Managing crown rot on upper Eyre Peninsula - a joint learning experience

Dr Margaret Evans
Evans Consulting

Location
Buckleboo
Tim Larwood
Rainfall
Av. Annual: 297 mm
Av. GSR: 195 mm
2022 Total: 492 mm
2022 GSR: 350 mm
Yield
Potential: potential yield calculator - 5.12 t/ha (good finish); 2.56 t/ha (poor finish)
Actual: 2.66 - 4.14 t/ha (W); 3.52 - 5.12 t/ha (B)
Paddock history
2021: Wheat
2020: Vetch
2019: Oats
Soil type
Red calcareous sandy loam
Soil test
PredictaB® analysis showed inoculum of the following stem-base/root diseases was present at the site: high risk - crown rot; low/medium risk - take-all; low risk - rhizoctonia and *Pratylenchus neglectus*
Plot size
12 m x 2 m x 4 reps
Trial design
Blocked split-plot
Yield limiting factors
Nil

Location
Mitchellville
Ty Kaden
AIR EP and Franklin Harbour Agricultural Bureau
Rainfall
Av. Annual: 282 mm
Av. GSR: 190 mm
2022 Total: 411 mm
2022 GSR: 215 mm
Yield
Potential: potential yield calculator - 3.06 t/ha (good finish); 1.53 t/ha (poor finish)
Actual: 1.90 - 3.12 t/ha (W); 3.73 - 4.36 t/ha (B)

Key messages

- **Crown rot expression was low in trials on upper Eyre Peninsula and in the Upper North as there was no stress that limited water availability for grain filling.**
- **Only yield data are available at this time - when crown rot severity data are available and statistical analyses are complete, more extensive interpretation of results will be possible.**
- **There were no obvious effects of varietal resistance or maturity on responses to Victrato® fungicide seed dressing (due for commercial release in Australia in 2024).**
- **Despite limited crown rot expression, some small yield responses were seen to Victrato®. These responses were consistent with the lower end of responses seen for bread wheat and barley at medium and high rainfall sites in South Australia in previous years, where crown rot expression was significant.**
- **Further research is planned to better understand crop responses to Victrato® in low rainfall and to determine whether those responses influence carryover of crown rot inoculum.**

Why do the trial?

The aims of this series of trials included assessing the effects of varietal resistance and maturity on crown rot expression and the efficacy of the fungicide seed treatment Victrato® for managing crown rot in low rainfall environments such as the upper Eyre Peninsula (UEP). Findings from other trials, demonstrations and capacity building activities will be presented in future EPFS Summary articles.

Victrato® (with Tymirium® chemistry, planned to be available commercially in Australia in 2024) is a seed applied fungicide with potential to reduce yield losses due to crown rot. This product has been shown to improve cereal yields in medium and high rainfall areas in the presence of crown rot. Information on the efficacy of this product for low rainfall areas is limited, but preliminary data from the upper North (one trial in each of 2020 and 2021) indicate responses are likely to be more variable than those seen in medium and high rainfall areas.

The decision to target the UEP, specifically the areas of Cowell and Kimba, for research and capacity building around crown rot management was based on the results of a survey undertaken by AIR EP in 2021. AIR EP has undertaken project management and activity co-ordination and, together with the involvement of the Buckleboo Farm Improvement Group and the Franklin Harbour Agricultural Bureau in planning and implementing trials, this has contributed to ensuring the research is relevant to UEP farming systems.

