

2016 UAV Rhizo Summary

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The Adams family set up large scale rhizoctonia trial which had three treatments:

1. Untreated – untreated seed sown with fertiliser and flutriafol,
2. Systiva® treated seed
3. Uniform® treated fertiliser (400 mL/ha) and untreated seed

These were sown in double width strips from a paddock edge with the remainder of the paddock sown with Uniform treated fertiliser (Image 1). Using UAV normal and NDVI images and ignoring patches, five areas with relatively even crop growth were selected for use in patch mapping. Patches and nearby healthy crop were sampled in August for soil (PredictaB) and plant roots (disease scoring). UAV images were also taken in August and patches plus nearby healthy crop were hand cut for dry matter and grain yield prior to harvest. There was waterlogging in all the treatment strips during the year.

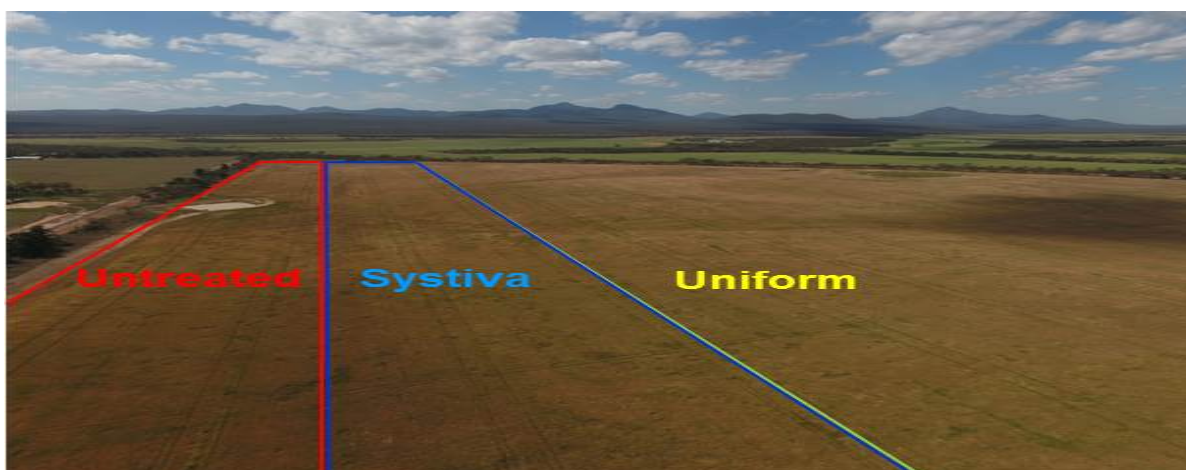


Image 1: South Stirlings site with treatment strips of Untreated (red), Systiva treated seed (blue) and Uniform treated fertiliser (yellow).

The Adams barley developed rhizoctonia which accounted for 0.6 % of paddock area which was half of 2015 levels (1.2 %). The overall number of patches also reduced from 4,280 to 1,761. At all three sites monitored in this project, rhizoctonia levels were substantially lower than the previous year as summer rain is known to reduce rhizoctonia levels.

The Uniform treated areas had a significantly higher grain yield (Table 1) and dry matter at maturity (Table 2) relative to the Untreated area. On average, Uniform increased grain yield by 700 kg/ha. 400 mL/ha of Uniform costs \$24/ha so at \$200 /t for grain, would have returned roughly \$140 /ha.

Patches in the untreated area showed the greatest yield reductions averaging only 41% of healthy yield while patches in Systiva yield was significantly better (59% of healthy) and Uniform (51%) was between these.

Neither of the treatments improved grain quality and grain from the Uniform treated areas had a significantly decreased grain weight which is likely to be a result of its increased yield overall.

Despite the excellent moisture availability during spring, grain from plants inside patches still had significantly higher screenings relative to the surrounding crop (4.1 vs 6.0%). Grain brightness was better inside patches as those plants tend to mature later than the surrounding healthy crop.

Table 1. Grain yield (t/ha) at the South Stirlings in 2016.

