AGRONOMIC SYSTEMS TO IMPROVE PROFITABILITY OF WHEAT ON WHEAT THROUGH DISEASE AND NUTRITION MANAGEMENT AT BINNU

Christine Zaicou-Kunesch, Ciara Beard & Chad Reynolds, DAFWA Geraldton

Summary

- In 2013 at Binnu, Mace was the highest yielding variety when sown on wheat stubble.
- Nitrogen application didn't influence grain yield (t/ha) but did influence protein and grain weight (kg/hl).
- Fungicide application reduced disease levels, which resulted in yield increases.
- Adequate nitrogen is not an alternative to fungicide but an additional measure to make plants less vulnerable to disease.

Background

Risk factors to the wheat on wheat systems are disease and nutrition. The foliar diseases yellow spot (YS) and septoria nodorum blotch (SNB) are particularly high risk when wheat is sown on wheat stubble. Variety choice, timing of fungicide and nitrogen are tools to manage this system.

To maximise fungicide return on susceptible varieties, studies indicate the need for optimum nitrogen nutrition. This relationship needs to be tested on newer varieties with improved disease resistance for disease management in a wheat on wheat system.

Aim

Determine the value of nitrogen and fungicide on the profitability of new wheat varieties with different disease resistances in wheat on wheat system.

Trial Details

Location: Binnu (NAG Trial Site)
Soil Type: Yellow sand
Rain: January to April – 80mm; May to October – 162mm

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
33	5.8	41.4	0.2	41.8	6.6	26.4	52.6	22.4	11.8	0	0.4

Plot Size: 20m x 1.54m
Number of Plots: 96 (32 treatments x 3 reps)
Variety: Cobra (SNB:YS* - MRMS:MS), Corack (MSS:MR), Mace (MS:MRMS), Wyalkatchem (MSS:MR) *Refers to disease resistance ratings to SNB and YS
Seeding rates for targeted 150 plants/m^2: Cobra – 57 kg/ha, Corack – 89 kg/ha, Mace – 62 kg/ha, Wyalkatchem – 69 kg/ha
Seeding Date: 9th May
Fertiliser (Rate/ha):

N	Drilled below seed at seeding (9th May)	Nitrogen topdressed at seeding (9th May)	Nitrogen topdressed mid season (12th June)
N0	50kg/ha MAPSZC	0N	0N
N30	50kg/ha MAPSZC	23N (50kg/ha Urea)	7N (15kg/ha Urea)
N60	50kg/ha MAPSZC	23N (50kg/ha Urea)	37N (80kg/ha Urea)
N90	50kg/ha MAPSZC	23N (50kg/ha Urea)	67N (146kg/ha Urea)

Chemical (Rate/ha): 9th May – 200ml Talstar, 100ml Dominex, 1.5L Treflan, 2L Sprayseed
29th May - 670ml Velocity + 1% Hasten; 27th June - 670ml Velocity + 1% Hasten
Fungicide (Rate/ha): 10th July (Z39) – 150ml Prosaro

Harvest: 24th October

Results

A plant density of 150 plant/m^2 was targeted. Actual plants established were between 101 and 113 plants/m^2. This indicates a seeding efficiency of 75%. The seed was sown onto moist soil and there were rains following seeding.

Disease (measured as average leaf area diseased on top 3 leaves, LAD) was slow to develop at the site and was found to be a mixture of yellow spot and septoria nodorum blotch. At flag leaf emergence, disease though still low was significantly being reduced by nitrogen application, and at the beginning of anthesis this was still the case, with fungicide application also significantly reducing disease. At early grain development stage, following regular spring rainfall, disease levels developed to moderate levels and variety, nitrogen and fungicide all had significant effects (Table 1). Fungicide significantly reduced disease levels for all varieties and nitrogen treatments. In the absence of fungicide, the N90 treatment significantly reduced disease in Cobra, Mace and Wyalkatchem, while the N60 treatment significantly reduced disease in only Wyalkatchem. When fungicide was applied, none of the nitrogen treatments had any significant effect on disease levels in any of the varieties.

Table 1. Percentage leaf area diseased (LAD) of 4 varieties with nitrogen and fungicide treatments sown at Binnu in 2013. Figures are average disease on top three leaves at Z71 (early grain development). Disease was a mixture of SNB and YS.

