Farmer best bet demonstrations for Rhizoctonia management

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DEMO

Searching for answers

Location:
Warramboo
Rainfall
Av. Annual: 300 mm
2012 Total: 204 mm
2012 GSR: 141 mm
Yield
Potential: 1.0 t/ha (W)
Actual: 1.3-1.5 t/ha (W)
Soil
Calcareous loamy sand

Location:
Wynarka (near Karoonda)
Rainfall
Av. Annual: 335 mm
Av. GSR: 238 mm
2012 Total: 294 mm
2012 GSR: 1221 mm
Yield
Potential: 2.6 t/ha (B)
Actual: 3.7 t/ha (B)
Soil
Sand over sandy loam

Location:
Streaky Bay
Rainfall
Av. Annual: 298 mm
Av. GSR: 243 mm
2012 Total: 205 mm
2012 GSR: 156 mm
Yield
Potential: 1.2 t/ha (W)
Actual: 1.0 t/ha (W)
Soil
Highly calcareous grey loamy sand

Key messages

- **2012 was a set up year for the Rhizoctonia best bets demonstrations.**
- **Fungicides banded with fluid fertilisers at seeding did not reduce Rhizoctonia in the following cereal crop.**

Why do the demonstration?

After a resurgence in Rhizoctonia research over the last decade, our understanding of this difficult to manage disease has increased substantially. The aim of the project summarised in this article is to use the latest findings from this Rhizoctonia research to demonstrate the collective value of 'best bet' strategies in broad acre environments of the upper EP in comparison to current farming practices. This SAGIT funded project will be looking at the impact of break crops on Rhizoctonia inoculum in 2013 and of crop management on disease expression in the following cereal crop. However, the opportunity was also taken to monitor some farmer activities in 2012 which may impact on Rhizoctonia.

How was it done?

Within the demonstration areas of the paddock four replicated sampling lines were established to measure and collect data. Three sites were monitored – banded fungicides at Warramboo and Wynarka (southern Mallee) and canola at Piednippie. Paddock history, PreDicta B disease inoculum levels (RDTS), soil moisture, soil fertility, plant density, Rhizoctonia patch and root score, grain yield and quality were taken from both the "district practice" part of the paddock and "Rhizoctonia control" part. Each demonstration had treatments located parallel to each other, a minimum of one seeder width and greater than 500 m in length. The sampling lines were established across the treatments.

Kane & Veronica Sampson, Warramboo

In 2012 Kane included fungicides in a fluid fertiliser but he also applied some strips without fungicide, so the +/- fungicide strips were monitored for Rhizoctonia disease incidence. The paddock was sown on 28 May with Axe wheat @ 65 kg/ha using fluid fertiliser with 6 units P, 9 units N and trace elements (TE) of 1.5 kg/ha each of elemental Mn and Zn. The previous paddock rotation was; 2011 Mace wheat; 2010 pasture; 2009 barley.

Three fungicide treatments were used, one had active ingredient (Triadimefron 125 g/L) @ 500 ml/ha, another had an active ingredient of 250 g/L Flutrifol @ 400 ml/ha. The control was the fluid fertiliser and TE mix only. Note: these fungicides are registered for control of cereal leaf diseases (mainly rusts) not Rhizoctonia. One of each fungicide and one control were sown with two seeder widths and approximately 1 km in length. They were located parallel to each other along the paddock fence line. Four sampling lines within each strip were monitored during the season. 4 x 10 m strips were harvested with the small plot harvester for grain yield and quality.

What happened?

The PreDicta B disease inoculum levels of risk were all in the below detection/low level for Take-all, Crown Rot, Cereal Cyst Nematode and Pratylenchus neglectus. The *Rhizoctonia solani AG8* risk was high with 296 pg DNA/g soil.

The paddock had undulating sandhills with shallow flats and the initial soil data taken from four sites across the soil and treatments areas and bulked (Table 1) shows a soil pH of 7.9 with adequate phosphorus and nitrogen levels.

