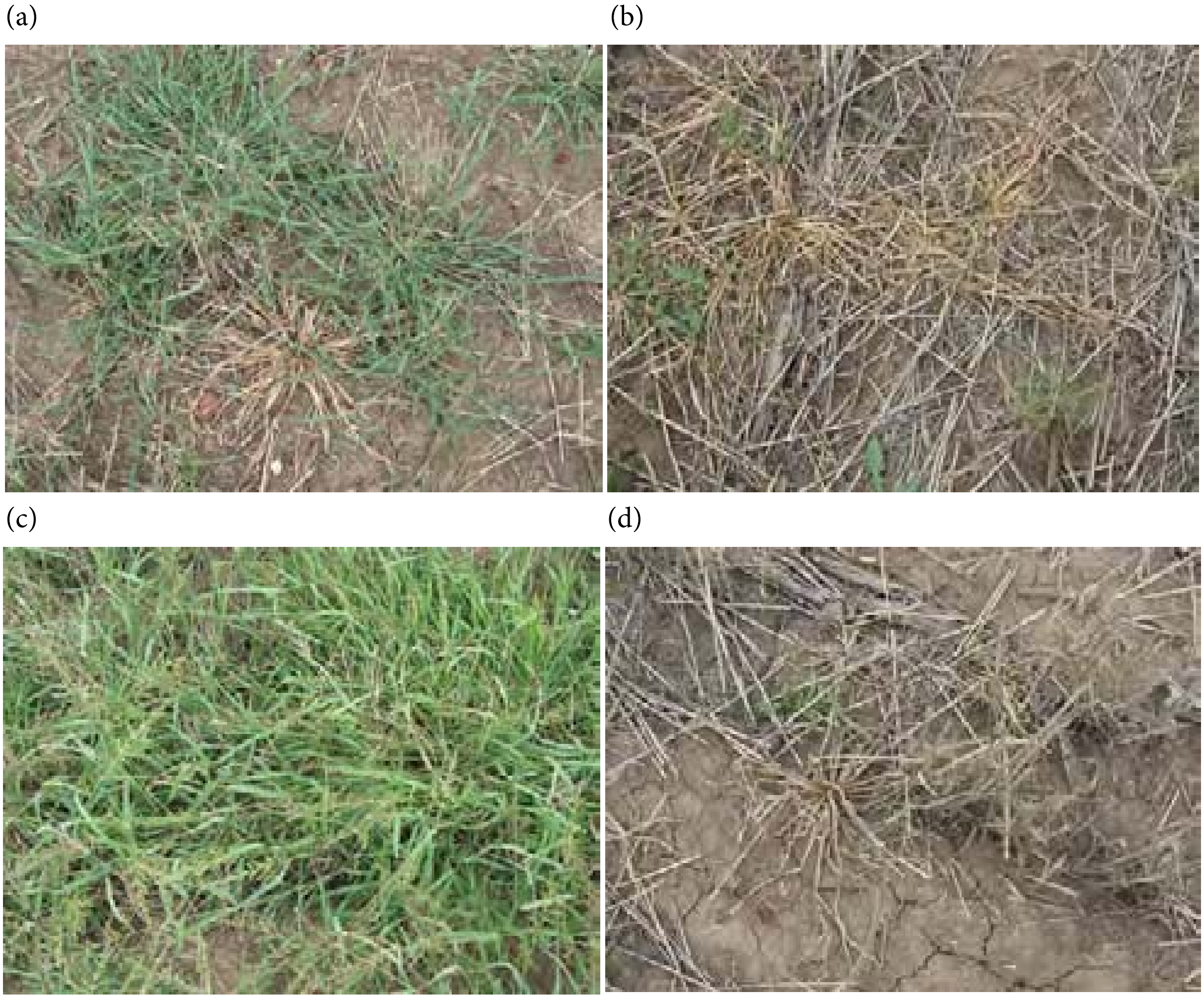

Figure 2. BYG symptoms on 4.2.10 (23 days after treatment). (a) glyphosate 450 at 2 L/ha, (b) Falcon (Factor) WG at 180g/ha, (c) untreated control and (d) Veridct 520 at 150 mL/ha

Summary

There are currently no registrations for using Group A herbicides in fallow situations. However, the production of summer broadleaf crops such as mungbeans, sunflower, cotton and soybeans is compatible with the use of these herbicides.

