Effects of fluid fungicides on crown rot when applied at sowing

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Key findings

- Evidence from this trial indicates that further investigation of fluid fungicides banded at sowing for crown rot management is warranted
- Many treatments decreased crown rot incidence early in the season and in these treatments, the plants had increased vegetative bulk later in the season
- Fungicide application reduced levels of crown rot DNA in the crop at maturity
- Expression of crown rot symptoms in durum wheat and bread wheat were different, depending on the treatment applied

Why do the trial?

This was a proof-of-concept trial to assess whether applying fluid fungicides in bands at sowing has potential for managing crown rot.

How was it done?

Funding from GRDC and industry partners was used to run the trial, which was direct drilled on 12th June 2012 in plots of 6 rows x 14m. In each plot, the fungicide treatment was applied to 3 rows, with 3 rows left untreated. Three replicates were sown to the bread wheat cultivar "Yitpi" and three replicates were sown to the durum wheat cultivar "Tamaroi". Three fungicides with different chemistries were applied as fluids in the following locations:

- IF - in furrow as a band below the seed.
- SB - as a band on the soil surface above the seed.
- IF+SB - half rate of the fungicide applied IF and half rate applied SB.

Samples for visual disease assessment and pathogen DNA analysis were taken in August at early tillering and in October at early grain fill. Harvest index cuts were taken in November (harvest ready) as plots were not suited to standard harvesting methods.

Browning on the base of the leaf sheath (August samples) or stems (October samples) was used to assess incidence of crown rot (% of plants showing basal browning). Crown rot severity (scoring scale 0-5 on the main stem) and whitehead expression were recorded for October samples. After visual disease assessments, the base 7 cm of the plant was dried and ground, then sent to the Predicta B testing service at SARDI to assay for DNA of *F. pseudograminearum*.

Results

Figure 1. Effect of fungicides applied at sowing on crown rot incidence at early tillering in durum and bread wheats

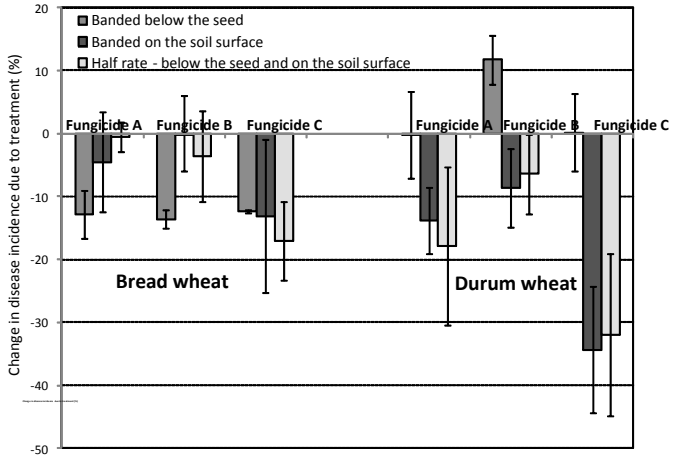


Figure 2. Effect of fungicides applied at sowing on vegetative plant weight at maturity in durum and bread wheats

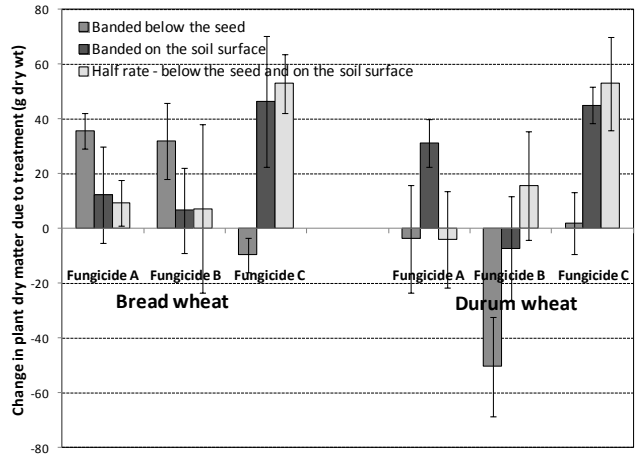
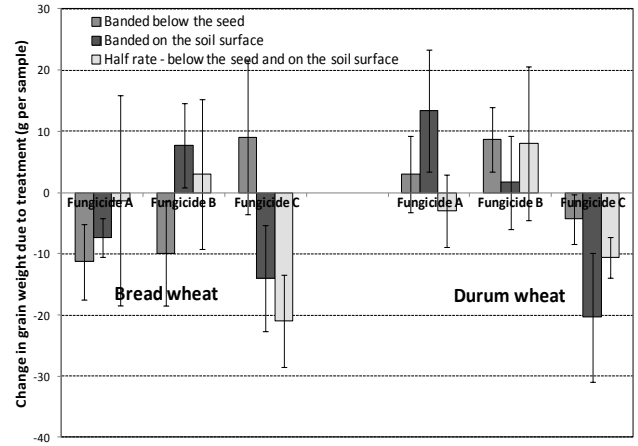


Figure 3. Effect of fungicides applied at sowing on grain weight at maturity in durum and bread wheats



The information presented in these graphs is a subset of that which is available and has been chosen to illustrate the main findings from the trial.

Graphs show the difference between results from untreated and fungicide treated areas within each trial plot. Standard errors of the mean are presented on each histogram bar.

Fig. 1 shows that crown rot incidence is reduced by many of the fungicide treatments. Banded below the seed appears most effective for bread wheat and banded on the surface appears most effective for durum wheat.

Fig. 2 shows that where fungicide application reduced disease incidence, that vegetative crop bulk at maturity was generally increased.

Fig. 3 shows that fungicide treatments which reduced disease incidence and increased vegetative crop growth generally had the lowest grain yield per sample.

At anthesis, concentrations of pathogen DNA in the crop were reduced by up to 99% (mean of 76% ± 3%) by fungicide application. This level of reduction occurred for both bread and durum wheat.

Discussion

Fungicide application as fluid bands at sowing reduced concentrations of the crown rot pathogen in plant tissues. This was associated with a reduction in disease expression in young plants and improved crop growth after that. This is the first record of one fungicide application having a visible effect on the crown rot pathogen, disease expression and plant growth in cereals.

The effectiveness of fungicide application did not result in improved yields. In fact, the more effective the fungicide was early in the crop, the lower the yields. This might be the result of greater crop bulk in those treatments resulting in more moisture stress during the very low rainfall spring of 2012. This outcome is likely to be a rare event. In most instances a reduction in crown rot is expected to lead to increased yields.

Bread and durum wheat appeared to respond differently to the placement of fungicides and it is unclear why this effect occurred or whether it would be repeatable. What is clear is that for both cereal types, fungicide application reduced pathogen DNA concentrations at maturity and this implies there will be less carryover of crown rot inoculum to the next crop. The practical outcomes from this reduction need to be explored as fluid fungicide banding may contribute significantly to keeping crown rot inoculum at a low risk level. This might be a powerful management tool, particularly in inter-row sowing systems.

Further trial work will be required to confirm the effects seen in this trial and to explore the reliability with which these effects express over a range of sites and seasons. More importantly, the cost-effectiveness of such treatments needs to be established.

Harvest at Hart 2012