

New seed treatment for the management of crown rot in cereals

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Key findings

- Victrato reduced disease severity and white head expression at Hart.
- Disease severity was low, resulting in a minimal yield loss.
- White head expression averaged 1.2% across the trial and crown rot infected 71% of plants. Variety resistance did not influence disease levels in 2022.
- Crown rot levels in 2022 were low and there was no impact on yield. Grain yield averaged 5.10 t/ha across the trial. Variety resistance to crown rot did not affect grain yield due to the low disease levels.

Introduction

Crown rot (*Fusarium pseudograminearum* and/or *Fusarium culmorum*) is a fungal disease that can infect cereals and grasses. It is a disease that is common across all cropping areas in South Australia and can cause yield losses between 5-20% in wheat and more than 50% in Durum (GRDC 2019).

Strategies that can be used to reduce the impact of crown rot are to include non-cereal crops in the paddock rotation, selecting varieties with improved genetic resistance or the use of seed treatments. A combination of these treatments is the best way to reduce the impact of crown rot.

Victrato® (active ingredient cyclobutrifluram) is a seed treatment that is undergoing registration by Syngenta for the control of crown rot and suppression of root lesion nematodes. Victrato also provides control of fusarium head blight and fusarium seedling blight. Victrato is recommended to be applied with other seed treatments as the product does not have any control or suppression of smut, bunt and other soil diseases typically controlled by seed treatments.

This trial aims to evaluate the performance of Victrato on barley, wheat and durum for the control of crown rot.

Methodology

Plot size	1.75 m x 10.0 m	Fertiliser	Seeding: DAP (18:20) Zn 1% + Impact @ 80 kg/ha
Seeding date	May 13, 2022		July 22: Easy N (42.5:0) @ 70 L/ha
Location	Hart, SA		August 17: Easy N (42.5:0) @ 60 L/ha
Harvest date	December 1, 2022		
Crop history	Mulgara Oaten Hay		

The trial was a split plot design with three replicates, five varieties and two seed treatments (Tables 1 and 2). It was managed with the application pesticides to ensure a weed and insect free canopy. All plots were assessed for grain yield (t/ha), protein (%), test weight (kg/hL), screenings (%) and disease severity (%). Data was analysed using a split-plot ANOVA model in Genstat 22nd edition.

Plant samples were collected at early grain fill for assessment of whitehead expression and browning on main stem bases. Crown rot incidence (% of main stems with basal stem browning) and severity (extent of browning on main stems) was scored visually on a 0-5 scale:

0 = 0%	No yield loss
1 = 1-10%	Possibility of minor yield loss
2 = 10-25%	Possibility of some yield loss
3 = 25-50%	Probably some yield loss
4 = 50-75%	Significant yield loss likely
5 > 75%	High yield loss likely

Table 1. Summary of varieties and their crown rot resistance sown at Hart in 2022 (GRDC 2022).

Crop type	Variety	Crown rot resistance
Durum	DBA-Aurora	VS
Durum	Bitalli	SVS
Durum	Patron (AGTD109)	SVS
Wheat	Scepter	MSS
Barley	Spartacus CL	S

Table 2. Summary of seed treatments trialed at Hart in 2022.

Treatment name	Products
Nil	Cruiser® 350FS + Vibrance®
Tymirium	Cruiser 350FS + Vibrance + Victrato

Predicta®B sampling was completed at the trial location before seeding. It was determined there was a medium risk for crown rot infection. To ensure a high background level of crown rot infection was present, sterile Millet seed was infected with *F. pseudograminearum* and was placed in furrow with the trial seed.

Results and discussion

Disease severity and incidence

The application of Victrato reduced the severity and incidence of crown rot at Hart in 2022 (Table 3). Crown rot severity was higher in the nil treatment than the Tymirium treatment, although the trial average was low. A basal stem browning (crown rot severity) score of around 2.00 is often associated with some yield loss (Evans et al 2020). The 2022 trial averaged a disease severity score of 1.00, meaning yield loss would be unlikely. The percentage of infected plants (incidence) was reduced when Victrato was applied.

