

NSW research results

RESEARCH & DEVELOPMENT – INDEPENDENT RESEARCH FOR INDUSTRY

The following paper is from an edition of the Northern or Southern New South Wales research results book.

Published annually since 2012, these books contain a collection of papers that provide an insight into selected research and development activities undertaken by NSW DPI in northern and southern NSW.

Not all papers will be accessible to readers with limited vision.
For help, please contact: Carey Martin at carey.martin@dpi.nsw.gov.au

©State of NSW through the Department of Regional New South Wales, 2023

Published by NSW Department of Primary Industries,
a part of the Department of Regional New South Wales.

You may copy, distribute, display, download and otherwise freely deal with this publication for any purpose, provided that you attribute the Department of Regional New South Wales as the owner. However, you must obtain permission if you wish to charge others for access to the publication (other than at cost); include the publication advertising or a product for sale; modify the publication; or republish the publication on a website. You may freely link to the publication on a departmental website.

Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Department of Regional New South Wales or the user's independent adviser.

Any product trade names are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product name does not imply endorsement by the department over any equivalent product from another manufacturer.

Regional crown rot management – North Star 2015

Steven Simpfendorfer and Robyn Shapland

NSW DPI, Tamworth

Introduction

Crown rot (CR), caused predominantly by the fungus *Fusarium pseudograminearum* (*Fp*), remains a major constraint in producing winter cereals in the NSW northern grains region. Cereal varieties differ in their resistance to CR which can have a significant impact on their relative yield in the presence of this disease.

Rancona® Dimension (ipconazole + metalaxyl) was recently registered in Australia as a fungicide seed treatment with good activity against cereal bunts and smuts, pythium and for the suppression of rhizoctonia. Rancona® Dimension is also the first seed treatment to be registered (at 320 mL/100 kg seed) for the suppression of CR. Suppression, by definition, indicates that the seed treatment reduces the pathogen's growth for a set period of time early in the season.

Two trials were conducted at this site:

1. A variety trial, which was one of 12 conducted by NSW DPI in 2015 across central/northern NSW extending into southern Qld to examine the effect of CR on the yield of two barley, one durum and 13 bread wheat varieties.
2. A second trial aimed to evaluate the efficacy of Rancona® Dimension as a standalone option to control CR was also conducted across the same 12 sites in the northern region. This will hopefully ensure that growers have a realistic expectation of what this seed treatment can achieve if used in isolation from other integrated disease management strategies.

Site details

Location:	“Glenhoma”, North Star
Co-operators:	Malcolm Doolin
Sowing date:	27 May 2015
Fertiliser:	90 kg/ha Granulock® 12Z and 80 kg/ha of urea at sowing
Starting N:	21.2 mg/kg (0–60 cm)
PreDicta B®:	1.0 Pt/g (low), nil <i>Pn</i> and nil crown rot at sowing (0–30 cm)
In-crop rainfall:	~156 mm
Harvest date:	11 November 2015

Treatments

Trial 1. Variety evaluation

- Two barley varieties: (Commander[Ⓛ] and La Trobe[Ⓛ])
- One durum variety: (Jandaroi[Ⓛ])
- Eleven commercial bread wheat varieties: (EGA Gregory[Ⓛ], LRPB Flanker[Ⓛ], Sunmate[Ⓛ], LRPB Gauntlet[Ⓛ], LRPB Lancer[Ⓛ], LRPB Viking[Ⓛ], LRPB Spitfire[Ⓛ], Beckom[Ⓛ], Mitch[Ⓛ], Suntop[Ⓛ] and Sunguard[Ⓛ]; listed in order of increasing resistance to CR) and two numbered lines (VO7176-69 and QT15046R).
- Added or no added CR at sowing using sterilised durum grain colonised by at least five different isolates of *Fp*.

Trial 2. Fungicide seed treatment evaluation

- EGA Gregory[Ⓛ] with added or no added CR at sowing using infected durum grain.
- Seed treatments evaluated:
 1. Nil seed treatment
 2. Rancona® Dimension (ipconazole 25 g/L + metalaxyl 20 g/L) at 320 mL/100 kg seed
 3. Dividend M® (difeniconazole 92 g/L + metalaxyl-M 23 g/L) at 260 mL/100 kg seed

Key findings

Yield loss from crown rot ranged from 1.4% (not significant) in the bread wheat variety Suntop[Ⓛ] up to 35.0% in the bread variety EGA Gregory[Ⓛ].

Bread wheat variety choice impacted on yield in the presence of high levels of crown rot infection with all 12 entries being between 0.33 t/ha to 1.53 t/ha higher yielding than EGA Gregory[Ⓛ].

The yield of the two barley varieties was impacted by late rain at this site in 2015 which resulted in considerable lodging, especially in La Trobe[Ⓛ]. The barley data from this site should be considered with caution.

