Crown rot variety trials – southern NSW 2015

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Key findings

» Yield losses of up to 20% due to crown rot were observed in 2015.
» Losses ranged from 2%–11% in bread wheat and 1.5%–3% for barley.
» Crown rot has a significant effect on gross margins when comparing grain quality and yields between crown rot treated and untreated plots.
» Select the highest yielding varieties rather than those with enhanced crown rot tolerance to minimise losses.
» Reduce the risk of crown rot infection by using crop rotation as well as stubble management.

Introduction

The aim of the experiment was to examine the effect of crown rot on yield in 12 bread wheats, one durum wheat and five barley varieties of differing tolerance levels in southern NSW (sNSW).

Crown rot is caused by the pathogens *Fusarium pseudograminearum* and *Fusarium culmorum*. Crown rot restricts the flow of nutrients and water up the stem resulting in pinched or empty grain heads.

Site details

Wagga Wagga was the site selected for 2015 as it represents the medium–high rainfall cropping region of southern NSW. The experiment was sown on 2 June 2015.

Treatments

Eighteen locally relevant varieties with a range of tolerance levels to crown rot were used (Table 1). Trials were inoculated with a mixture of isolates collected from southern NSW .

There were two treatments:

1. Crown rot added (Plus CR): 72 g of crown rot infected non-viable seed sown per plot with the viable seed.
2. Control/no crown rot added (Minus CR): no crown rot inoculum sown in plots.

A foliar spray of Bumper® at 0.5 L/ha was applied on 14 September for foliar disease control. The herbicides Precept 150® at 1.5 L/ha, Axial® at 0.2 L/ha and Adigor® at 0.5 L/ha were applied on 9 September to ensure good weed control.

Table 1. Barley and wheat varieties included in the 2015 crown rot trial.

Variety	Cr rating [#]
Buloke[Φ]	S–VS [P]
Commander[Φ]	MS–S
Compass[Φ]	S
GrangeR[Φ]	S
Hindmarsh[Φ]	S
Waagan[Φ]	S
Elmore CL Plus[Φ]	MS–S [P]
Emu Rock[Φ]	MS–S
EGA_Gregory[Φ]	S
Impala[Φ]	MS–S
Lancer[Φ]	MS–S
Merlin[Φ]	MS
Phantom[Φ]	MS–S
Sunguard[Φ]	MS
Suntop[Φ]	MS–S
Trojan[Φ]	MS
EGA_Wedgetail[Φ]	MS–S
EGA_Bellaroi[Φ]	VS

[#] Crown rot rating from NSW DPI Winter crop variety sowing guide 2015.

[P] Provisional rating.

Results

Yield

Adding crown rot inoculated seed resulted in a yield loss in all varieties in the experiment with the exception of Suntop (Figure 1), but not all these differences were statistically significant. The greatest yield loss comparing the crown rot treated and untreated plots was in the VS durum wheat variety EGA_Bellaroi (20%).

Where there was crown rot, Trojan performed well, yielding higher than 9 of the10 other bread wheats that had no crown rot. Yield losses