	Treatment			
Position	Untreated	Systiva	Uniform	Average
Healthy	5.87	5.63	6.34	5.97
Patch	2.38	3.35	3.25	2.99
Average	4.12	4.49	4.82	4.48

ANOVA	p-value	lsd (5%)
Position	<.001	0.442
Treatment	0.045	0.541
Pos.Treatmt	0.810	-

%cv 3.3

Table 2. Crop Biomass (t/ha) at maturity at the South Stirlings in 2016.

	Treatment			
Position	Untreated	Systiva	Uniform	Average
Healthy	11.31	11.54	12.66	11.84
Patch	4.56	6.70	7.50	6.25
Average	7.94	9.12	10.10	9.05

ANOVA	p-value	lsd (5%)
Position	<.001	1.260
Treatment	0.003	1.543
Pos.Treatmt	0.400	-

%cv 3.4

Unsurprisingly there was significantly more root disease on plants within patches than in nearby healthy crop. Neither Systiva nor Uniform significantly reduced root disease relative to Untreated plants although there was an improvement (Figure 1).

PredictaB test results showed a high level of rhizoctonia inside patches but this was lower than in 2015. There were also low-moderate levels of root lesion nematodes (*P. negletus*) which Mark and family are aware of, a low level of crown rot and some Pythium root rot (which enjoys wet soils).

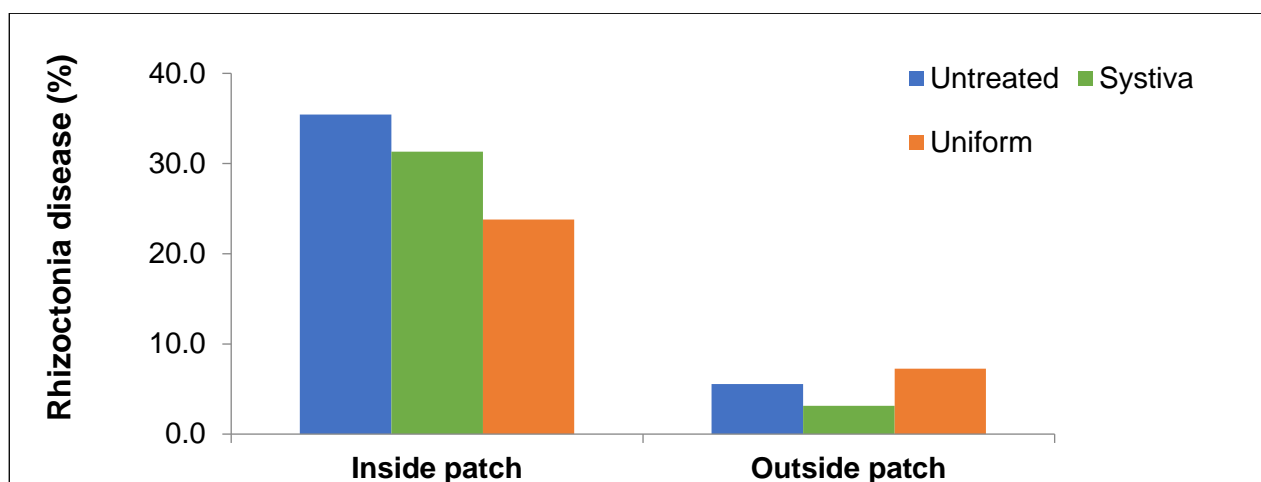


Figure 1: Rhizoctonia disease on plant roots in Untreated, Systiva and Uniform strips inside or outside rhizoctonia patches at the South Stirlings.

Rhizoctonia Results Over Two Years

One difficulty with rhizoctonia is that it does not occur at a regular rate across a paddock so that selecting areas to do comparisons on can be difficult which is why it is useful to have large scale treatments to iron out some of the variation. Unfortunately, we don't know why some patches form while others do not. Although the incidence of rhizoctonia fell across all treatment areas relative to 2015, the decline in the Systiva and Uniform treated areas was even higher (Figure 2).