Plans are underway to obtain a Pesticide Permit that allows the use of Group A herbicides in fallows using WeedSeeker technology. Industry will be informed if and once the Permit is granted.

Many of the Group A herbicides have residual effects on subsequent cereal crops. Therefore applications in fallow should be made in the early stages of the fallow, to allow time for residual effects to dissipate. Furthermore, the risk of developing Group A resistant BYG is high if used repeatedly in fallows. It is recommended that all survivors be controlled with a follow-up herbicide application such as paraquat or cultivation to ensure no resistance seeds are returned to the seed bank. Appropriate warnings and guidelines will be available in the WeedSeeker Pesticide Permit.

Verdict 520, Falcon (Factor) WG and Sertin at the higher rate are the preferred options. If early emergence of BYG occurs in winter cereals due to warm weather at establishment, the preferred option is Topik.

Most label registrations have a growth stage limit for application which is around the early tillering stage for BYG. It appears from the results in this experiment that the latest growth stage that could be used is the early panicle emergence stage (most likely mid to late tillering). Herbicide labels should be altered in light of this information.

These results are consistent with those obtained from a glasshouse study using matching treatments.

Acknowledgements

This project was funded by NSW DPI and GRDC Risk Assessment and Preventative Strategies for Herbicide Resistance in Northern Region, Phase III (DAQ000136). Thanks to Bill Davidson and Rebecca Miller for field assistance.

Group A herbicide options for glyphosate resistant awnless barnyard grass control in fallows – Glasshouse Experiment

Tony Cook

NSW DPI, Tamworth

Introduction

Selective grass herbicides (Group A) are registered for controlling grass weeds in broadleaf crops and winter cereals. They are not registered for fallow weed control. However, there may be an increasing need to use these herbicides in fallow situations to control glyphosate resistant grasses. The purpose of this experiment was to determine which Group A herbicides are most effective at controlling glyphosate resistant awnless barnyard grass (BYG). Results of this study will be compared to those generated from an experiment investigating similar treatments on BYG grown under field conditions.

Site details

Location: Tamworth Agricultural Institute

Spraying Date: 31st December 2009 to BYG at the mid to late tillering stage.

1st Assessment: 15th January 2010, biomass reduction estimates and live BYG plants per pot

2nd Assessment: 2nd February 2010, biomass reduction estimates and live BYG plants per pot

Pot experiment: 3 BYG plants were grown in each pot with 19 treatments (Table 1) and 3 replicates

Treatments

Table 1. Treatment List

Herbicide	Rate of product per hectare + adjuvant	Herbicide	Rate of product per hectare + adjuvant
1. Untreated control	–	10. Select	190 mL + uptake 0.5%
2. Verdict 520	75 mL + uptake 0.5%	11. Select	380 mL + uptake 0.5%
3. Verdict 520	150 mL + uptake 0.5%	12. Achieve WG	500 g + Supercharge 1%
4.Fusilade	500 mL + NI wetter 0.1%	13. Achieve WG	1 kg + Supercharge 1%
5. Fusilade	1 L + NI wetter 0.1%	14. Topik 240 EC	160 mL + uptake 0.5%
6. Falcon WG (Factor WG)	90 g + Supercharge 1%	15. Topik 240 EC	320 mL + uptake 0.5%
7. Falcon WG (Factor WG)	180 g + Supercharge 1%	16. Axial	300 mL + uptake 0.5%
8. Sertin 186 EC	500 mL + uptake 1%	17. Axial	600 mL + uptake 0.5%
9. Sertin 186 EC	1 L + uptake 1%	18. Wildcat	500 mL + uptake 0.5%
		19. Wildcat	1 L + uptake 0.5%

Where: NI = non-ionic wetter Chemwett 1000 and Falcon WG is now sold as Factor WG.

