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Regional crown rot management – Parkes 2016

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Key findings

- Yield loss from crown rot ranged from not significant in the bread wheat varieties Mitch[Ⓓ] and Beckom[Ⓓ] up to 18.6% in the bread wheat variety LRPB Flanker[Ⓓ].
- The two barley varieties Spartacus[Ⓓ] and La Trobe[Ⓓ] along with nine of the bread wheat entries were higher yielding (0.28 t/ha to 0.86 t/ha) in the presence of high levels of crown rot infection than EGA Gregory[Ⓓ].
- Grain protein levels were relatively low across the site which varied from 9.2% in Coolah[Ⓓ] up to 11.5% in the barley variety Spartacus[Ⓓ]. Protein levels in all other entries were not affected by crown rot infection.
- Crown rot infection caused a small (0.6 to 1.4%) but significant increase in the level of screenings in the four barley varieties and four of the 13 bread wheat entries but remained below 5% for all entries.

Introduction

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

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

Site details

Location	'Kundibah', North Parkes Mine
Co-operator	Matthew Burkitt
Sowing date	21 May 2016
Fertiliser	80 kg/ha Granulock 12Z (treated with 2.8 L/ha of flutriafol) and 80 kg N/ha as Urea applied at sowing
Starting soil water	~100 mm plant available soil water (0–120 cm)
Rainfall	The growing season rainfall was 475 mm
PreDicta B	Nil <i>Pratylenchus thornei</i> , 0.4 <i>P. neglectus</i> /g soil (low risk) and 0.8 log <i>Fusarium</i> /g soil (low crown rot risk) at sowing (0–15 cm)
Harvest date	2 December 2016

Treatments

Varieties (20)

- Four barley varieties: Commander[Ⓓ], Compass[Ⓓ], La Trobe[Ⓓ] and Spartacus[Ⓓ].
- Three durum varieties: Jandaroi[Ⓓ] and DBA Lillaroi[Ⓓ] plus the numbered line 190873.
- Thirteen bread wheat varieties: EGA Gregory[Ⓓ], LRPB Flanker[Ⓓ], Beckom[Ⓓ], Coolah[Ⓓ], Sunmate[Ⓓ], LRPB Lancer[Ⓓ], LRPB Reliant[Ⓓ], LRPB Gauntlet[Ⓓ], LRPB Spitfire[Ⓓ], Mitch[Ⓓ], Suntop[Ⓓ] and Sunguard[Ⓓ]; (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, yields ranged from 4.82 t/ha in the durum line 190873 up to 5.51 t/ha in the bread wheat variety Coolah[Ⓢ] (Table 1). The bread wheat varieties Mitch[Ⓢ] and Beekom[Ⓢ] did not suffer significant yield loss under high levels of crown rot infection (added CR). In the remaining entries, yield loss ranged from 5.7% in the bread wheat variety Coolah[Ⓢ] (0.31 t/ha) up to 18.6% in the bread wheat variety LRPB Flanker[Ⓢ] (1.02 t/ha).

No entry was lower yielding than EGA Gregory[Ⓢ] under high crown rot infection (added CR). The barley varieties Commander[Ⓢ] and Compass[Ⓢ], the three durum entries and bread wheat varieties LRPB Gauntlet[Ⓢ], LRPB Spitfire[Ⓢ] and LRPB Flanker[Ⓢ] all produced yields equivalent to EGA Gregory[Ⓢ] in the added CR treatment (Table 1).

The barley varieties Spartacus[Ⓢ] (0.69 t/ha) and La Trobe[Ⓢ] (0.59 t/ha), along with the bread wheat entries Coolah[Ⓢ] (0.86 t/ha), Mitch[Ⓢ] (0.84 t/ha), Suntop[Ⓢ] (0.75 t/ha), LRPB Lancer[Ⓢ] (0.72 t/ha), Beekom[Ⓢ] (0.71 t/ha), Sunmate[Ⓢ] (0.50 t/ha), LRPB Reliant[Ⓢ] (0.36 t/ha), Sunguard[Ⓢ] (0.35 t/ha) and LPB12-0494 (0.28 t/ha) were higher yielding than EGA Gregory[Ⓢ] under high levels of crown rot infection (added CR; Table 1).

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

Crop	Variety	Yield (t/ha)		Protein	Screenings (%)	
		No added CR	Added CR	(%)	No added CR	Added CR
Barley	Spartacus	5.38	5.03	11.5	1.6	3.0
	La Trobe	5.45	4.93	11.4	1.6	2.3
	Commander	4.87	4.55	10.1	2.0	2.9
	Compass	4.96	4.18	10.8	1.0	2.2
Durum	DBA Lillaro	4.95	4.47	10.6	1.4	1.7
	Jandaro	5.01	4.46	10.9	1.3	1.6
	190873	4.82	4.31	11.2	1.1	1.5
Bread wheat	Coolah	5.51	5.20	9.2	2.0	2.4
	Mitch	5.41	5.18	9.4	2.5	2.1
	Suntop	5.46	5.09	10.4	2.2	2.7
	LRPB Lancer	5.38	5.06	10.0	2.3	2.7
	Beekom	5.20	5.05	9.5	2.6	2.8
	Sunmate	5.41	4.84	9.8	3.4	4.7
	LRPB Reliant	5.13	4.70	9.9	3.1	3.9
	Sunguard	5.21	4.69	10.4	2.4	3.1
	LPB12-0494	5.06	4.62	9.8	4.0	4.8
	LRPB Gauntlet	4.97	4.58	10.6	2.4	2.9
	LRPB Spitfire	5.07	4.56	11.2	1.9	2.1
	LRPB Flanker	5.49	4.47	9.6	2.1	2.6
	EGA Gregory	5.19	4.34	9.8	2.3	2.7
Site mean		5.20	4.72	10.3	2.2	2.7
CV (%)		3.4		4.4	15.5	
l.s.d		0.271		0.52	0.62	
P value		0.004		<.001	0.047	

Grain quality

Only moderate protein levels were achieved at this site in 2016, which ranged from 9.2% (Coolah^{db}) up to 11.5% (Spartacus^{db}; Table 1). Crown rot infection (added CR) did not significantly affect grain protein levels in any of the entries at this site in 2016.

In the no added CR treatment, screening levels ranged from 1.0% in the barley variety Compass^{db} up to 4.0% in the bread wheat line LPB12-0494 (Table 1). Screening levels increased by 0.6–1.4% in the added CR treatment with the four barley varieties and the bread wheat entries Sunmate^{db}, LRPB Reliant^{db}, Sunguard^{db} and LPB12-0494. In the remaining entries, 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 1.5% in the durum line 190873 up to 4.8% in the bread wheat line LPB12-0494 (Table 1).

Conclusions

Cereal crop and variety choice provided a 6–20% yield benefit over growing the susceptible bread wheat variety EGA Gregory^{db} under high levels of crown rot infection at Parkes 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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