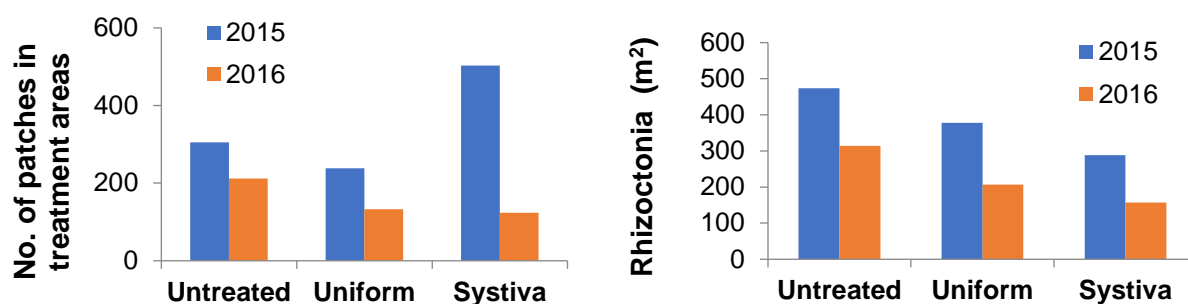


Figure 2: Number and area of rhizoctonia patches in treatment areas in 2015 and 2016; no treatments were applied in 2015.

Conclusions

Results indicate that Uniform significantly improved crop yields in a second-year barley crop and in a wet season; in dry years' root diseases such as rhizoctonia generally have even greater effects on grain yield and quality. Systiva seed dressing, which is registered for rhizoctonia suppression, also showed some improvement over the untreated areas of the paddock. In DAFWA researcher Daniel Huberli's work, he showed that the ideal system to combat rhizoctonia is to apply Uniform as a liquid in-furrow along with a seed dressing registered to suppress rhizoctonia such as EverGol Prime. While Uniform is not a cheap option, results here indicate that the yield response may be worth considering. The yield monitor data has not been assessed yet, which will provide more interesting cross year and treatment comparisons.

Both Systiva and Uniform are now registered for a number of foliar diseases including net blotches and leaf rust which weren't considered in this analysis.

UAV Mapping of Crop Diseases in Rotations

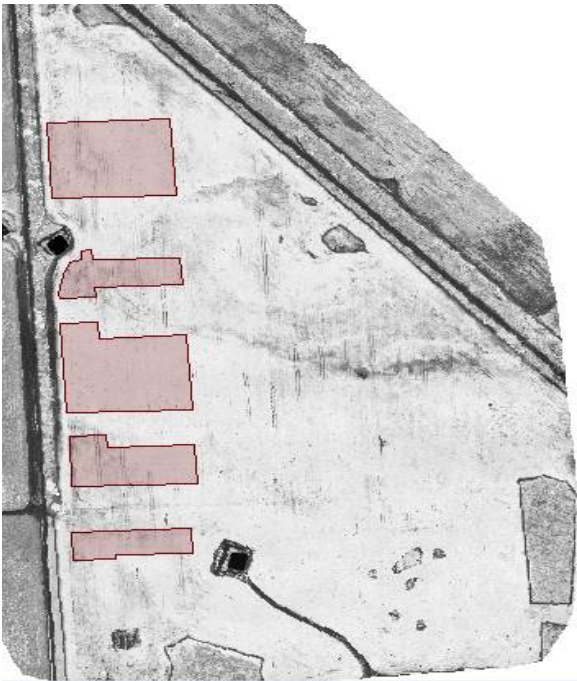


Image 2: 2016 areas used in treatment analysis – refers to the parts of a paddock that included the Untreated, Uniform and Systiva treatments applied where the growth appeared relatively even.