Results

Table 2. 1st assessment, estimates of BYG biomass reduction (%) and live plants per pot on 15.01.10 (15 DAT)

Treatment	% Biomass Reduction	BYG per pot	Treatment	% Biomass Reduction	BYG per pot
Sertin 186 EC 500 mL + Uptake 1%	94	2.7	Untreated	0	3.0
Sertin 186 EC 1 L + Uptake 1%	94	2.3	Topik 160 mL + Uptake 0.5%	100	0
Select 190 mL + Uptake 0.5%	95	2.0	Topik 320 mL + Uptake 0.5%	100	0
Select 380 mL + Uptake 0.5%	95	2.7	Factor WG 90 g + Supercharge 1%	99	0.3
Achieve WG 500 g + Supercharge 1%	93	2.7	Factor WG 180 g +Supercharge 1%	100	0
Achieve WG 1 kg + Supercharge 1%	96	2.0	Wildcat 500 mL + Uptake 0.5%	99	0.3
Verdict 520 75 mL + Uptake 0.5%	100	0	Wildcat 1 L + Uptake 0.5%	100	0
Verdict 520 150 mL + Uptake 0.5%	100	0	Axial 300 mL + Uptake 0.5%	96	3.0
Fusilade 500 mL + Non-Ionic Wetter 0.1%	99	0.7	Axial 600 mL + Uptake 0.5%	97	3.0
Fusilade 1 L + Non-Ionic Wetter 0.1%	100	0			

Most treatments in this experiment achieved excellent control 15 days after application (Table 2). Assessments made later, 33 days after treatment (Table 3) indicate slightly improved control with 100% control obtained with both low and high rates of the herbicides Verdict, Fusilade, Topik, Factor and Wildcat.

Table 3. 2nd assessment, estimates of BYG biomass reduction (%) and live plants per pot on 2.2.10 (33 DAT)

Treatment	% Biomass Reduction	BYG per pot	Treatment	% Biomass Reduction	BYG per pot
Sertin 186 EC 500 mL + Uptake 1%	95	2.3	Untreated	0	3.0
Sertin 186 EC 1 L + Uptake 1%	97	1.7	Topik 160 mL + Uptake 0.5%	100	0
Select 190 mL + Uptake 0.5%	89	1.3	Topik 320 mL + Uptake 0.5%	100	0
Select 380 mL + Uptake 0.5%	99	0.3	Factor WG 90 g + Supercharge 1%	100	0
Achieve WG 500 g + Supercharge 1%	99	1.7	Factor WG 180 g +Supercharge 1%	100	0
Achieve WG 1 kg + Supercharge 1%	98	1.7	Wildcat 500 mL + Uptake 0.5%	100	0
Verdict 520 75 mL + Uptake 0.5%	100	0	Wildcat 1 L + Uptake 0.5%	100	0
Verdict 520 150 mL + Uptake 0.5%	100	0	Axial 300 mL + Uptake 0.5%	99	0.3
Fusilade 500 mL + Non-Ionic Wetter 0.1%	100	0	Axial 600 mL + Uptake 0.5%	100	0
Fusilade 1 L + Non-Ionic Wetter 0.1%	100	0			

Summary

There are currently no registrations for using Group A herbicides in fallow situations. However, the production of summer broadleaf crops such as mungbeans, sunflower, cotton and soybeans is compatible with the use of these herbicides.

Plans are underway to obtain a Pesticide Permit that allows the use of Group A herbicides in fallows using WeedSeeker technology. Industry will be informed if and once the Permit is granted.

Many of the Group A herbicides have residual effects on subsequent cereal crops. Therefore applications should be made in the early stages of the fallow to allow time for residual effects to dissipate. Furthermore, the risk of developing Group A resistant BYG is high if used repeatedly in fallows. It is recommended that all survivors be controlled with a follow-up herbicide application such as paraquat or cultivation to ensure no resistance seeds are returned to the seed bank. Appropriate warnings and guidelines will be available in the WeedSeeker Pesticide Permit.

Verdict 520, Factor WG, Topik, Fusilade and Wildcat are the preferred options. If early emergence of BYG occurs in winter cereals due to warm weather at establishment, the preferred option is Topik or Wildcat. However, these treatments need to be tested under field conditions as glasshouse environments generally conducive to better levels of control.

