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Regional crown rot management – Merriwa 2016

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Key findings

- Yield loss from crown rot ranged from not significant in the barley variety Compass(Φ), durum entries 190873 and Jandaroi(Φ) and six of the bread wheat varieties, up to 19.7% in the barley variety Commander(Φ).
- Only the bread wheat variety Beckom(Φ) was higher yielding (by 0.58 t/ha) in the presence of high levels of crown rot infection than the susceptible bread wheat variety EGA Gregory(Φ).
- Grain protein levels were very low across the site (average 8.2%) and varied from 7.5% in LRPB Reliant(Φ) up to 8.9% in LRPB Spitfire(Φ). Crown rot did not affect protein levels in any entry.
- Screening levels were very low across entries, but crown rot infection caused a small (0.5–1.3%), yet significant, increase in the level of screenings in the barley varieties Compass(Φ) and Commander(Φ), as well as in the bread wheat varieties Coolah(Φ) and LRPB Spitfire(Φ).

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 have a significant effect on their relative yield when the disease is present.

This experiment was one of 11 conducted by NSW DPI in 2016 across central/northern NSW extending into southern Qld; to examine how crown rot affects the yield and quality of four barley, three durum and 13 bread wheat varieties.

Site details

Location	'Woodlands", Merriwa
Co-operator	Mark Campbell
Sowing date	2 June 2016
Fertiliser	90 kg/ha Granulock 12Z at sowing
Rainfall	The growing season rainfall was 378 mm
PreDicta B	0.5 *Pratylenchus thornei*/g soil (low risk), 0.4 *P. neglectus*/g soil (low risk) and 1.5 log *Fusarium* DNA/g soil (medium crown rot risk) at sowing (0–15 cm)
Harvest date	8 December 2016

Treatments

Varieties (20)

- Four barley varieties: Commander(Φ), Compass(Φ), La Trobe(Φ) and Spartacus(Φ).
- Three durum varieties: Jandaroi(Φ) and Lillaroi(Φ) plus the numbered line 190873.
- Thirteen bread wheat varieties: EGA Gregory(Φ), LRPB Flanker(Φ), Beckom(Φ), Coolah(Φ), Sunmate(Φ), LRPB Lancer(Φ), LRPB Reliant(Φ), LRPB Gauntlet(Φ), LRPB Spitfire(Φ), Mitch(Φ), Suntop(Φ) and Sunguard(Φ); (listed in order of increasing resistance to crown rot) plus one numbered line LPB12-0494.

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

In the no added CR treatment, yield ranged from 3.55 t/ha in the durum variety Jandaroi$^{\phi}$ up to 4.96 t/ha in the barley variety Commander$^{\phi}$ (Table 1). The barley variety Compass$^{\phi}$, durum entries 190873 and Jandaroi$^{\phi}$, along with six of the bread wheat varieties (Beckom$^{\phi}$, Coolah$^{\phi}$, LRPB Spitfire$^{\phi}$, LRPB Lancer$^{\phi}$, LRPB Gauntlet$^{\phi}$ and Suntop$^{\phi}$) did not suffer significant yield loss under high levels of crown rot infection (added CR). In the remaining entries yield loss ranged from 9.4% in the bread wheat variety LRPB Reliant$^{\phi}$ (0.42 t/ha) up to 19.7% in the barley variety Commander$^{\phi}$ (0.98 t/ha).

All three durum entries and the bread wheat varieties Sunguard$^{\phi}$ and Sunmate$^{\phi}$ were lower yielding than EGA Gregory$^{\phi}$ under high crown rot infection (added CR). With the exception of Beckom$^{\phi}$, the remaining bread wheat entries, along with the four barley varieties, produced yield equivalent to EGA Gregory$^{\phi}$ in the added CR treatment (Table 1).

The bread wheat variety Beckom$^{\phi}$ (0.58 t/ha) was the only entry that was higher yielding than EGA Gregory$^{\phi}$ under high levels of crown rot infection (added CR; Table 1).

Grain quality

Protein levels were low at this site in 2016 and ranged between 7.5% (LRPB Reliant$^{\phi}$) up to 8.9% (LRPB Spitfire$^{\phi}$; Table 1). The low protein levels were likely related to denitrification that occurred with transient water logging at the site early in the season.

Crown rot infection (added CR) did not significantly affect grain protein levels in any of the entries at this site in 2016.

Screening levels were very low across entries, but crown rot infection caused a small (0.5–1.3%), yet significant, increase in the level of screenings in the barley varieties Compass$^{\phi}$ and Commander$^{\phi}$, and the bread wheat varieties Coolah$^{\phi}$ and LRPB Spitfire$^{\phi}$.

Table 1. Yield and grain quality of varieties with no added and added crown rot – Merriwa 2016.

Crop	Variety	Yield (t/ha)		Protein (%)	Screenings (%)	
		No added CR	Added CR		No added CR	Added CR
Barley	La Trobe	4.53	4.06	8.4	0.9	1.1
	Spartacus	4.61	4.03	8.8	0.9	1.1
	Compass	4.29	4.01	8.4	0.4	1.0
	Commander	4.96	3.98	8.1	0.7	2.0
Durum	190873	3.56	3.45	8.6	0.4	0.4
	DBA Lillaroi	3.76	3.29	8.3	0.4	0.5
	Jandaroi	3.55	3.29	8.4	0.5	0.5
Bread wheat	Beckom	4.90	4.58	7.8	0.9	1.0
	Coolah	4.49	4.32	8.0	1.2	1.6
	LPB12-0494	4.70	4.16	8.0	1.8	2.1
	LRPB Spitfire	4.31	4.05	8.9	1.3	1.9
	LRPB Reliant	4.45	4.03	7.5	1.2	1.4
	Mitch	4.61	4.00	7.6	0.7	0.7
	EGA Gregory	4.44	4.00	7.8	0.6	1.0
	LRPB Lancer	4.05	3.96	8.8	0.6	0.6
	LRPB Flanker	4.65	3.79	7.7	0.7	0.9
	LRPB Gauntlet	3.88	3.71	7.8	0.7	0.8
	Suntop	3.92	3.70	8.0	1.5	1.5
	Sunguard	4.02	3.60	8.2	0.6	0.6
	Sunmate	4.16	3.60	8.2	2.2	2.1
Site mean		4.29	3.88	8.2	0.9	1.1
CV (%)		5.1		5.4	23.4	
l.s.d.		0.336		0.5	0.39	
P value		0.023		<.001	0.001	

Conclusions

Cereal crop and variety choice affected yield in the absence and presence of added crown rot inoculum, which differed by 1.41 t/ha and 1.30 t/ha, respectively between the best and worst entries. Only the bread wheat variety Beckom(ϕ) provided a yield benefit (15%) over growing the susceptible bread wheat variety EGA Gregory(ϕ) under high levels of crown rot infection at Merriwa in 2016. This 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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