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Regional crown rot management – Gilgandra 2017

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Key findings

- The durum variety Jandaroi$^{\Phi}$, plus the two bread wheat varieties LRPB Mustang$^{\Phi}$ and LRPB Spitfire$^{\Phi}$ were affected by frost at this site in 2017, which complicates interpretations.
- Yield loss from crown rot ranged from not significant in the four barley varieties and three of the 12 bread wheat varieties, up to 66% loss in the durum variety Jandaroi$^{\Phi}$.
- The four barley varieties were 0.99–1.42 t/ha higher yielding than the susceptible bread wheat variety EGA Gregory$^{\Phi}$, where high levels of crown rot infection were present.
- The bread wheat varieties LRPB Reliant$^{\Phi}$, Suntop$^{\Phi}$, Mitch$^{\Phi}$ and Sunguard$^{\Phi}$ were also higher yielding (0.40–0.46 t/ha) than EGA Gregory$^{\Phi}$ in crown-rot-infected plots.

Introduction

Crown rot (CR), caused predominantly by the fungus *Fusarium pseudograminearum* (*Fp*), remains a major constraint to winter cereal production in the northern grains region. Cereal varieties differ in their resistance to crown rot, which can significantly affect their relative yield when the disease is present.

This experiment was one of six NSW DPI conducted in 2017 across central/northern NSW, extending into southern Qld, to examine the effect of crown rot on the yield and quality of four barley, four durum and 12 bread wheat varieties.

Site details

Location	'Inglewood', Gilgandra
Co-operator	Kevin Kilby
Sowing date	11 May 2017
Fertiliser	80 kg/ha Granulock 12Z (treated with 2.8 L/ha of flutriafol) plus 70 kg/ha of urea spread on the soil surface at sowing
Starting nitrogen	97 kg N/ha to a depth of 120 cm
Starting soil water	~120 mm plant available soil water (0–120 cm)
Rainfall	The growing season rainfall was 63 mm
PREDICTA®B	Nil *Pratylenchus thornei*, nil *P. neglectus* and nil crown rot levels at sowing (0–15 cm of soil)
Harvest date	31 October 2017

Treatments

Varieties (20)

- Four barley varieties: Commander$^{\Phi}$, Compass$^{\Phi}$, La Trobe$^{\Phi}$ and Spartacus$^{\Phi}$.
- Four durum varieties: Jandaroi$^{\Phi}$, DBA Lillaroi$^{\Phi}$, DBA Bindaroi$^{\Phi}$ plus the numbered line AGD043.
- Twelve bread wheat varieties: EGA Gregory$^{\Phi}$, LRPB Flanker$^{\Phi}$, Coolah$^{\Phi}$, Sunmate$^{\Phi}$, LRPB Lancer$^{\Phi}$, LRPB Reliant$^{\Phi}$, LRPB Gauntlet$^{\Phi}$, LRPB Spitfire$^{\Phi}$, LRPB Mustang$^{\Phi}$, Mitch$^{\Phi}$, Suntop$^{\Phi}$ and Sunguard$^{\Phi}$ (listed in order of increasing resistance to crown rot).

Pathogen treatment

Added or no added crown rot at sowing using sterilised durum grain colonised by at least five different isolates of *Fp* at a rate of 2.0 g/m of row at sowing.

Results

Yield

Frost damage was most severe in the durum variety Jandaroi$^{\Phi}$ and noticeable in the bread wheat varieties LRPB Mustang$^{\Phi}$ and LRPB Spitfire$^{\Phi}$, which reduced their yield in both the inoculated and un-inoculated plots. In the no added CR treatment, yield ranged from 0.66 t/ha in the frost-affected durum variety Jandaroi$^{\Phi}$ up to 3.22 t/ha in the barley variety La Trobe$^{\Phi}$ (Table 1).

Table 1. Yield and grain quality of varieties with no added and added crown rot – Gilgandra 2017.

Crop	Variety	Yield (t/ha)		Protein (%)	Screenings (%)	
		No added CR	Added CR		No added CR	Added CR
Barley	La Trobe	3.22	2.97	13.0	1.1	2.2
	Compass	2.80	2.62	13.1	1.4	2.3
	Commander	2.89	2.56	12.7	1.7	3.7
	Spartacus	2.78	2.54	14.3	0.9	2.1
Durum	AGD043	1.60	0.93	12.8	5.3	11.2
	DBA Lillaroi	1.57	0.84	14.3	4.4	7.6
	DBA Bindaroi	1.62	0.83	13.7	3.1	8.2
	Jandaroi	0.66	0.23	15.7	1.7	4.3
Bread wheat	Sunguard	2.32	2.01	12.7	3.5	3.7
	Mitch	2.35	2.00	12.0	5.5	6.2
	Suntop	2.36	1.99	12.4	3.3	4.1
	LRPB Reliant	2.33	1.95	12.1	6.3	6.6
	Coolah	2.30	1.89	11.3	3.0	5.0
	LRPB Lancer	2.36	1.86	13.3	2.5	3.0
	LRPB Flanker	2.27	1.82	12.1	3.4	4.8
	LRPB Gauntlet	2.22	1.65	13.0	3.9	4.6
	LRPB Mustang	1.57	1.65	12.7	6.1	7.1
	EGA Gregory	2.39	1.55	12.0	4.7	5.6
	LRPB Spitfire	1.73	1.47	15.2	5.3	4.7
	Sunmate	2.00	1.34	13.0	7.2	5.7
Site mean		2.17	1.73	13.1	3.7	5.1
CV (%)		11.1		2.1	11.6	
l.s.d.		0.351		0.32	0.83	
P value		0.058		<0.001	<0.001	