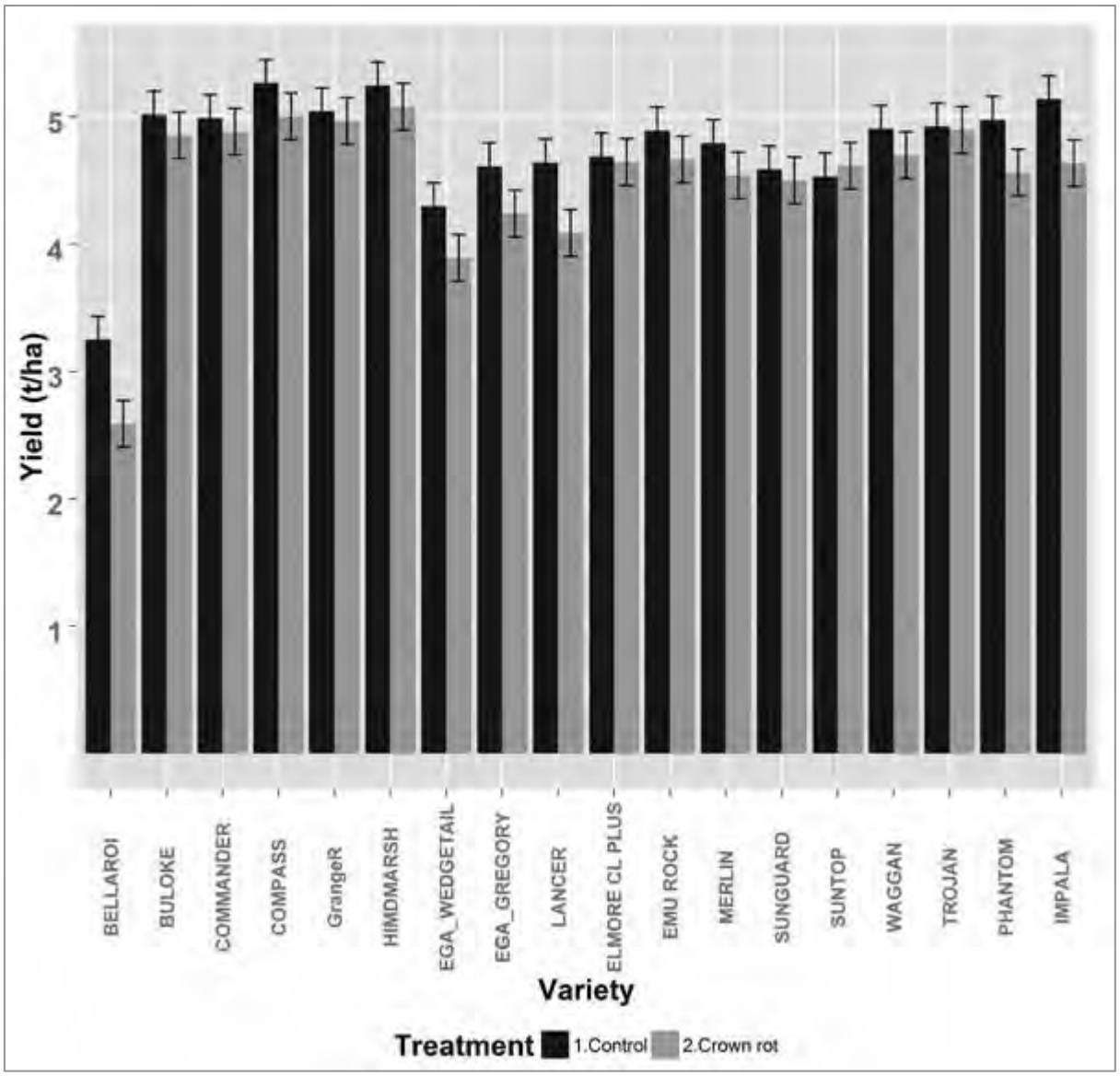

Figure 1. Crown rot yield trial Wagga Wagga, 2015. The effect of crown rot on yield in treated and untreated plots. Standard error bars indicate a significant difference between treatments where they do not overlap.

associated with crown rot varied from 2–11% in the remaining bread and biscuit wheats. Elmore CL PLUS, Sunguard, Suntop and Trojan displayed minimal losses between treated and untreated plots. EGA_Bellaroi was the worst performing variety. The later maturing lines such as EGA_Wedgetail were lower yielding due to the late sowing time.

Compass and Hindmarsh were the best performing barley varieties where there was crown rot. However, Compass showed the greatest yield loss (5%) between treated and untreated plots. There were minimal differences between the other three varieties in the trial with 1.5–3% yield losses.

Gross margins

The effects of crown rot on yield are shown in Figure 1. Crown rot can also affect the gross margin through increased screenings, test weight reductions, retention reductions and variation in grain protein content. These factors combine to downgrade grain quality and pricing, adding a multiplier effect to any reduced yield.

Table 1 shows the variation in yield, quality grades and effect on gross margin between crown rot treated and untreated plots for the 18 varieties selected.

The figure ($) lost per hectare varied between varieties depending on yield, tolerance and grain quality downgrades. On average across the 18 varieties, $78.51 per hectare was lost due to yield reduction and grain quality downgrades. In particular, crown rot caused the barley cultivar Commander to be downgraded from malt to feed quality due to reduced test weight. This resulted in a drop in per hectare price from $232 to $178, or $54/tonne penalty. The flow on effect resulted in a $288.60 net loss per hectare when comparing crown rot treated and untreated plots.

Table 1. Crown rot effects on gross margin, grain quality and yield.

