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Regional crown rot management – Rowena 2017

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Key findings

- Yield loss from crown rot ranged from 14.2% in the barley variety Compass$^{\Phi}$ up to 82.7% in the durum variety Jandaroi$^{\Phi}$.
- Bread wheat variety choice affected yield where there were high levels of crown rot infection, with nine bread wheats (Sunguard$^{\Phi}$, Suntop$^{\Phi}$, LRPB Lancer$^{\Phi}$, Mitch$^{\Phi}$, LRPB Reliant$^{\Phi}$, LRPB Mustang$^{\Phi}$, Sunmate$^{\Phi}$, Coolah$^{\Phi}$ and LRPB Spitfire$^{\Phi}$) being between 0.28 t/ha and 0.98 t/ha higher yielding than EGA Gregory$^{\Phi}$.
- Barley varieties had an even greater yield difference than the bread wheat varieties where there were high levels of crown rot infection, with Compass$^{\Phi}$ being 2.37 t/ha and Commander 1.78 t/ha higher yielding than EGA Gregory$^{\Phi}$.
- The four durum varieties were very susceptible to crown rot with yield losses ranging from 69.7% to 82.7% and associated significant increases screenings levels. Hence, durum should only be grown in paddocks known to have low levels of crown rot inoculum.

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 CR, which can significantly affect their relative yield in the presence of this disease.

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

Site details

Location	'Combos', Rowena
Co-operator	Will and Tilla Winston-Smith
Sowing date	7 June 2017
Fertiliser	220 kg/ha urea and 60 kg/ha Granulock Z extra at sowing
Starting nitrogen	115 kg nitrogen (N)/ha to 120 cm
Starting soil water	~185 mm plant available soil water (0–120 cm)
Rainfall	Growing season rainfall was 103 mm
PREDICTA®B	3.7 *Pratylenchus thornei*/g soil (medium risk), nil *P. neglectus* and 0.6 log *Fusarium* DNA/g (low CR risk) at sowing (0–15 cm)

Treatments

Varieties (20)

- Four barley varieties: Commander$^{\Phi}$, Compass$^{\Phi}$, La Trobe$^{\Phi}$ and Spartacus CL$^{\Phi}$. Note that La Trobe$^{\Phi}$ and Spartacus CL$^{\Phi}$ plots were selectively eaten by pigs near harvest and have been excluded from the analysis at this site in 2017.
- 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 CR).
- All entries sown to achieve a target plant population of 100 plants/m^2.

Pathogen treatment

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

Results

Yield

In the no added CR treatment, yields ranged from 1.52 t/ha in the durum variety DBA Lillaroi$^{\Phi}$ up to 3.55 t/ha in the barley variety Compass$^{\Phi}$ (Table 1).

All entries suffered significant yield loss under high levels of CR infection (added CR), ranging from 14.2% in the barley variety Compass$^{\Phi}$ (0.50 t/ha) up to 82.7% in the durum variety Jandaroi$^{\Phi}$ (1.90 t/ha; Table 1).

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

Crop	Variety	Yield (t/ha)		Protein (%)		Screenings (%)	
		No added CR	Added CR	No added CR	Added CR	No added CR	Added CR
Barley	Compass	3.55	3.04	17.6	16.5	2.4	3.6
	Commander	2.98	2.45	17.4	16.5	2.7	3.7
Durum	AGD043	2.59	0.81	16.5	14.7	5.8	43.6
	Jandaroi	2.29	0.40	16.4	16.2	4.5	32.8
	DBA Lillaroi	1.52	0.35	18.4	16.8	6.7	27.9
	DBA Bindaroi	1.77	0.34	17.2	15.5	5.4	32.0
Bread wheat	Sunguard	2.24	1.65	16.2	14.9	10.5	19.7
	Suntop	2.20	1.44	17.0	17.0	3.4	5.4
	LRPB Lancer	2.13	1.36	16.6	15.7	5.9	7.7
	Mitch	2.17	1.34	15.7	15.3	12.8	19.3
	LRPB Reliant	2.14	1.32	15.3	14.2	7.8	16.0
	LRPB Mustang	1.68	1.13	15.6	14.9	5.4	9.6
	Sunmate	2.28	1.11	16.1	15.0	6.6	13.0
	Coolah	2.35	1.10	15.6	13.6	6.8	13.2
	LRPB Spitfire	1.74	0.95	19.2	18.7	3.9	5.3
	LRPB Gauntlet	1.69	0.79	16.4	15.6	5.0	8.9
	EGA Gregory	2.06	0.67	15.6	14.3	8.1	11.7
	LRPB Flanker	1.90	0.65	15.8	14.7	4.8	15.4
Site mean		2.18	1.16	16.6	15.6	6.0	16.1
CV (%)		8.5		2.9		23.8	
l.s.d.		0.232		0.76		4.28	
P value		<0.001		0.018		<0.001	

The three durum varieties Jandaroi$^{\Phi}$, DBA Lillaroi$^{\Phi}$ and DBA Bindaroi$^{\Phi}$ were between 0.27 t/ha and 0.33 t/ha lower yielding than EGA Gregory$^{\Phi}$ under high CR infection (added CR).