The four barley varieties, the bread wheat variety Sunguard$^{\Phi}$ and the two frost-affected bread wheats (LRPB Mustang$^{\Phi}$ and LRPB Spitfire$^{\Phi}$) did not suffer significant yield loss under high levels of crown rot infection (added CR). In the remaining entries, yield loss ranged from 15% in the bread wheat variety Mitch$^{\Phi}$ (0.36 t/ha) and up to 66% in the severely frost-affected durum variety Jandaroi$^{\Phi}$ (0.43 t/ha) (Table 1). In the other three durum varieties, yield loss ranged from 42–49% (0.68–0.79 t/ha). In the bread wheat varieties, yield loss associated with crown rot infection was highest in EGA Gregory$^{\Phi}$ at 35% (0.84 t/ha).

All four durum varieties were lower yielding than EGA Gregory$^{\Phi}$ under high crown rot infection (added CR) by between 0.63 t/ha for AGD043 and up to 1.33 t/ha for Jandaroi$^{\Phi}$. Seven of the bread wheat varieties (Coolah$^{\Phi}$, LRPB Lancer$^{\Phi}$, LRPB Flanker$^{\Phi}$, LRPB Gauntlet$^{\Phi}$, LRPB Mustang$^{\Phi}$, LRPB Spitfire$^{\Phi}$ and Sunmate$^{\Phi}$) produced a yield equivalent to EGA Gregory$^{\Phi}$ in the added CR treatment (Table 1).

All four barley varieties were between 0.99 t/ha (Spartacus$^{\Phi}$) to 1.42 t/ha (La Trobe$^{\Phi}$), yielding higher than EGA Gregory$^{\Phi}$ under high levels of crown rot infection (added CR; Table 1). Four of the bread wheat varieties (LRPB Reliant$^{\Phi}$, Suntop$^{\Phi}$, Mitch$^{\Phi}$ and Sunguard$^{\Phi}$) were also higher yielding (0.40–0.46 t/ha) than EGA Gregory$^{\Phi}$ in the added CR treatment.

Grain quality

Protein levels were quite high at this site in 2017 ranging between 11.3% (Coolah$^{\Phi}$) up to 15.7% (Jandaroi; Table 1). Crown rot infection (added CR) did not significantly affect grain protein levels in any of the lines at this site in 2017.

Where no CR was added, screening levels ranged from 0.9% in the barley variety Spartacus$^{\Phi}$ up to 7.2% in the bread wheat variety Sunmate$^{\Phi}$ (Table 1).

Screening levels were increased by between 0.9% (Compass$^{\Phi}$) to 1.9% (Commander$^{\Phi}$) in the added CR treatment for the four barley varieties, and by 2.6% (Jandaroi$^{\Phi}$) to 5.9% (AGD043) across the four durum entries. Four of the bread wheat entries (Coolah$^{\Phi}$, LRPB Flanker$^{\Phi}$, LRPB Mustang$^{\Phi}$ and EGA Gregory$^{\Phi}$) had increased screening levels of 1–2% in the added CR treatment, while Sunmate$^{\Phi}$ had 1.5% lower screenings in the inoculated plots. In the remaining bread wheats, there was no significant difference in the level of screenings between the no added CR and added CR treatments. In the added CR treatment, screening levels ranged from 2.1% in the barley variety Spartacus$^{\Phi}$ up to 11.2% in the durum wheat line AGD043 (Table 1).

Conclusions

Cereal crop species and variety choice affected yield in the absence and presence of crown rot infection, which differed by 2.56 t/ha and 2.75 t/ha, respectively between the best and worst entries. Frost damage was obvious in the durum variety Jandaroi$^{\Phi}$ plus bread wheat varieties LRPB Mustang and LRPB Spitfire$^{\Phi}$, which carried through to reduced yields relative to the other winter cereals at this site in 2017.

The four bread wheat varieties LRPB Reliant$^{\Phi}$, Suntop$^{\Phi}$, Mitch$^{\Phi}$ and Suntop$^{\Phi}$ provided a 26–30% yield benefit over growing the susceptible bread wheat variety EGA Gregory$^{\Phi}$ under high levels of crown rot infection at Gilgandra in 2017. This yield benefit was even higher (64–92%) with all four of the barley varieties at this site in 2017. These crop or variety choices could have maximised profit in this growing season, but will **not** reduce inoculum levels for subsequent crops, because all winter cereal varieties are susceptible to crown rot infection. Winter cereal crop and variety choice is therefore **not** the sole solution to crown rot, but rather just one element of an integrated management strategy to limit losses from this disease.

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