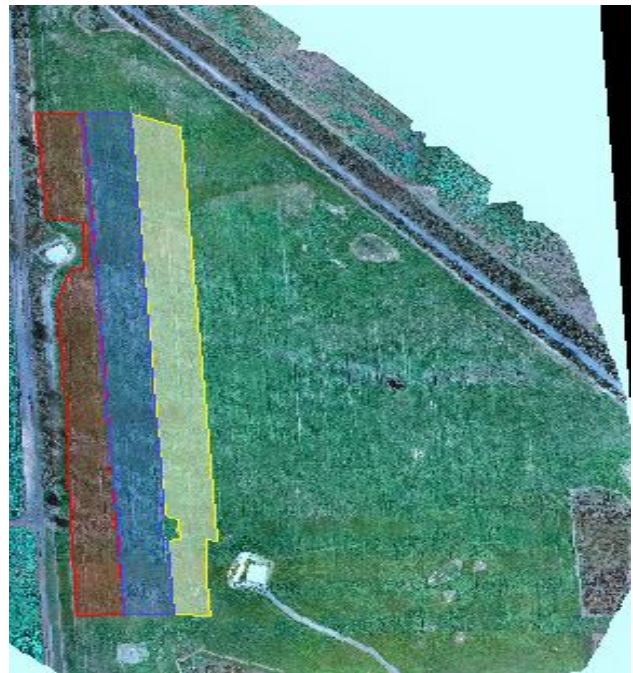


Image 3: 2016 treatment areas - refers to the strips of Untreated,

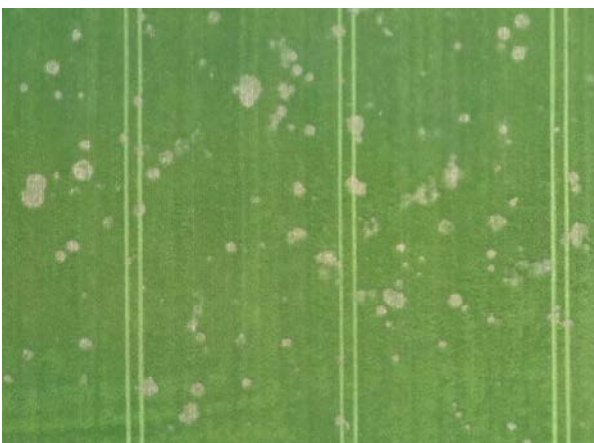


Image 4: Sth Stirlings rhizo & nem patches 2016- close up of rhizoctonia patches and some that are likely to also have nematodes present as they do not have the typical symptoms (there are full sized plants inside the patch).



Image 5: Sth Stirlings rhizo 2015 closer – some patches closer up,

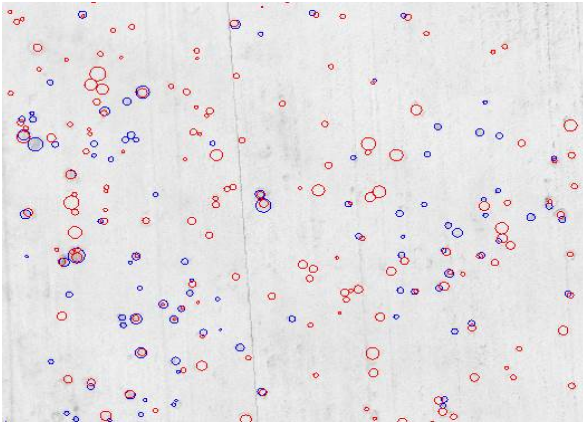


Image 6: Sth Stirlings rhizo 2015&2016 close up – shows rhizo patches from 2015 (red) and 2016 (blue).

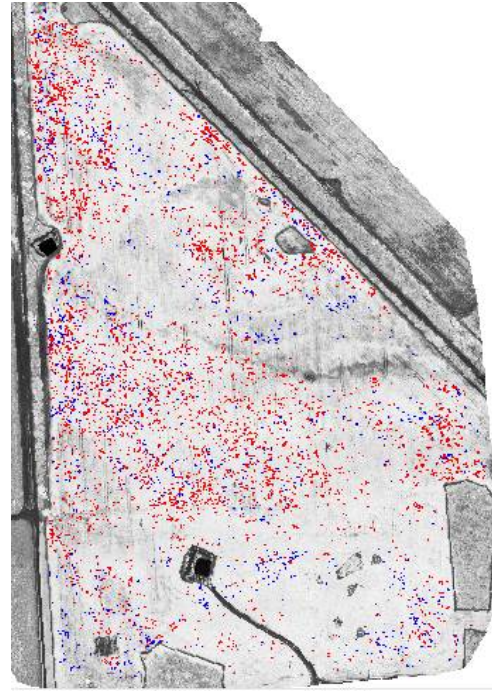


Image 7: Sth Stirlings rhizo 2015&2016 overlaid – rhizo patches from both years 2015 (red) and 2016 (blue).