Most label registrations have a growth stage limit for application which is around the early tillering stage for BYG. It appears from the results in this experiment that the latest growth stage that could be used is the early panicle emergence stage (most likely mid to late tillering). Herbicide labels should be altered in light of this information.

These results are generally consistent with those obtained from a field study using similar treatments, except that Wildcat, Axial and Achieve did not provide satisfactory control of BYG in the field.

Acknowledgements

This project was funded by NSW DPI and GRDC Risk Assessment and Preventative Strategies for Herbicide Resistance in Northern Region, Phase III (DAQ000136). Thanks to Bill Davidson and Rebecca Miller for field assistance.

Group A Herbicide options for glyphosate resistant liverseed grass control in fallows – glasshouse experiment

Tony Cook

NSW DPI, Tamworth

Introduction

Selective grass herbicides (Group A) are registered for controlling grass weeds in broadleaf crops and winter cereals. They are not registered for fallow weed control. However, there may be an increasing need to use these herbicides in fallow situations to control glyphosate resistant grasses. The purpose of this experiment was to determine which Group A herbicides are most effective at controlling glyphosate resistant liverseed grass (LSG).

Site details

Location: Tamworth Agricultural Institute

Spraying Date: 31st December 2009 to LSG at the mid to late tillering stage.

1st Assessment: 15th January 2010, biomass reduction estimates and live BYG plants per pot

2nd Assessment: 2nd February 2010, biomass reduction estimates and live BYG plants per pot

Pot experiment: Three LSG plants were grown in each pot. Total of 19 herbicide treatments (Table 1) and 3 replicates.

Treatments

Table 1. Treatment List

Herbicide	Rate of product per hectare + adjuvant	Herbicide	Rate of product per hectare + adjuvant
1. Untreated control	–	10. Select	190 mL + uptake 0.5%
2. Verdict 520	75 mL + uptake 0.5%	11. Select	380 mL + uptake 0.5%
3. Verdict 520	150 mL + uptake 0.5%	12. Achieve WG	500 g + Supercharge 1%
4. Fusilade	500 mL + NI wetter 0.1%	13. Achieve WG	1 kg + Supercharge 1%
5. Fusilade	1 L + NI wetter 0.1%	14. Topik 240 EC	160 mL + uptake 0.5%
6. Falcon WG (Factor WG)	90 g + Supercharge 1%	15. Topik 240 EC	320 mL + uptake 0.5%
7. Falcon WG (Factor WG)	180 g + Supercharge 1%	16. Axial	300 mL + uptake 0.5%
8. Sertin 186 EC	500 mL + uptake 1%	17. Axial	600 mL + uptake 0.5%
9. Sertin 186 EC	1 L + uptake 1%	18. Wildcat	500 mL + uptake 0.5%
		19. Wildcat	1 L + uptake 0.5%

Where: NI = non-ionic wetter Chemwett 1000 and Falcon WG is now sold as Factor WG.

Results

Table 2. 2nd assessment, estimates of LSG biomass reduction (%) and live plants per pot on 2.2.10 (33 DAT)

Treatment	% Biomass Reduction	BYG per pot	Treatment	% Biomass Reduction	BYG per pot
Sertin 186 EC 500 mL + Uptake 1%	95	1.7	Untreated	0	3.0
Sertin 186 EC 1 L + Uptake 1%	98	1.0	Topik 160 mL + Uptake 0.5%	100	0
Select 190 mL + Uptake 0.5%	97	2.0	Topik 320 mL + Uptake 0.5%	100	0
Select 380 mL + Uptake 0.5%	99	0.7	Factor WG 90 g + Supercharge 1%	100	0
Achieve WG 500 g + Supercharge 1%	83	2.3	Factor WG 180 g +Supercharge 1%	100	0
Achieve WG 1 kg + Supercharge 1%	99	1.7	Wildcat 500 mL + Uptake 0.5%	100	0
Verdict 520 75 mL + Uptake 0.5%	100	0	Wildcat 1 L + Uptake 0.5%	100	0
Verdict 520 150 mL + Uptake 0.5%	100	0	Axial 300 mL + Uptake 0.5%	98	2.7
Fusilade 500 mL + Non-Ionic Wetter 0.1%	100	0	Axial 600 mL + Uptake 0.5%	98	2.3
Fusilade 1 L + Non-Ionic Wetter 0.1%	100	0			

Summary

There are currently no registrations for using Group A herbicides in fallow situations.