Table 1 Initial soil data for Warramboo fungicide demonstration, 2012

Soil depth (cm)	Water volumetric (mm)	Nitrate N (mg/kg)	Ammonium N (mg/kg)	Estimated Mineral N 0-60 cm (kg/ha)	Colwell P (mg/kg)	Organic C (mg/kg)	EC (dS/m)	pH ($CaCl_2$)	Chloride (mg/kg)
0-10	12	2	2	5	34	2.4	0.35	7.9	1.92
10-40	40	24	1	86					
40-70	29	8	1	29					
70-100	Rock at depth (in flats - rock in 50-60 cm zone)								

Table 2 The effect of banded fungicides on dry matter, disease and grain yield of wheat at Warramboo, 2012

	Control	Flutrifol	Triadimefron	*F prob (P=0.05)*
Early dry matter (g/plant)	0.12	0.12	0.11	*ns**
Rhizoctonia patch score**	1.9	1.4	1.7	*ns*
Rhizoctonia patch severity***	1.2	1.0	1.3	*ns*
Rhizoctonia root infection****	1.0	1.3	1.1	*ns*
Average number of crown roots	10.3	9.3	7.6	*ns*
% Rhizoctonia crown roots infection	83	45	77	*LSD=21*
Grain yield (t/ha)	1.57	1.54	1.27	*LSD=0.10*
Grain protein (%)	13.8	13.3	13.7	*ns*
Grain moisture (%)	9.5	9.5	9.6	*ns*
Screenings in grain (%)	3.5	2.3	4.4	*ns*
1000 grain weight (g)	30.9	33.3	29.1	*ns*
Test weight (g/hL)	77.2	76.1	77.4	*ns*

** ns=all treatments similar, ** number plants affected by Rhizoctonia of 5 selected plants across a row, scored every 2m, *** scored every 2m where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage, **** plants roots visually scored for Rhizoctonia root damage where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage.*

In 2012 there was less than expected Rhizoctonia disease incidence as the paddock was the last sown in cold conditions. There were no differences with the added fungicides to Rhizoctonia disease incidence, root infection and plant growth early in the season (Table 2). However, there was some Yellow Leaf Spot (YLS) in the crop early and although it isn't registered for YLS control, the Flutrifol treatment looked slightly better earlier in the season. There was a difference with crown root infection later in the season, but this did not improve grain yield at maturity. The lower yield in the Triadimefron may be due to the location of this treatment in the shallower zone of the paddock rather than the sides of the sand hills where the other treatments were located.

The results at harvest suggested that Triadamefron reduced grain yield but there were no differences measured in grain quality.

Stuart Pope, Wynarka (near Karoonda), southern Mallee

In 2012 Stuart used fungicides in his fluid fertiliser, so the demonstration was monitored for any differences in disease incidence in barley.

The paddock received regular summer sprays to keep the paddock clean of weeds. The paddock was sown with Scope barley on 21 May with a Morris Concept seeder in a one pass operation. Fertiliser was 27:12 banded below the seed @ 75 kg/ha. Five L/ha of a fluid trace element mix was also banded under the seed with 80 g/L of Zn sulphate, 60 g/L of Mn sulphate and 20 g/L of Cu sulphate.

Herbicides used prior to seeding were Glyphosate and MCPA amine two weeks before seeding, then Gramoxone, Trifluralin and Metribuzin immediately prior to seeding. The paddock also had 40 g/ha of On Duty® applied in June for brome grass control. The previous paddock history was; 2011 Mace wheat (2.3 t/ha); 2010 lupins; 2009 barley.

The fungicide used was 250 gm/L Flutrifol at a rate of 400 ml/ha. Note: this fungicide treatment is registered for control of cereal leaf diseases (rusts) not Rhizoctonia. The control was one seeder width where the fluid delivery system was turned off, so this area received 75 kg/ha of granular fertiliser at seeding but no fungicide and no fluid trace element mix. 50 kg/ha of urea was also applied to the whole paddock in late July.

Two control strips were sown, one seeder width wide with the fungicide treatment located either side and between them. Four sampling points were located within each treatment, giving 12 fungicide and 8 control measurements. 10 m strips were harvested at 4 points within each of the 3 treatments, with the small plot harvester for grain yield and quality.

