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Regional crown rot management – Mungindi 2015

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Key findings

Yield loss from crown rot ranged from 11.0% (not significant) in the barley variety La Trobe(ф) up to 70.0% in the bread wheat variety EGA Gregory(ф).

Bread wheat variety choice had a large effect on yield where there were high levels of crown rot infection with nine varieties being between 0.46 t/ha to 1.69 t/ha higher yielding than EGA Gregory(ф).

The barley variety La Trobe(ф) was 2.08 t/ha higher yielding than EGA Gregory(ф) under high levels of crown rot infection.

Rancona® Dimension provided a small (0.29 t/ha) yield benefit compared to no seed treatment in the presence of high levels of crown rot infection at this site in 2015 but was far from providing complete control of the disease with 63% yield loss still occurring.

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:	**"Bullawarie", Mungindi, Qld**
Co-operator:	**Andrew Earle**
Sowing date:	**26 May 2015**
Fertiliser:	**60 kg/ha Urea and 40 kg/ha Granulock® 12Z at sowing**
Starting N:	**24 mg/kg to 0.6 m**
PreDicta B®:	**Nil root lesion nematodes, 2.1 log *Fusarium* DNA/g (high risk) at sowing (0–30 cm)**
Harvest date:	**23 October 2015**

Treatments

Trial 1. Variety evaluation

- Two barley varieties: (Commander(ф) and La Trobe(ф))
- One durum variety: (Jandaroi(ф))
- Eleven commercial bread wheat varieties: (EGA Gregory(ф), LRPB Flanker(ф), Sunmate(ф), LRPB Gauntlet(ф), LRPB Lancer(ф), LRPB Viking(ф), LRPB Spitfire(ф), Beckom(ф), Mitch(ф), Suntop(ф) and Sunguard(ф); 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(ф) 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

- Results from the barley variety Commander were excluded from analysis at this site due to severe damage from the herbicide Topik® which was applied across the predominantly wheat trial site. Data for La Trobe was still included as it did not appear to be significantly impacted.
- In the no added CR treatment, yield ranged from 2.34 t/ha in the bread wheat variety Viking up to 3.56 t/ha in the bread wheat variety Beckom (Table 1).
- All varieties with the exception of the barley variety La Trobe, suffered significant yield loss under high levels of CR infection (added CR), which ranged from 19.8% in the bread wheat variety Sunguard (0.53 t/ha) up to 70.0% in the bread wheat variety EGA Gregory (2.07 t/ha). Yield loss was potentially underestimated at this site as a high level of background CR inoculum already existed across the site. Hence, there was a level of infection in the no added CR plots.
- No entry was lower yielding than EGA Gregory under high CR infection (added CR). The durum variety Jandaroi and bread wheat entries QT15046R, VO7176-69 and LRPB Flanker all produced yield equivalent to EGA Gregory in the added CR treatment (Table 1).
- The bread wheat varieties Viking (0.46 t/ha), LRPB Lancer (0.52 t/ha), LRPB Gauntlet (0.59 t/ha), Sunmate (0.79 t/ha), Mitch (0.90 t/ha), LRPB Spitfire (0.97 t/ha), Suntop (1.25 t/ha), Sunguard (1.28 t/ha) and Beckom (1.69 t/ha) were all higher yielding than EGA Gregory under high levels of CR infection (added CR).
- The barley variety La Trobe was 2.08 t/ha higher yielding than EGA Gregory under high levels of CR infection (added CR, Table 1).

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

Crop	Variety	Yield (t/ha)		Protein (%)	Screenings (%)	
		No added CR	Added CR		No added CR	Added CR
Barley	La Trobe	3.34	2.97	12.8	17.9	22.3
	Commander	na	na	na	na	na
Durum	Jandaroi	2.61	1.15	14.3	5.2	23.2
Bread wheat	Beckom	3.56	2.58	12.1	9.3	14.7
	Sunguard	2.70	2.17	13.5	5.7	12.6
	Suntop	3.01	2.14	12.8	9.1	14.5
	LRPB Spitfire	2.73	1.86	13.9	5.2	9.8
	Mitch	2.66	1.79	12.9	12.3	16.8
	Sunmate	2.96	1.68	12.0	6.7	12.8
	LRPB Gauntlet	2.86	1.48	13.3	3.0	11.0
	LRPB Lancer	2.54	1.41	14.3	6.5	14.8
	Viking	2.34	1.35	13.1	9.2	18.2
	QT15046R	2.92	1.00	12.6	8.2	18.1
	V07176-69	2.76	0.95	12.6	7.0	16.0
	LRPB Flanker	2.78	0.93	13.1	6.6	20.1
	EGA Gregory	2.96	0.89	12.6	5.7	20.0
Site mean		2.72	1.57	13.1	7.8	16.4
CV (%)		10.9		3.8	19.2	
LSD		0.383		0.577	3.781	
P value		<0.001		<0.001	<0.001	