Paddock history
2021: Wheat
2020: Vetch
2019: Oats
Soil type
Sandy loam over carbonate layer
Soil test
PredictaB® analysis showed inoculum of the following stem-base/root diseases was present at the site: high risk - crown rot; low/medium risk - take-all; low risk - rhizoctonia and *Pratylenchus neglectus*
Plot size
12 m x 2 m x 4 reps
Trial design
Blocked split-plot
Yield limiting factors
Nil

Location
Booleroo Centre
Matt Nottle
Upper North Farming System
Rainfall
Av. Annual: 391 mm
Av. GSR: 276 mm
2022 Total: 410 mm
2022 GSR: 244 mm
Yield
Potential: potential yield calculator - 2.41 t/ha (good finish); 1.20 t/ha (poor finish)
Actual: 1.66 - 2.39 t/ha (W); 3.10 - 3.28 t/ha (B)
Paddock history
2021: Wheat
2020: Canola
Soil type
Duplex
Soil test
PredictaB® analysis showed inoculum of the following stem-base/root diseases was present at the site: high risk - crown rot; low/medium risk - take-all and common root rot; low risk - rhizoctonia, *Pratylenchus neglectus* and *P. thornei.*
Plot size
12 m x 2 m x 4 reps
Trial design
Blocked split-plot
Yield limiting factors
Very late sown due to poor early season rainfall and this reduced yields.

How was it done?

Field trials were established in paddocks with a high risk of crown rot at Buckleboo (9 May 2022), Mitchellville (9 May 2022) and Booleroo Centre (21 June 2022). Statistical advice and trial designs were provided by Sharon Nielsen (SN Stats), who will undertake statistical analyses (including meta-analysis) once all data from the trials are available.

Five bread wheat varieties and one barley variety suited to UEP were sown at all sites with and without seed-applied Victrato® fungicide. Entries included a range of maturities (which can influence responses to crown rot) and different crown rot resistance ratings (S = susceptible; MSS = moderately susceptible to susceptible).

Bread wheat varieties were Emu Rock (very quick to quick maturing; MSS), LRPB Anvil (quick to mid maturing; MSS), Vixen (quick maturing; S), Calibre (quick to mid maturing), Razor (quick to mid maturing; IMI tolerant; S), and Scepter (mid maturing; S). Commodus barley (quick to mid maturing) was included as barley may "escape" yield losses due to crown rot because of its very early maturity.

The same seed sources were used for all trials and Victrato® fungicide was supplied by Syngenta Australia and applied to seed by Lyndon May. Total solution rate was 600 mL/100 kg of seed.

At this time, only grain yield data are available - 2022 harvest dates were 17 December Buckleboo and Mitchellville, 18 December Booleroo Centre. No statistical analyses have been undertaken. Once the data set is complete (plant density, whitehead expression, browning on main stem bases, grain quality) and results from statistical analyses are available, further EPFS articles will include that information.

What happened?

Mild conditions during flowering and grain filling meant white heads due to crown rot did not express as there was limited moisture stress on plants. Stem browning symptoms due to crown rot developed at all sites. All trials were weed free and not adversely affected by leaf diseases, insect pests or frosts.

At Booleroo Centre the start to the season was late so the trial was late-sown, which affected plant growth and yields. At Buckleboo plant growth and yields benefited from good sub-soil moisture due to high summer rainfall and good early growing season rainfall.

Average yields of varieties (Table 1) reflect seasonal conditions at the sites, being lowest at Booleroo Centre and highest at Buckleboo. Commodus barley, as would be expected, had the highest yields at all sites (Table 1). There was no obvious influence of varietal maturity or resistance to crown rot on yield.

There were some yield improvements in the Victrato® treated plots (Table 2), but also a number of negative yield responses. Yield improvements were most consistent at Mitchellville (Table 2), where preliminary stem browning assessment suggests greater expression of crown rot symptoms than at the other sites.

The most consistent yield improvements (average and range) were seen for Calibre and Razor (Table 2). There was no obvious influence of varietal resistance or maturity on responses to Victrato® treatment.

Table 1. Preliminary information[1] on effects of varietal resistance[2] and maturity[3] on yields (t/ha - average, range in brackets) of bread wheat and barley in the presence of crown rot at Buckleboo, Mitchellville and Booleroo Centre in 2022.