Table 3. Summary of crown rot severity, incidence and white head expression at Hart in 2022. Values shaded blue are best performing treatments.

Seed treatment	Disease severity	Incidence (%)	White head expression (%)
Nil	1.20 ^b	77 ^b	1.5 ^b
Tymirium	0.81 ^a	65 ^a	0.8 ^a
LSD (P≤0.05)	0.16	7.4	0.47

White head expression was also reduced by Victrato application in 2022. White head expression is more common when crops experience warm, dry springs (GRDC 2019). When white head expression is low, yield loss is likely to be minimal. If the 2022 trial experienced a water stressed spring, it would be likely for increased white head expression to occur due to high crown rot incidence.

Crown rot incidence was affected by variety selection, with Bitalli, DBA-Aurora and Scepter recording the lowest incidence, averaging 61%. Patron and Spartacus recorded high incidence levels of 79% and 93%, respectively (data not shown). An incidence of 20% or greater can present a risk of yield loss due to crown rot (Evans et al 2020). This suggests all varieties trialed in 2022 had a higher risk of yield loss, although a wet spring reduced this risk.

A trial conducted at Hart in 2020, also assessed the impact of Victrato on crown rot severity and grain production. The Victrato seed treatment reduced disease severity and white head expression at Hart in 2020 (Evans et al 2020). This reduction in disease was reflected in grain yield increases of 4-26% at Hart with very susceptible durum wheat benefitting most.



Figure 2. Patron (AGTD109) durum wheat untreated (left) and Victrato (right) applied at Hart in 2022.

Crop quality and yield

Crown rot severity was low and did not result in yield loss at Hart in 2022. Yields were similar for all varieties, ranging from 4.79 – 5.35 t/ha (Table 4). Spartacus CL was the best performing variety for grain protein, measuring 11.9 %. This would be expected as the nitrogen requirement of barley is lower than wheat. Scepter and DBA-Aurora also produced higher levels of protein with 10.6% and 10.2%, respectively. Test weights for durum and wheat were high with Scepter performing well.

Screenings were low across all varieties.

Table 4. Summary of grain yield and grain quality of varieties trialed at Hart in 2022. Shaded values show the best performing treatments.

Variety	Grain Yield (t/ha)	Protein (%)	Test Weight (kg/hL)	Screenings (%)
DBA-Aurora	5.13	10.2 ^{bc}	82.8 ^b	0.63 ^b
Bitalli	5.35	10.0 ^b	83.6 ^c	0.38 ^a
Patron	5.25	8.6 ^a	82.4 ^b	0.57 ^{ab}
Scepter	4.79	10.6 ^c	85.2 ^d	0.57 ^{ab}
Spartacus CL	5.00	11.9 ^d	67.6 ^a	0.96 ^c
LSD (P≤0.05)	NS	0.58	0.78	0.2

Values with the same letters are not significantly different.

Application of Victrato did not affect grain protein or test weight in 2022. As this was observed in a wet spring, the grain quality could be different if there was a dry spring and high levels of disease in the crop. Screenings were reduced when Victrato was applied as seed treatment, although screenings were still low across the trial, averaging 0.61%. In years where screenings are higher due to crown rot, Victrato could potentially reduce screenings.

Crown rot severity and white head expression was greater in 2020 than 2022, resulting in yield loss due to crown rot infection. Victrato improved grain yield in trials at Hart and Pinery, with increases of 4-26% and 13-32% respectively due to reductions in disease severity and white head expression (Evans et al 2020).

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References

Evans M, Hosking D and May L 2020, 'Managing crown rot – fungicide seed treatment and variety resistance', 2020 Hart Trial Results

<https://www.hartfieldsite.org.au/pages/resources/trials-results/2020-trial-results.php>

GRDC 2019, 'Crown rot – southern', *GRDC Fact Sheet*

<https://grdc.com.au/resources-and-publications/all-publications/factsheets/2019/crown-rot-southern>

GRDC 2022, '2023 South Australian Crop Sowing Guide', NVT Crop Sowing Guides

Syngenta 2022, 'Victrato seed treatment', Product Overview