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Regional crown rot management – Nyngan 2015

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Key findings

Yield loss from crown rot ranged from 0.5% (not significant) in the bread wheat variety Sunguard$^{\phi}$ up to 47.3% in the bread wheat variety EGA Gregory$^{\phi}$.

Bread wheat variety choice had a large effect on yield where there were high levels of crown rot infection with eleven entries being between 0.65 t/ha to 1.35 t/ha higher yielding than EGA Gregory$^{\phi}$.

The barley varieties Commander$^{\phi}$ and La Trobe$^{\phi}$ were 1.64 t/ha and 2.47 t/ha higher yielding than EGA Gregory$^{\phi}$ under high levels of crown rot infection, respectively.

Rancona® Dimension did not provide a yield benefit in the presence of high levels of crown rot infection at this site in 2015.

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:	**"Innaminna", Nyngan**
Co-operater:	**Jack and Dione Carter**
Sowing date:	**8 May 2015**
Fertiliser:	**80 kg/ha Granulock® 12Z at sowing; 70 kg/ha Easy N® on 10 July 2015**
Starting N:	**48.5 mg/kg to 0.6 m**
PreDicta B®:	**Nil root lesion nematodes, nil crown rot at sowing (0–30 cm)**
In-crop rainfall:	**~179 mm**
Harvest date:	**30 October 2015**

Treatments

Trial 1. Variety evaluation

- Two barley varieties: (Commander$^{\phi}$ and La Trobe$^{\phi}$)
- One durum variety: (Jandaroi$^{\phi}$)
- Eleven commercial bread wheat varieties: (EGA Gregory$^{\phi}$, LRPB Flanker$^{\phi}$, Sunmate$^{\phi}$, LRPB Gauntlet$^{\phi}$, LRPB Lancer$^{\phi}$, LRPB Viking$^{\phi}$, LRPB Spitfire$^{\phi}$, Beckom$^{\phi}$, Mitch$^{\phi}$, Suntop$^{\phi}$ and Sunguard$^{\phi}$; 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$^{\phi}$ 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
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 2.48 t/ha in the bread wheat variety Sunguard up to 4.37 t/ha in the barley variety La Trobe (Table 1).
- All entries with the exception of the bread wheat varieties LRPB Spitfire, Viking and Sunguard, suffered significant yield loss under high levels of CR infection (added CR) which ranged from 12.9% in the barley variety Commander (0.44 t/ha) up to 47.3% in the bread wheat variety EGA Gregory (1.22 t/ha).
- Concentrating purely on the extent of yield loss associated with CR infection in the different varieties can potentially be misleading as entries can vary markedly in their actual yield potential in a particular environment and season.
- Amongst the bread wheat entries, Viking and Sunguard had the lowest yield loss from CR at Nyngan in 2015. However, in the absence of added CR, Viking was significantly lower yielding than Beckom (0.62 t/ha), QT15046R (0.56 t/ha) and LRPB Gauntlet (0.47 t/ha) (Table 1).
- Sunguard similarly in the no added CR treatment was between 0.80 t/ha to 0.44 t/ha lower yielding than the bread wheat entries Beckom, QT15046R, LRPB Gauntlet, LRPB Flanker, Sunmate, LRPB Spitfire and Suntop at Nyngan in 2015. Hence, selecting a variety on the basis of reduced yield loss to CR should not come at the expense of yield potential.
- Under high CR pressure (added CR) yield ranged from 3.83 t/ha in the barley variety La Trobe down to 1.36 t/ha in the widely grown bread wheat variety EGA Gregory.
- Only the advanced bread wheat line V07176-69 and the durum variety Jandaroi were not significantly higher yielding than EGA Gregory in the presence of added CR.
- The average yield benefit over growing EGA Gregory under high CR infection ranged from 2.47 t/ha (182%) with the barley variety La Trobe down to 0.65 t/ha (48%) with the recently released bread wheat variety Mitch.
- However, the relative yield benefit compared to EGA Gregory was considerably greater with other bread wheat varieties such as LRPB Spitfire (1.35 t/ha), Beckom (1.33 t/ha), Viking (1.27 t/ha), LRPB Lancer (1.15 t/ha), Sunguard (1.11 t/ha) and Suntop (1.09 t/ha).
- Commander, the second barley variety in the trial, had a 1.64 t/ha (121%) yield benefit over EGA Gregory under high levels of CR infection in the added CR treatments at Nyngan in 2015 (Table 1).