Table 3 Soil data for the Wynarka (Mallee) paddock demonstration, 2012

Soil depth (cm)	Water volumetric (%)	Nitrate N NO_3 (mg/kg)	Ammonium N NH_4 (mg/kg)	Total Mineral N 0-60 cm (kg/ha)	Colwell P (mg/kg)	Organic C (%)	EC (dS/m)	pH ($CaCl_2$)
0-10	8.4	5	8	16	5	0.77	0.07	6.7
10-40	9.8	3	3	22	3			
40-70	26.3	7	4	40	7			
70-100	27.4	9	2	40	9			

Table 4 The effect of fungicides and trace elements on dry matter, disease and yield of barley at Wynarka (Mallee), 2012

	Control	Flutrifol + Trace Element mix	*F prob (P=0.05*
Plant establishment (plants/m^2)	120	123	*ns**
Early dry matter (g/plant)	0.63	0.61	*ns*
Rhizoctonia patch score**	1.05	0.66	*ns*
Rhizoctonia patch severity***	0.93	0.55	*ns*
Rhizoctonia root infection****	1.29	1.31	*ns*
Average number of crown roots	8.7	9.0	*ns*
% Rhizoctonia crown roots infection	3.19	3.84	*ns*
Grain yield (t/ha)	3.70	3.92	*ns*
Grain protein (%)	9.92	9.96	*ns*
Grain moisture (%)	10.8	10.8	*ns*
Screenings in grain (%)	6.2	4.1	*ns*
1000 grain weight (g)	77.2	76.1	*ns*
Test weight (g/hL)	89.8	90.2	*ns*

** ns=all treatments similar, ** number plants affected by Rhizoctonia of 5 selected plants across a row, scored every 2m, *** scored every 2m where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage, **** plants roots visually scored for Rhizoctonia root damage where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage.*

What happened?

The PreDicta B disease inoculum levels of risk were all in the below detection/low level for Take-all, Crown Rot, Cereal Cyst Nematode and *Pratylenchus neglectus*. The *Rhizoctonia solani AG8* risk was low with 2-24 pg DNA/g soil.

The soil type is sand over sandy loam (Karoonda dune swale) with a pH of 6.7, and lower nitrogen at depth compared to the EP soils.

A good break to the season, early sowing in warmer conditions and good nutrition levels allowed the crop to establish well. The low initial Rhizoctonia inoculum level and the seasonal conditions resulted in low Rhizoctonia symptoms in this paddock this season.

The Mallee and Warramboo sites, sown to barley and wheat respectively, showed large differences in Rhizoctonia crown root infection despite a similar number of crown roots (Table 4). Crown roots develop depending on the seasonal conditions and the number of tillers. Barley is generally more susceptible to Rhizoctonia infection and Rhizoctonia disease symptoms but the initial Rhizoctonia inoculum level was much lower at the Mallee site. Greater infection may have also occurred at the Warramboo site due to plant stress, especially lack of soil moisture from August onwards.

There were no differences due to treatments in grain yield or grain quality at this site.

Dion, Nev and Karen Trezona, Piednippie

A paddock with a high grass history was sown to canola in 2011. The paddock had a seeder strip which was a fallow with some medic and a few weeds (melon and milk thistle). This area was monitored in the 2012 season after being over-sown with wheat, for any differences in Rhizoctonia disease incidence.

The paddock was sown with Mace wheat @ 60 kg/ha on 12 June with 50 kg/ha of DAP (18:20:0:0). The previous paddock history was; 2011 Telfer canola (TT); 2010: Marloo oats, 2009 Wyalkatchem wheat.

The 2011 canola crop was CB Telfer, which is a TT canola. It was sown @ 3 kg/ha with 65 kg/ha DAP (18:20:0:0). It received a post sowing application of Terbyne®, then Targa® (grass control) and Lorsban® (insect control) approximately 6 weeks after sowing. The active ingredient in Terbyne® is Terbuthylazine (750g/kg), a triazine herbicide. Terbyne® is a group C herbicide which provides pre-emergent weed control in pulses and TT canola which has less of a plant back period than atrazine or simazine.