Rancona® Dimension provided a small (0.22 t/ha) yield benefit compared to no seed treatment in the presence of high levels of crown rot infection (added CR) at this site in 2015 but was far from providing complete control of the disease with 29% yield loss still occurring.

4. Jockey Stayer® (fluquinconazole 167 g/L) at 450 mL/100 kg seed.

Dividend M® and Jockey Stayer® are NOT registered for the suppression of CR, but were included to represent a commonly used wheat seed treatment for bunt and smut control, or early control of stripe rust (leaf disease), respectively. Including four treatments across each site ensured statistical rigour for yield outcomes.

Results

Trial 1. Variety evaluation

Yield

- In the no added CR treatment yield ranged from 1.92 t/ha in the barley variety La Trobe up to 3.68 t/ha in the durum variety Jandaroi (Table 1).
- Late rainfall near harvest resulted in significant lodging in some entries at this site and was most severe in the two barley varieties. This appears to have negatively impacted on yield of the barley varieties, particularly La Trobe, which were difficult to harvest as they were nearly flat on the ground. Barley yield at this site should therefore be considered with caution.
- All entries with the exception of the bread wheat varieties Suntop, LRPB Lancer and Mitch suffered significant yield loss under high levels of CR infection (added CR) which ranged from 9.1% in the bread wheat variety Beckom (0.28 t/ha) up to 35.0% in the bread wheat variety EGA Gregory (0.94 t/ha).

Table 1. Yield and grain quality of varieties with no added and added crown rot – North Star 2015

Crop	Variety	Yield (t/ha)		Protein (%)		Screenings (%)	
		No added CR	Added CR	No added CR	Added CR	No added CR	Added CR
Barley	Commander	2.66	2.41	14.3	14.5	9.0	13.4
	La Trobe	1.92	1.63	14.2	14.0	16.1	17.6
Durum	Jandaroi	3.68	2.65	14.7	14.7	3.8	16.1
Bread wheat	Suntop	3.32	3.27	12.8	12.7	9.8	11.3
	LRPB Spitfire	3.43	2.95	14.4	14.3	5.8	6.7
	LRPB Lancer	3.10	2.91	14.5	13.8	7.8	9.8
	Sunmate	3.55	2.91	12.5	12.2	6.7	10.6
	Beckom	3.04	2.77	12.8	12.6	15.5	21.0
	Mitch	2.82	2.74	12.9	12.2	11.6	10.8
	LRPB Gauntlet	3.13	2.62	13.4	13.1	2.8	6.0
	Viking	3.17	2.62	13.7	13.2	12.8	18.7
	Sunguard	3.01	2.42	14.2	13.7	8.0	9.1
	LRPB Flanker	2.99	2.20	13.6	12.8	8.7	16.2
	VO7176-69	2.90	2.19	13.0	12.3	7.8	13.1
	QT15046R	2.70	2.07	13.2	12.4	11.3	17.4
	EGA Gregory	2.69	1.74	13.7	12.6	9.6	18.8
Site mean		3.01	2.51	13.6	13.2	9.2	13.5
CV (%)		4.8		2.1		15.8	
LSD		0.218		0.46		2.93	
P value		<0.001		0.01		<0.001	

- No entry was lower yielding than EGA Gregory under high levels of CR infection (added CR) with only the barley variety La Trobe producing a similar yield to EGA Gregory due to severe lodging which restricted its yield.
- The bread wheat entries QT15046R (0.33 t/ha), VO7176-69 (0.45 t/ha), LRPB Flanker (0.46 t/ha), Sunguard (0.68 t/ha), Viking (0.88 t/ha), LRPB Gauntlet (0.88 t/ha), Mitch (1.00 t/ha), Beckom (1.03 t/ha), Sunmate (1.17 t/ha), LRPB Lancer (1.17 t/ha), LRPB Spitfire (1.21 t/ha) and Suntop (1.53 t/ha) were all higher yielding than EGA Gregory under high levels of CR infection (added CR).
- The durum variety Jandaroi was 0.91 t/ha higher yielding than EGA Gregory under high levels of CR infection (added CR, Table 1).

- The barley variety Commander was 0.67 t/ha higher yielding than EGA Gregory under high levels of CR infection (added CR, Table 1).

Grain quality

- Protein levels were relatively high at this site in 2015 which in the no added CR treatment ranged between 12.5% (Sunmate) up to 14.7% (Jandaroi; Table 1).
- Crown rot infection (added CR) significantly reduced grain protein levels by between 0.5 to 1.1% in the bread wheat entries Viking, LRPB Lancer, Sunguard, Mitch, VO7176-69, LRPB Flanker, QT15046R and EGA Gregory (Table 1).
- In the no added CR treatment, screening levels ranged from 2.8% in the bread wheat variety LRPB Gauntlet up to 16.1% in the barley variety La Trobe (Table 1).
- Screening levels were increased in the added CR treatment with all entries with the exception of the barley variety La Trobe and bread wheat varieties Suntop, LRPB Spitfire, LRPB Lancer, Mitch and Sunguard.
- In the added CR treatment, screening levels ranged from 6.0% in the bread wheat variety LRPB Gauntlet up to 21.0% in the bread wheat variety Beckom (Table 1).