However, the production of summer broadleaf crops such as mungbeans, sunflower, cotton and soybeans are compatible with the use of these selective grass herbicides.

Plans are underway to obtain a Pesticide Permit that allows the use of Group A herbicides in fallows using WeedSeeker technology. Industry will be informed if and once the Permit is granted.

Many of the Group A herbicides have residual effects on subsequent cereal crops. Therefore applications should be made in the early stages of the fallow to allow time for residual effects to dissipate. Furthermore, the risk of developing Group A resistant LSG is high if used repeatedly in fallow situations. It is recommended that all surviving LSG be control with a follow-up herbicide application such as paraquat or cultivation to ensure no resistance seeds are returned to the seed bank. Appropriate warnings and guidelines will be available in the WeedSeeker Pesticide Permit.

Verdict 520, Factor WG, Topik, Fusilade and Wildcat are the preferred options. If early emergence of LSG occurs in winter cereals due to warm weather at establishment, the preferred option is Topik or Wildcat. However, these treatments need to be tested under field conditions as glasshouse environments are generally conducive to better levels of weed control.

Most label registrations have a growth stage limit for application which is around early tillering stage for LSG. It appears from the results in this experiment that the latest growth stage that could be used is the early panicle emergence stage (most likely mid to late tillering). Herbicide labels should be altered in light of this information.

Acknowledgements

This project was funded by NSW DPI and GRDC Risk Assessment and Preventative Strategies for Herbicide Resistance in Northern Region, Phase III (DAQ00136). Thanks to Bill Davidson and Rebecca Miller for field assistance.

Tolerance of Jandaroi durum wheat to Group B herbicides

Bill Manning

NSW DPI, Gunnedah

Introduction

Trials over many years have found durum wheats to be sensitive to the sulfonylurea group (Group B) herbicides and that durum varieties vary in their level of tolerance to these herbicides. In many cases however, the yield benefit of weed control will be greater than the yield penalty due to the herbicide (Churchett and Walker 2010). There is evidence that some of these herbicides can interfere with the plants root system causing shortening of the roots and reduce Zinc uptake (Rengael and Wheal 1996). As a result, use of these herbicides may induce zinc deficiency on zinc deficient soils. The cracking black and grey soils of northern NSW are often deficient in zinc and sulfonylurea herbicides take longer to break down in the alkaline environment.

The aim of this study was to investigate a range of Group B herbicides in durum wheat, monitoring the impact of these herbicides on crop health and grain yield on the Liverpool Plains.

Site details

Location: "South Wandobah," Spring Ridge

Soil Type: Sloping black vertosol, Zn 1.4 mg/kg

Sowing Date: 1st July

Herbicides Applied: 3rd August, Z14 to Z21

Visual Phytotoxicity Score: 26th August

Treatments

This trial tested the performance of Jandaroi wheat with a range of Group B herbicides applied post emergence in a tank mix with MCPA (Table 1). In most cases the herbicide treatment was repeated with a tank mix containing a liquid foliar Zinc chelate (Zn 740R) to evaluate if the addition of zinc would lessen the impact of the herbicide. The control and metsulfuron methyl (Ally®) treatments were repeated with and without MCPA to test the influence of MCPA on the overall phytotoxicity. Plots were hand weeded to remove the influence of weed competition on grain yield.

Table 1. List of herbicide treatments including Zinc and MCPA additive

Treatment #	Herbicide	Rate	Zn 740 (L/ha)	MCPA 500 mL/ha
1	Control	–	3	750
2	Control	–	0	750
3	Control	–	3	0
4	Control	–	0	0
5	Glean®	20 g/ha	3	750
6	Glean®	20 g/ha	0	750
7	Ally®	5 g/ha	3	750
8	Ally®	5 g/ha	0	750
9	Logran®	13 g/ha	3	750
10	Logran®	13 g/ha	0	750
11	Torpedo®	100 mL/ha	3	750
12	Torpedo®	100 mL/ha	0	750
13	Atlantis OD®	330 mL/ha	0	750
14	Ally®	5 g/ha	3	0
15	Ally®	5 g/ha	0	0
16	Harmony M®	30 g/ha	3	750
17	Harmony M®	30 g/ha	0	750

Early crop growth

- Three weeks after herbicide application the plots were assessed visually for damage (reduction in growth). Plots were scored from 1–5, 1 representing no damage and 5 representing a large reduction in early growth.
- The differences in damage score between + and – Zn within the same herbicide group were mostly small with only Torpedo® found to have a significantly higher damage score in the absence of zinc.