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

Crop	Variety	Yield (t/ha)		Protein (%)	Screenings (%)
		No added CR	Added CR		
Barley	La Trobe	4.37	3.83	12.1	36.8
	Commander	3.45	3.00	12.6	40.6
Durum	Jandaroi	2.37	1.40	13.9	15.4
Bread wheat	LRPB Spitfire	2.93	2.71	12.7	12.3
	Beckom	3.28	2.69	12.0	25.1
	Viking	2.66	2.63	13.2	30.6
	LRPB Lancer	2.96	2.51	12.9	9.8
	Sunguard	2.48	2.47	12.3	15.1
	Suntop	2.92	2.45	11.8	19.4
	Sunmate	2.94	2.28	11.2	13.9
	LRPB Flanker	2.94	2.23	12.4	18.5
	QT15046R	3.22	2.20	11.8	16.7
	LRPB Gauntlet	3.13	2.17	11.5	8.2
	Mitch	2.75	2.01	12.4	19.9
	V07176-69	2.72	1.55	12.3	22.0
	EGA Gregory	2.57	1.36	11.9	18.8
Site mean		2.98	2.34	12.3	20.2
CV (%)		7.0		7.9	39.4
LSD		0.306		1.12	9.17
P value		<0.001		0.002	<0.001

Grain quality

- Adding CR inoculum did not significantly impact on grain quality in any of the entries (data not presented). Hence, the average of added CR and no added CR treatments for each entry are presented (Table 1).
- Protein levels ranged between 11.2% (Sunmate) up to 13.9% (Jandaroi; Table 1).
- Screening levels in the bread wheat entries ranged from 8.2% in LRPB Gauntlet up to 30.6% in Viking (Table 1).
- Screening levels were quite high in the barley varieties with 36.8% in La Trobe and 40.6% in Commander.

Trial 2. Fungicide seed treatment evaluation

- The addition of *Fp* inoculum at sowing reduced establishment in the added CR treatment (63 plants/m^2) compared to the no added CR treatment (80 plants/m^2), averaged across seed treatments.
- Jockey Stayer® (65 plants/m^2) had lower establishment than Dividend M® (76 plants/m^2) and Rancona® Dimension (75 plants/m^2) averaged across the CR treatments. The interaction between CR treatment and seed treatment was not significant (P=0.255).
- There was no significant (P=0.097) difference in the yield of EGA Gregory with any of the seed treatments in the no added CR treatment (Figure 1).
- Yield loss in the added CR treatment was 34% with Dividend M®, 43% with Jockey Stayer®, 48% with no seed treatment and 50% with Rancona® Dimension compared to the corresponding no added CR treatment (Figure 1).
- Dividend M® was slightly higher yielding (0.37 t/ha) than Rancona® Dimension in the added CR treatment, but was not significantly different from Jockey Stayer® or no seed treatment (Figure 1).

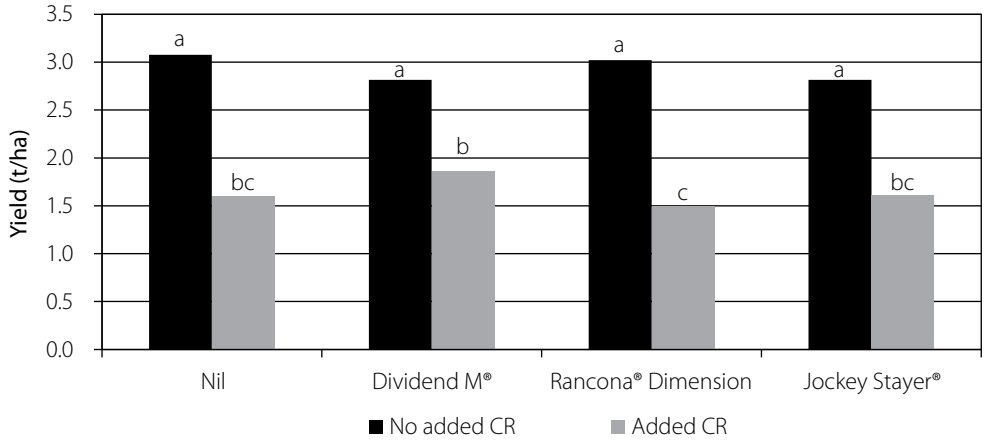

Figure 1. *Impact of fungicide seed treatments on the yield of EGA Gregory(◊) in the absence and presence of added crown rot inoculum – Nyngan 2015*
Bars with the same letter are not significantly different (P=0.097)

Conclusions

Cereal crop and variety choice provided a 48–182% yield benefit over growing the susceptible bread wheat variety EGA Gregory under high levels of crown rot infection at Nyngan in 2015. This 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.

The barley variety La Trobe appeared quite promising for maximising yield in the presence of high CR infection at Nyngan in 2015 and was also considerably higher yielding than other entries in the no added treatment. La Trobe achieved a significant yield benefit over Commander barley (0.83 t/ha) and the best performing bread wheat variety LRPB Spitfire (1.22 t/ha) in the presence of high CR infection at Nyngan in 2015. La Trobe is malt accredited but relative grain price (malt vs feed barley; wheat vs barley), the increased susceptibility of La Trobe to BYDV, impact on *Pt* populations, segregation by grain accumulators and performance of other barley and bread wheat varieties not included in these trials (www.nvt.online.com.au) should be considered as part of potential variety choices for the Nyngan district. Although achieving high yield in this trial, La Trobe also had a very high level of screenings at 36.8% which also needs to be taken into consideration.

Rancona® Dimension did not provide a significant yield benefit over the use of no seed treatment or the two other commonly used seed treatments examined under high CR pressure at Nyngan in 2015. Although Rancona® Dimension is registered for the suppression of crown rot, with activity against early infection and potential establishment losses (not evident at this site), 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.

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