Table 5 Initial soil data for paddock demonstration, Piednippie 2012

Soil depth (cm)	Water volumetric (mm)	Nitrate N NO_3 (mg/kg)	Ammonium N NH_4 (mg/kg)	Total Mineral N 0-60 cm (kg/ha)	Colwell P (mg/kg)	Organic C (mg/kg)	EC (dS/m)	pH ($CaCl_2$)	Chloride (mg/kg)
0-10	9	1.0	1.00	3	34	1.45	0.26	7.70	1.87
10-40	30	31.3	2.50	135			0.92		
40-70	25	50.0	4.05	112			1.45		
70-100	24	72.6	5.63	108			2.14		

Table 6 The effect of two break options on wheat dry matter, disease and yield at Piednippie, 2012

	TT Canola	Fallow/medic	*F prob (P=0.05)*
Early dry matter (g/plant)	0.17	0.16	*ns**
Rhizoctonia patch score**	0.75	1.07	*ns*
Rhizoctonia patch severity***	0.3	0.6	*ns*
Rhizoctonia root infection****	0.9	0.8	*ns*
Average number of crown roots	7.0	8.0	*ns*
% Rhizoctonia crown roots infection	4.2	5.5	*ns*
Grain yield (t/ha)	0.96	0.97	*ns*
Grain protein (%)	11.7	11.7	*ns*
Grain moisture (%)	9.5	9.5	*ns*
Screenings in grain (%)	2.2	6.7	*LSD=1.4*
1000 grain weight (g)	35.9	32.9	*ns*
Test weight (g/hL)	80.5	78.5	*LSD=1.9*

** ns=all treatments similar, ** number plants affected by Rhizoctonia of 5 selected plants across a row, scored every 2m, *** scored every 2m where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage, **** plants roots visually scored for Rhizoctonia root damage where 0=no Rhizoctonia damage and 5=severe Rhizoctonia damage.*

GPS co-ordinates of the fallow strip were taken at the first sampling and marker pegs were placed in the fence line. The whole paddock was sown by the farmer. The canola strip monitored during the season was located one seeder width east of the fallow strip. Four sampling points were located within each treatment. 4 x 10 m strips were harvested with the small plot harvester for grain yield and quality.

What happened?

The PreDicta B disease inoculum levels of risk for the canola and fallow areas were all in the below detection level for Take-all, Crown Rot, Cereal Cyst Nematode and low risk for *Pratylenchus neglectus.* The *Rhizoctonia solani AG8* risk was high with 212 pg DNA/g soil after canola and medium 116 pg DNA/g soil after the fallow.

The soil test data showed a soil pH of 7.7 in a grey calcareous sandy loam with adequate phosphorus levels and high nitrogen levels (Table 5).

There were no differences in Rhizoctonia disease incidence or yield in the paddock demonstration (Table 6). The Rhizoctonia inoculum level was higher than expected in both the canola and fallow/medic but this may have been due to several factors; a simazine type product being used in 2011 on the canola crop which might increase root damage; lower plant density in the canola crop due to mice damage; and a history of grass issues in this paddock. There were some differences in grain quality with the canola area having less screenings and a higher test weight.

What does this mean?

Two of the farmers involved were using fungicide treatments with fluid systems and these were monitored for differences in Rhizoctonia disease incidence. There were no differences in early Rhizoctonia disease incidence in any of the fungicide treatments used by farmers in 2012.

Previous research on Eyre Peninsula with canola has shown a reduction in Rhizoctonia inoculum levels and differences in disease incidence following canola compared to cereals. On Eyre Peninsula fallow treatments and medic treatments have also reduced Rhizoctonia inoculum disease levels compared to cereals. Following a canola crop the paddock is generally sown to wheat and sown earlier as grass weeds have been controlled in the previous season. These factors give the plants a greater chance to be less affected by Rhizoctonia as seen at Piednippie, and this paddock was the highest yielding paddock on this farm in 2012.

The impact of break crops on Rhizoctonia inoculum and of crop management on disease expression in the following cereal crop will continue to be monitored in 2013.

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