Grain quality

- Adding CR inoculum did not significantly affect grain protein levels 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 12.0% (Sunmate) up to 14.3% (Jandaroi and LRPB Lancer; Table 1).
- In the no added CR treatment, screening levels ranged from 3.0% in the bread wheat variety LRPB Gauntlet up to 17.9% in the barley variety La Trobe (Table 1).
- Screening levels were increased in the added CR treatment with all entries by between an additional 4.4% in the barely variety La Trobe up to 18.0% in the durum variety Jandaroi.
- In the added CR treatment, screening levels ranged from 9.8% in the bread wheat variety LRPB Spitfire up to 23.2% in the durum variety Jandaroi (Table 1).

Trial 2. Fungicide seed treatment evaluation

- Averaged across seed treatments plant establishment was significantly higher in the no added CR treatment (89 plants/m^2) compared to the added CR treatment (70 plants/m^2).
- Averaged across CR inoculum treatments plant establishment with Rancona® Dimension (90 plants/m^2) was better than that achieved with Jockey Stayer® (76 plants/m^2) or no seed treatment (71 plants/m^2) but was not significantly different from Dividend M® (81 plants/m^2). The interaction between seed treatment and CR inoculum was not significant (P=0.243).
- Dividend M® slightly reduced the yield of EGA Gregory by 0.35 t/ha compared to no seed treatment in the no added CR treatment but was not significantly different from either of the two other fungicide seed treatments examined (Figure 1).
- Yield loss in the added CR treatment was 63% with Rancona® Dimension, 70% with Dividend M®, 72% with Jockey Stayer® and 75% with no seed treatment compared to the corresponding no added CR treatment (Figure 1).
- Rancona® Dimension provided a small (0.29 t/ha) yield benefit compared to no seed treatment in the presence of high levels of crown rot infection (added CR) but was not significantly different from the two other fungicide seed treatments examined. This benefit was not evident under high background levels of infection (no added CR) at the site and was far from complete control of crown rot with 63% yield loss still occurring (Figure 1).

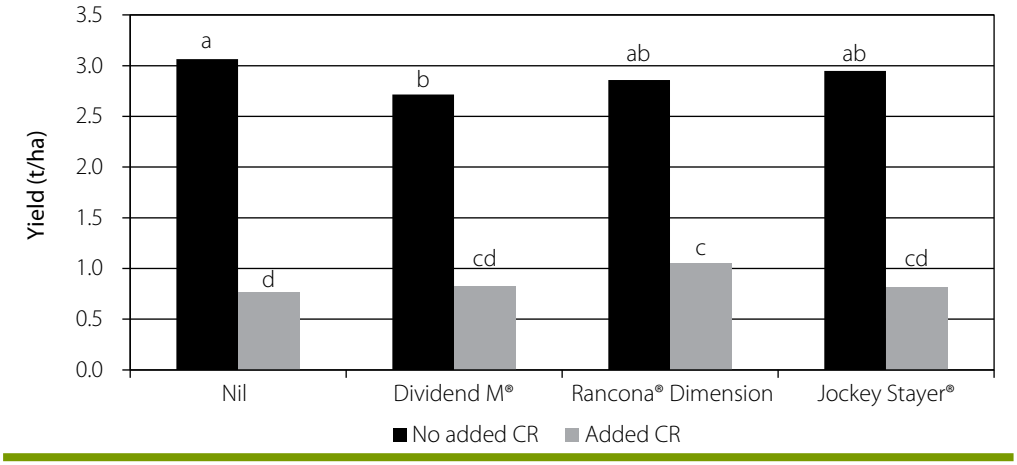

Figure 1. *Impact of fungicide seed treatments on the yield of EGA Gregory(b) in the absence and presence of added crown rot inoculum – Mungindi 2015*
Bars with the same letter are not significantly different (P=0.064)

Conclusions

Cereal crop and variety choice provided a 52–234% yield benefit over growing the susceptible bread wheat variety EGA Gregory under high levels of CR infection at Mungindi in 2015. This 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 (0.29 t/ha) over the use of no seed treatment under high crown rot pressure at Mungindi in 2015, but was not significantly different from the two other commonly used seed treatments examined. Although Rancona® Dimension is registered for the suppression of crown rot, with activity against early infection and potential establishment losses evident in this study, 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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