Variety	Treatment	Grade potential (a)	Grade potential price ($/t) (b) (d) (e)	Actual grade (c)	Actual grade price ($/t) (b) (d) (e)	Loss in downgrades ($/t)	Mean yield (t/ha)	Gross margin ($/ha)	Loss (minus CR versus Plus CR) ($/ha)
Buloke	Minus CR	BU1	229.00	BU1	229.00	0.00	5.02	1149.34	
Buloke	Plus CR	BU1	229.00	BU1	229.00	0.00	4.85	1111.73	-37.61
Commander (d)	Minus CR	CO1	232.00	CO1	232.00	0.00	4.99	1157.90	
Commander (d)	Plus CR	CO1	232.00	F1	178.00	-54.00	4.88	869.30	-288.60
Compass	Minus CR	F1	178.00	F1	178.00	0.00	5.26	937.14	
Compass	Plus CR	F1	178.00	F1	178.00	0.00	5.00	890.65	-46.49
GrangeR	Minus CR	GN1	229.00	GN1	229.00	0.00	5.04	1155.07	
GrangeR	Plus CR	GN1	229.00	GN1	229.00	0.00	4.97	1137.45	-17.62
Hindmarsh	Minus CR	HIND	202.00	HIND	202.00	0.00	5.25	1059.79	
Hindmarsh	Plus CR	HIND	202.00	HIND	202.00	0.00	5.08	1025.73	-34.06
EGA_Bellaroi (E)	Minus CR	DR1	340.00	DR3	270.00	-70.00	3.25	877.70	
EGA_Bellaroi (E)	Plus CR	DR1	340.00	DR3	270.00	-70.00	2.59	698.95	-178.76
EGA_Gregory	Minus CR	AH	231.50	ASW1	211.50	-20.00	4.61	975.55	
EGA_Gregory	Plus CR	AH	231.50	AGP1	210.50	-21.00	4.24	892.31	-83.24
EGA_Wedgetail	Minus CR	APH	246.50	ASW1	212.50	-34.00	4.30	913.28	
EGA_Wedgetail	Plus CR	APH	246.50	ASW1	212.50	-34.00	3.89	827.09	-86.19
Elmore CL Plus	Minus CR	AH	231.50	HPS1	213.50	-18.00	4.69	1001.12	
Elmore CL Plus	Plus CR	AH	231.50	AGP1	210.50	-21.00	4.64	977.43	-23.69
Emu Rock	Minus CR	AH	231.50	AUH2	220.50	-11.00	4.89	1078.64	
Emu Rock	Plus CR	AH	231.50	AGP1	210.50	-21.00	4.66	981.65	-96.99
Impala (E)	Minus CR	ASF1	330.00	ASF1	330.00	0.00	5.14	1695.84	
Impala (E)	Plus CR	ASF1	330.00	ASF1	330.00	0.00	4.64	1529.77	-166.07
Lancer	Minus CR	APH	246.50	AGP1	210.50	-36.00	4.64	977.06	
Lancer	Plus CR	APH	246.50	AGP1	210.50	-36.00	4.09	860.60	-116.46
Merlin	Minus CR	AH	231.50	ASW1	212.50	-19.00	4.79	1018.90	
Merlin	Plus CR	AH	231.50	ASW1	212.50	-19.00	4.54	964.41	-54.49
Phantom	Minus CR	APW	217.50	APW1	217.50	0.00	4.98	1082.52	
Phantom	Plus CR	APW	217.50	AGP1	210.50	-7.00	4.56	960.39	-122.14
Sunguard	Minus CR	AH	231.50	AGP1	210.50	-21.00	4.59	965.71	
Sunguard	Plus CR	AH	231.50	AGP1	210.50	-21.00	4.50	947.12	-18.59
Suntop	Minus CR	APH	246.50	AGP1	210.50	-36.00	4.53	954.08	
Suntop	Plus CR	APH	246.50	AGP1	210.50	-36.00	4.62	971.61	17.53
Trojan	Minus CR	APW	217.50	AGP1	210.50	-7.00	4.92	1036.69	
Trojan	Plus CR	APW	217.50	AGP1	210.50	-7.00	4.90	1030.54	-6.15
Waagan	Minus CR	ASW	212.50	ASW1	212.50	0.00	4.90	1042.30	
Waagan	Plus CR	ASW	212.50	AGP1	210.50	-2.00	4.70	989.00	-53.31

(a) NSW DPI Winter crop variety sowing guide 2015
(b) GrainCorp prices at Grong Grong at 23 February 2015
(c) GrainCorp 2015–16 grain specifications
(d) GrainCorp prices at Coolamon at 23 February 2016
(e) Grain Link specifications and price at 23 February 2016

Not all varieties were as severely penalised as Commander. The majority of wheat and barley in the experiment lost significantly less per hectare (in the vicinity of $20–$80). This is still a considerable loss when multiplied out on a paddock scale. Suntop was not consistent with the rest of the data as it increased yield even though crown rot was present. However, this yield increase was not significant.

Summary

The dry spring conditions (September and October 2015) were conducive to the expression of crown rot in sNSW. The combination of high infection rates and warm conditions resulted in the observed yield losses. However, yield losses were less than expected, possibly due to adequate winter rainfall providing sub soil moisture at depth, reducing stress during the grain fill stage.

A few varieties of both wheat and barley were able to maintain yield in the presence of crown rot. Elmore CL Plus, Sunguard, Buloke and Hindmarsh performed well in the 2014 and 2015 experiments, whilst Trojan, Suntop, GrangeR and Commander performed well in the 2015 experiment. More varieties will be assessed during the coming year.

Crown rot has the ability to severely affect gross margins. It not only reduces yield, but can also increase screenings, affect test weight and grain protein resulting in quality downgrades. Downgraded grain quality and yield can cost the grower a considerable income. Quality losses can occur even when yield is not affected.

The current recommendation remains that growers should remove cereals from their rotations under high levels of crown rot. Sow a pulse or oilseed break crop and for more than one season if possible. If a cereal must be grown then select wheat varieties for the best yield in the area, or consider barley.

Growers should note that this is a single site summary and should not be relied on soley when selecting varieties.

Note: This is an industry summary provided pre-publication. Further information and analysis will be published in due course.

Acknowledgements

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