Variety	Nil Fungicide				Plus Fungicide			
	N0	N30	N60	N90	N0	N30	N50	N90
Cobra	28	27	23	21	15	13	11	14
Corack	29	34	26	33	18	18	14	13
Mace	28	28	26	21	16	18	13	14
Wyalkatchem	28	30	22	19	15	10	11	11
							LSD (5%)	5.59

The greenness (NDVI reading) of the plants was measured with a Greenseeker on the 10th July. Wyalkatchem, with a NVDI of 0.4121, was significantly greener than the other three varieties that ranged between 0.3392 and 0.3547 (p=<0.001, LSD=0.02157). The greenness of plants was significantly greater at 60 kg/ha nitrogen compared to 0 and 30 kg/ha N (p=0.03). There was no significant difference in greenness between the 60 and 90 kg/ha Nitrogen. However visually, the 60 kg/ha N looked healthier than the other treatments.

There was no influence of nitrogen treatments on grain yield. However varieties did differ in grain yield and this influenced grain protein (p=<0.001, LSD=0.049). Mace was significantly higher yielding than Corack and Wyalkatchem, while Cobra was significantly lower than all the other varieties (Figure 1). The higher yields did lead to protein dilution for Corack and Mace, but they were still within receival standards. Increasing nitrogen to N60 increased grain protein. However a further increase to N90 at Binnu in 2013 did not increase protein (Figure 2).

Fungicide influenced grain yield and protein (Figure 1 and 2). An application of 150ml/ha Prosaro fungicide at flag leaf emergence (Z39) increased grain yield by 100 kg/ha averaged across all varieties and nitrogen treatments. (p=<0.001, LSD=0.036). This response is economic assuming fungicide and application costs of $19/ha at $320/t price.

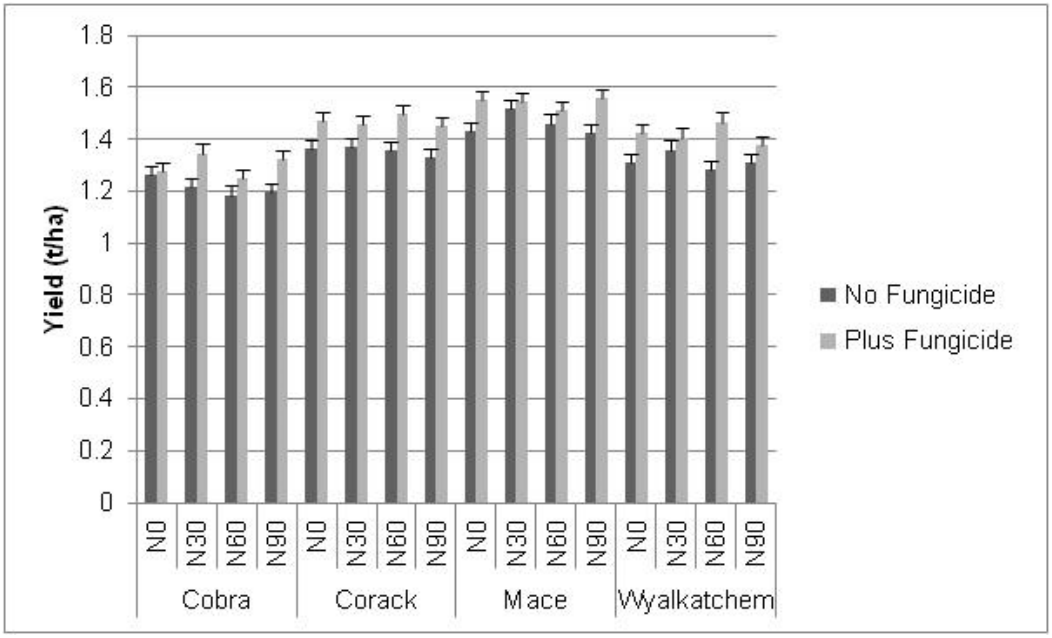

Figure 1: Grain yield of 4 varieties with nitrogen and fungicide treatments sown at Binnu in 2013. (LSD = 0.036).