Trial 2. Fungicide seed treatment evaluation

- The addition of *Fp* inoculum at sowing reduced establishment in the added CR treatment (92 plants/m²) compared to the no added CR treatment (102 plants/m²), averaged across seed treatments.
- None of the fungicide seed treatments significantly impacted on establishment in the presence or absence of CR infection.
- Rancona® Dimension increased the yield of EGA Gregory by 0.24 t/ha compared to no seed treatment and 0.34 t/ha compared to Dividend M® in the no added CR treatment but was not significantly different from Jockey Stayer® (Figure 1).
- Yield loss in the added CR treatment was 28% with Dividend M®, 29% with Rancona® Dimension, 31% with no seed treatment and 39% with Jockey Stayer® compared to the corresponding no added CR treatment (Figure 1).
- Rancona® Dimension provided a small (0.22 t/ha) yield benefit compared to no seed treatment in the presence of high levels of CR infection (added CR) and was also higher yielding (0.21 to 0.38 t/ha) than the other fungicide seed treatments examined. This benefit was far from complete control of CR with 29% yield loss still occurring (Figure 1).

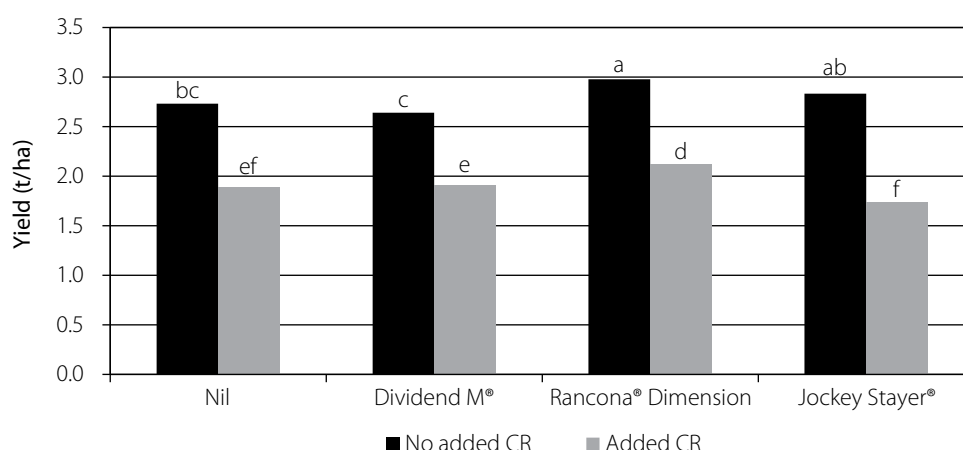


Figure 1. Impact of fungicide seed treatments on the yield of EGA Gregory[®] in the absence and presence of added crown rot inoculum – North Star 2015

Bars with the same letter are not significantly different ($P=0.03$)

Conclusions

Cereal crop and variety choice provided a 19–88% yield benefit over growing the susceptible bread wheat variety EGA Gregory under high levels of CR infection at North Star in 2015. The interaction of environment with the expression of CR and lodging was interesting at this site in 2015. Limited rainfall in September and October (9.0 mm total) exacerbated the expression of CR with significant yield loss occurring. However, a rainfall

event of around 30 mm at harvest maturity caused lodging which was more severe in the two barley varieties, especially La Trobe. The two barley varieties were generally higher yielding than the bread wheat entries in similar trials conducted across a further 11 sites in 2015, with La Trobe being particularly high yielding.

Crop and variety choice can maximise profit in the current season but will not reduce inoculum levels for subsequent crops, because all winter cereal varieties are susceptible to CR infection. Winter cereal crop and variety choice is therefore not the sole solution to CR but rather just one element of an integrated management strategy to limit losses from this disease.

Rancona® Dimension provided a small but significant yield benefit (0.22 t/ha) over the use of no seed treatment under high CR pressure at North Star in 2015 but did not provide complete control with 29% yield loss still occurring. Although Rancona® Dimension is registered for the suppression of CR, with activity against early infection and potential establishment losses, growers should not expect this to translate into a significant and consistent reduction in yield loss from CR infection when the product is used as a standalone management strategy.

Integrated management remains the best strategy to reduce losses to CR.

Acknowledgements

This research was co-funded by NSW DPI and GRDC under project DAN00175: National crown rot epidemiology and management. Thanks to the Malcolm Doolin and family for hosting this trial on their property in 2015. Thanks to Peter Matthews and Gerard Lonergan (NSW DPI) for technical assistance sowing, maintaining and harvesting the trial. Thanks to Chrystal Fensbo (NSW DPI) for grain quality assessments and to Jason Lowien (GrainCorp) for use of an NIR machine to determine grain protein levels.