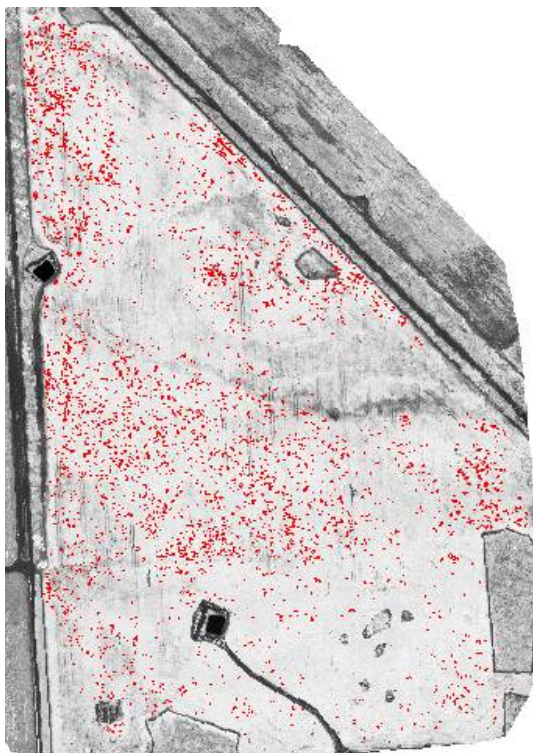


Image 8: Sth Stirlings rhizo 2015 – rhizo patches at a paddock scale. Represents 1.2% by area. Image underneath is the 2016 NDVI in greyscale where dark = reduced/no growth.

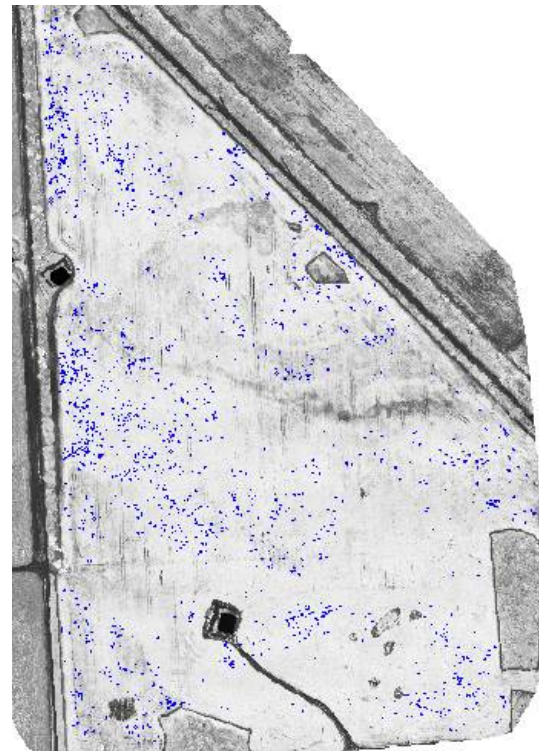


Image 9: Sth Stirlings rhizo 2016 – rhizo patches at a paddock scale. Represents 0.6% by area. Image underneath is the 2016 NDVI in greyscale where dark = reduced/no growth.



Figure 4: Sth Stirlings rhizo 2015 – normal (red, green, blue) image of the paddock mapped by UAV for rhizoctonia patches.

Acknowledgements

Thank-you to the Adams family for taking the time at sowing to put this trial in and giving me access to the paddock. This activity is part of the jointly funded DAFWA GRDC Cereal Pathology Project DAW00229.