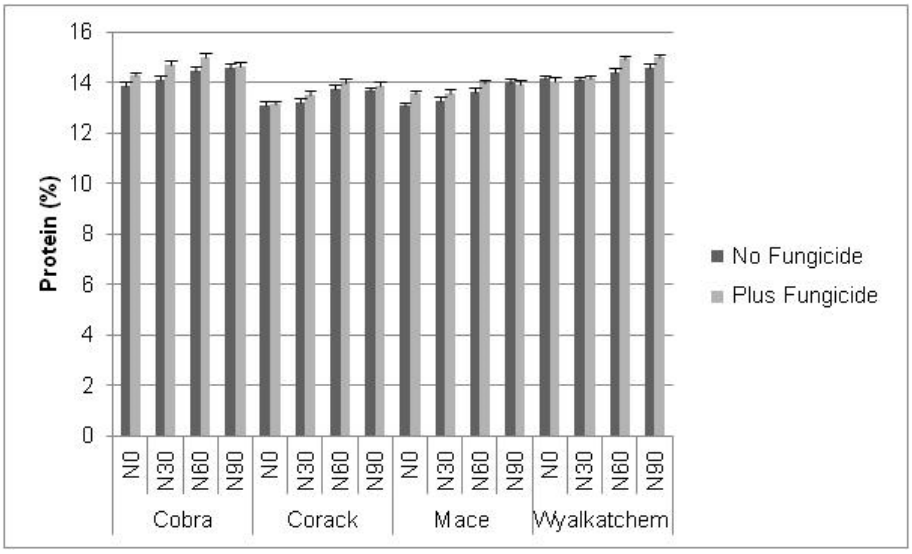

Figure 2: Grain protein of 4 varieties with nitrogen and fungicide treatments sown at Binnu in 2013. (LSD = 0.015).

The 2013 season is likely to have influenced production and the value of increasing nitrogen. Winter rainfall at Binnu was one of the driest on record with less than 30 mm of rain recorded between June and August. In contrast, regular spring rainfall aided the development of moderate levels of disease late in the season which explains the significant fungicide response.

Varieties differed in grain screening. Cobra, Corack and Mace had screenings greater than 5%. Nitrogen and fungicide did not significantly influence the grain screenings (Table 2).

Table 2: Grain screening (2mm sieve and whole and cracked) and staining of 4 varieties sown in Binnu in 2013 (averaged for nitrogen and fungicide). (p=0.001, LSD=0.65).

VARIETY	Protein (%)	Screenings % (whole and cracked)	Staining
Cobra	14.5	10.4	7.1
Corack	13.5	7.18	9.0
Mace	13.6	5.6	1.4
Wyalkatchem	14.4	4.9	4.0
LSD	0.2	0.65	0.8

Additional nitrogen in the dry year of 2013 was not economic. Yield increases did not cover additional fertiliser costs. Mace was the most profitable variety due to highest yield and good grain quality. Both Cobra and Corack were downgraded to feed due to staining.

Conclusion

- In 2013 at Binnu, Mace was the highest yielding variety when sown on wheat stubble.
- The dry winter at this trial site resulted in nitrogen application having no influence on grain yield.
- Fungicide and nitrogen treatments did increase grain protein for all varieties.
- Fungicide application at flag leaf emergence was profitable due to reduced disease levels and resulted in significant yield benefit in all varieties.
- Adequate nitrogen is an important measure in addition to fungicide to make plants less vulnerable to disease. It is particularly important for susceptible wheat varieties that are at risk of disease pressure in a wheat on wheat system.

Acknowledgements

This research is jointly funded by DAFWA , GRDC through “Wheat Agronomy - building system profitability in the Western Region” (DAW00218) and Summit. Special thanks to Eddy Pol from Summit for collaboration in the research. Thanks also to Trevor Bell, Steve Cosh and Anne Smith for trial management and technical support. Thanks to Northern Agri Group committee for support of the wheat agronomy trials at Binnu.

THANK YOU TO OUR 2013 BRONZE SPONSORS

AWB Helping Farmers Prosper

BAYER Bayer

SUMMIT FERTILIZERS A Quality Choice

Emerald GRAIN

PHIL GRAY TRANSPORT