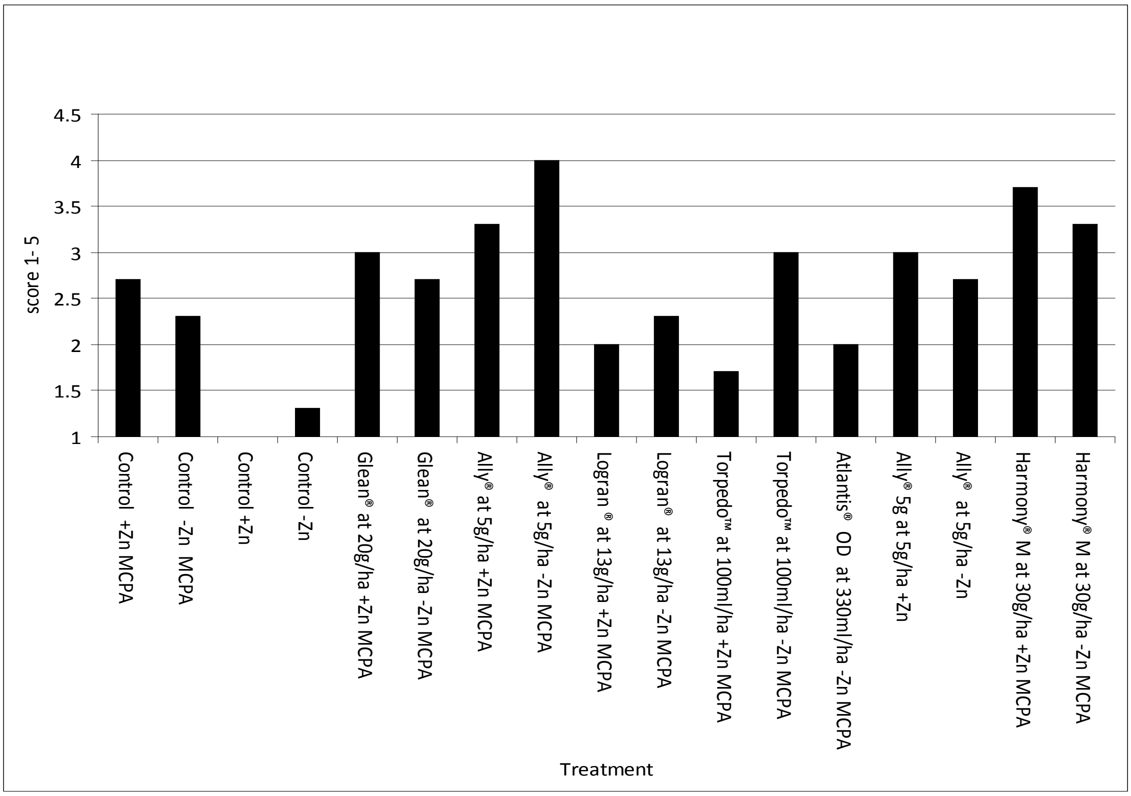

Figure 1. Effect of herbicide treatments on crop vigour (visual damage scale 1–5)

Grain yield

- Growing season rainfall was very high, however because the site was sloping the trial suffered minimal water logging.
- At harvest there were no statistically significant differences in yield between any of the treatments.