	Calibre	Scepter	Razor	Vixen	Emu Rock	Anvil	Commodus
CR Resistance	?	S	S	S	MSS	?MSS	"Escape"
Maturity	Q-M	M	Q-M	Q	VQ-Q	Q(-M)	Q-M
Buckleboo	3.4 (2.7-3.7)	4.1 (3.6-4.8)	3.7 (3.2-4.1)	4.1 (3.6-4.7)	3.6 (3.2-3.8)	2.7 (2.3-2.9)	4.3 (3.5-5.1)
Mitchellville	2.9 (2.8-3.1)	2.8 (2.6-3.1)	2.4 (2.3-2.5)	3.1 (2.8-3.4)	2.7 (2.6-2.8)	1.9 (1.5-2.2)	4.1 (3.7-4.4)
Booleroo Centre	2.4 (2.1-2.9)	2.3 (2.1-2.7)	2.2 (2-2.6)	1.8 (1.4-2.2)	1.7 (1.5-2.0)	1.7 (1.5-1.9)	3.2 (3.0-3.3)

[1] Interpretation of these data will be improved once crown rot severity information for main stems is available.
[2] ?=unknown, S=susceptible, MSS=moderately susceptible to susceptible.
[3] ?=unknown, Q=quick maturing, M=mid maturing, VQ=very quick maturing.

Table 2. Preliminary information[1] on yield improvements (average %, range in brackets) due to Victrato® seed treatment in cereals with different crown rot resistances[2] at Buckleboo, Mitchellville and Booleroo Centre in 2022.

	Calibre	Scepter	Razor	Vixen	Emu Rock	Anvil	Commodus
CR Resistance	?	S	S	S	MSS	?MSS	"Escape"
Buckleboo	11 (2-20)	-9 (-24-4)	4 (-1-8)	8 (2-19)	0 (-8-12)	5 (-13-13)	12 (0-30)
Mitchellville	6 (-1-15)	2 (-3-9)	10 (0-21)	10 (6-15)	6 (5-8)	7 (-2-25)	7 (-2-16)
Booleroo Centre	9 (1-22)	4 (-5-10)	1 (-6-7)	-1 (-12-13)	6 (-1-20)	6 (-1-15)	0 (-10-14)

[1]Interpretation of these data will be improved once crown rot severity information for main stems is available.
[2]?=unknown, S=susceptible, MSS=moderately susceptible to susceptible.

What does this mean?

Mild seasonal conditions and good moisture availability during grain filling meant crown rot pressure on yield was limited, although some stem browning expression occurred at all sites. This meant responses to Victrato® were lower than, but still consistent with, responses seen in replicated trials in medium rainfall areas of South Australia in 2020 and 2021.

The variability amongst replicates of a given variety in response to Victrato® is likely to have been influenced by normal spatial variability in yield as crown rot expression was so low. Statistical analysis of yield and crown rot severity data may clarify the roles played by spatial variability and Victrato® effects, as will results from the trials planned for 2023.

To determine whether there is a reduction in inoculum carryover after Victrato® was applied in 2022, crown rot inoculum will be quantified pre-sowing in 2023 using PredictaB® analysis of soil samples. If inoculum carryover is reduced, this will influence when and how Victrato® is used to manage crown rot on the UEP and in other low rainfall environments.

Acknowledgements

Thanks to the growers and their families who hosted trials, as well as to AIR EP and the farmer groups that provided support for the project. Thanks to SAGIT for funding the project “AEP-1022-R Managing crown rot on Upper Eyre Peninsula - a joint learning experience” for the period 2022-2024. Thanks to Elders Limited for funding the Booleroo Centre trial. Also to Lyndon May (Elders) for organising and helping sample the Booleroo Centre trial, treating seed for all trials and assisting with sampling and to the other Elders staff who assisted with sampling. Thanks also to EPAG Research and AgXtra for managing trials and to EPAG Research staff for sampling and processing samples from the UEP sites. Thanks to Syngenta Australia for providing Victrato® fungicide and for technical assistance.