The barley varieties Compass$^{\Phi}$ (2.37 t/ha) and Commander$^{\Phi}$ (1.78 t/ha), along with bread wheat varieties Sunguard (0.98 t/ha), Suntop$^{\Phi}$ (0.77 t/ha), LRPB Lancer$^{\Phi}$ (0.69 t/ha), Mitch$^{\Phi}$ (0.67 t/ha), LRPB Reliant$^{\Phi}$ (0.65 t/ha), LRPB Mustang$^{\Phi}$ (0.46 t/ha), Sunmate$^{\Phi}$ (0.44 t/ha), Coolah$^{\Phi}$ (0.43 t/ha) and LRPB Spitfire$^{\Phi}$ (0.28 t/ha) were all higher yielding than EGA Gregory$^{\Phi}$ under high levels of CR infection (added CR; Table 1). The bread wheat varieties LRPB Gauntlet$^{\Phi}$ and LRPB Flanker$^{\Phi}$ produced yields equivalent to EGA Gregory$^{\Phi}$ in the added CR treatment.

Grain quality

Protein levels were high at this site in 2017, ranging from 15.3% (LRPB Reliant$^{\Phi}$) up to 19.2% (LRPB Spitfire$^{\Phi}$) in the no added CR treatment. Crown rot infection (added CR) reduced grain protein levels by between 0.8% (LRPB Lancer$^{\Phi}$ and LRPB Gauntlet$^{\Phi}$) up to 2.0% (Coolah$^{\Phi}$) in 15 entries, with the exception of LRPB Spitfire$^{\Phi}$, Suntop$^{\Phi}$, Jandaroi$^{\Phi}$, Mitch$^{\Phi}$ and LRPB Mustang$^{\Phi}$ where the difference was not significant (Table 1).

Screening levels in the no added CR treatment ranged from 2.4% in the barley variety Compass$^{\Phi}$ up to 12.8% in the bread wheat variety Mitch$^{\Phi}$ (Table 1). Crown rot infection (added CR) did not significantly affect screening levels in at this site in 2017 for the barley varieties Compass$^{\Phi}$ and Commander$^{\Phi}$ and bread wheat varieties Suntop$^{\Phi}$, LRPB Spitfire$^{\Phi}$, LRPB Gauntlet$^{\Phi}$, LRPB Mustang$^{\Phi}$, LRPB Lancer$^{\Phi}$ and EGA Gregory$^{\Phi}$. In the remaining entries, CR infection increased screening levels by between 6.4% in the bread wheat varieties Sunmate$^{\Phi}$ and Coolah$^{\Phi}$ and up to 37.9% in the durum entry AGD043 (Table 1). The negative effect from CR on screenings was particularly noticeable in all four of the durum entries with a minimum increase in screening levels of 21.2% in DBA Lillaroi$^{\Phi}$.

Conclusions

Cereal crop and variety choice affected yield in the absence and presence of CR infection, which differed by 2.03 t/ha and 2.70 t/ha, respectively between the best and worst entries. Nine of the bread wheat varieties provided a 146% (Sunguard$^{\Phi}$) to 42% (LRPB Spitfire$^{\Phi}$) yield benefit above growing the susceptible bread wheat variety EGA Gregory$^{\Phi}$ under high levels of CR at Rowena in 2017. This benefit was even higher with the two barley varieties Compass$^{\Phi}$ and Commander$^{\Phi}$, which provided a yield benefit of 354% and 266%, respectively rather than growing EGA Gregory$^{\Phi}$ under high levels of CR infection.

These crop or variety choices could have maximised profit in this growing season but will **not** reduce inoculum levels for subsequent crops. All winter cereal varieties are susceptible to CR infection and carry the disease over from season to season. 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.

This experiment further highlights the extreme susceptibility of durum wheat varieties to CR, with yield losses ranging from 68.7% in AGD043 and up to 82.7% in Jandaroi$^{\Phi}$. Crown rot infection also dramatically increased screenings levels by 21.2% up to 37.9% in all four durum entries. Hence, very susceptible cereals such as durum, and the more susceptible bread wheat varieties, e.g. EGA Gregory$^{\Phi}$ and LRPB Flanker$^{\Phi}$,should only be grown in paddocks known to have low levels of CR inoculum based on PREDICTA®B testing before sowing.

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