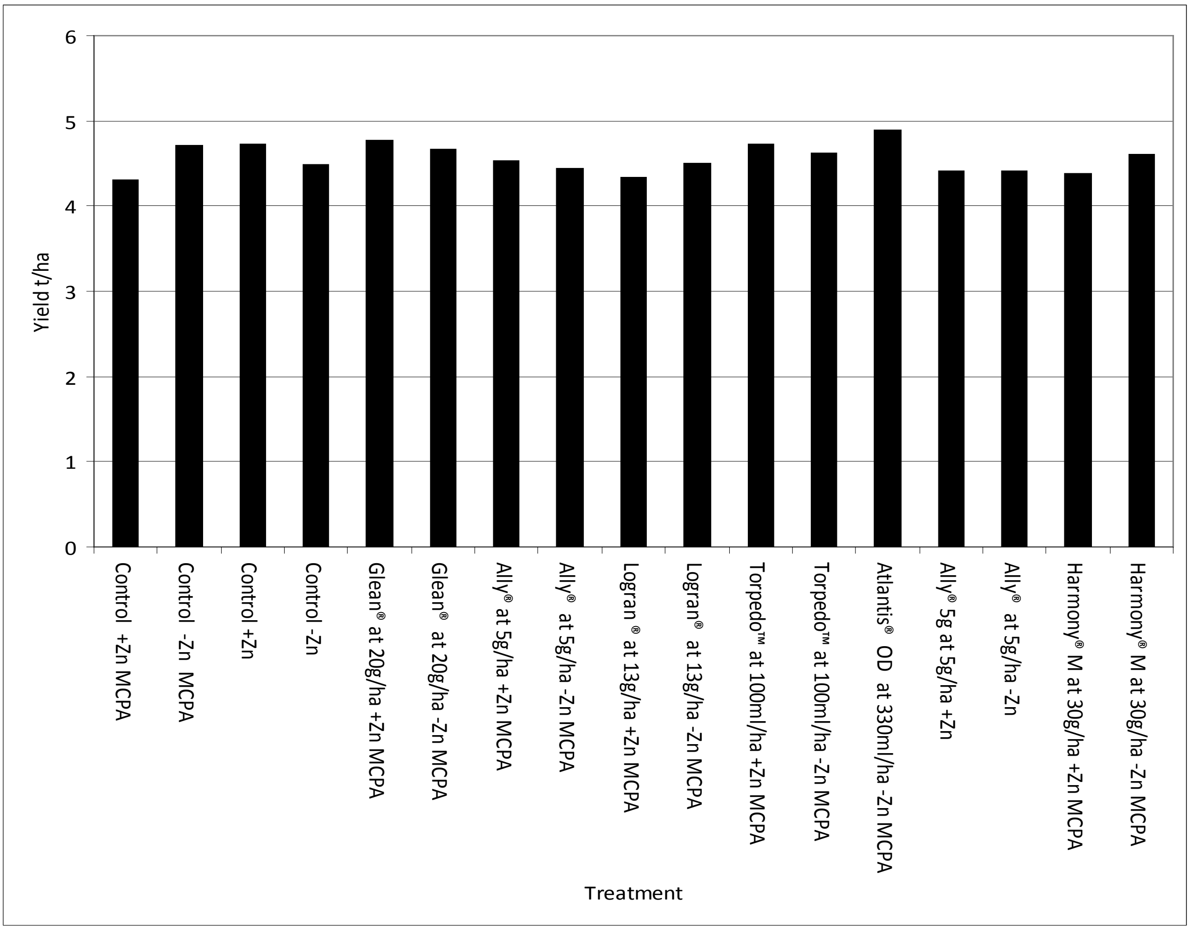

Figure 2. Grain yield across all treatments.

Summary

In this trial the application of a range Group B herbicides with and without Zinc and metsulfuron methyl with and without MCPA made no difference to final grain yield. Ideally this trial needs to be repeated in a drier year when crops have less time to recover from any early setbacks in growth. In years where moisture is not limiting crops can overcome a significant check to early growth due to the longer season. During wetter years such as 2010 chemicals may also breakdown faster after application reducing crop damage.

Acknowledgements

Dougal Pottie and Peter Foreman for technical assistance, Don Hubbard and Anthony Wassom for providing the trial site, Jim Hunt for assistance with trial design.

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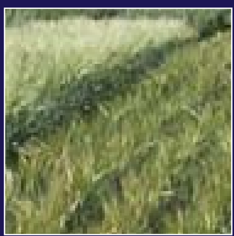

Northern Grains Region Trial Results Autumn 2011

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