Assessment of WMF Mineral/Microbe Broadacre Cropping Package and Nitrogen Management

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Aim

Western Mineral Fertilisers (WMF) Mineral and Microbe cropping programs have basically performed well on relatively low applications of Nitrogen and Phosphorus. This current trial is part of on-going research being conducted to examine mineral fertiliser/microbe programs and the value of adding various forms of extra or top up N.

Background

To evaluate crop vigour, nutrient status (plant tissue analysis), yield and quality - growing wheat with conventional granular fertiliser or Western Mineral's granular mineral fertiliser NPK Crop Plus.

To compare the effects of various "extra" Nitrogen applications.

Trial Details

Property	Nankivell property, East Maya
Plot size & replication	12m x 1.84m x 4 replicates, complete randomised block
Soil type	Loam, marginal moisture at 2cm, drying profile with hardpan at 20cm
Soil pH	5.5 ($CaCl_2$)
EC	0.152 dS/m
Sowing date	2/7/2010
Seeding rate	55 kg/ha Clearfield Stiletto (untreated with pickle or seed dressing). WMF plots treated with Ag Microbes @ 750 g/ton
Fertiliser	see table below
Nitrogen Application	at sowing or post emergent at 50% GS 12, 25% GS 13, 25% GS 14 (29/6/2010)
Paddock rotation	08 Peas, 09 Wheat
Herbicides	pre-emergent - Diuron at 400 mL/ha, Trifluralin at 2.5 L/ha, Avadex at 1.8 L/ha, Round-Up at 2 L/ha
Growing Season Rainfall	141mm

Table 1: Treatments.

Tml	Fert	Microbes	Nitrogen	Type of Fert	Units of N	N Timing
1	0	N	0	None	0	No N applied
2	NPK	Y	0	None	0	No N applied
3	NPK	Y	10 Units Granular WMF N	WMF	10	At Seeding
4	NPK	Y	20 Units Granular WMF N	WMF	20	At Seeding
5	NPK	Y	10 Units Granular Urea	Conventional	10	At Seeding
6	NPK	Y	20 Units Granular Urea	Conventional	20	At Seeding
7	NPK	Y	10 Units Granular WMF N	WMF	10	3WAS
8	NPK	Y	20 Units Granular WMF N	WMF	20	3WAS
9	NPK	Y	10 Units Granular Urea	Conventional	10	3WAS
10	NPK	Y	20 Units Granular Urea	Conventional	20	3WAS
11	DAP	N	0	None	0	No N applied
12	DAP	N	10 Units Granular WMF N	WMF	10	At Seeding
13	DAP	N	20 Units Granular WMF N	WMF	20	At Seeding

Tml	Fert	Microbes	Nitrogen	Type of Fert	Units of N	N Timing
14	DAP	N	10 Units Granular Urea	Conventional	10	At Seeding
15	DAP	N	20 Units Granular Urea	Conventional	20	At Seeding
16	DAP	N	10 Units Granular WMF N	WMF	10	3WAS
17	DAP	N	20 Units Granular WMF N	WMF	20	3WAS
18	DAP	N	10 Units Granular Urea	Conventional	10	3WAS
19	DAP	N	20 Units Granular Urea	Conventional	20	3WAS

Note: All WMF treated plots had seed treated with 750g/t of WMF AgMicrobes.

Table 2: Nutrient breakdown.

Typical %	N	P	K	S	Ca	Mg	Fe	Si	Cu	Zn	Mo	Mn	B	Ni
WMF NPK Crop Plus	8.5	8.5	4.5	8.0	4.0	0.8	2.1	5.4	0.035	0.035	0.0002	0.33	0.0013	0.0026
DAP	18.0	20.0	-	1.7	-	-	-	-	-	-	-	-	-	-
WMF N*	23.9	-	-	10.8	4.4	-	-	-	-	-	-	-	-	-
Urea	46.0	-	-	-	-	-	-	-	-	-	-	-	-	-

* **WMF N** contains nitrogen in the Ammonium (16.5%) and Nitrate (7.4%) forms

Results

Vigour

Plots were rated for vigour on two occasions. Vigour scores take into account biomass, colour and general plot fitness. There was generally very little vigour response to fertiliser, regardless of type or timing. The possible reason for this is outlined below in the yield section.

Yield

The mean site yield was 0.806 t/ha, with yields ranging between 0.717 t/ha and 0.866 t/ha.
Initially, each treatment combination (e.g. Treatment 2: NPK, microbes, No Urea) was tested against the yield. There were no significant differences noted between yields from different treatments. No significant differences were seen in the type of Nitrogen fertiliser applied, or the timing of Nitrogen application.

There are two factors which may have influenced this; firstly, the paddock had a large pea crop in 2008 and low yielding wheat crop in 2009, hence there may have been high background levels of soil nitrogen which may have masked some of the effects in this trial.
Secondly the poor seasonal conditions meant that yields were far below what might have been expected. Thus, nutrition may not have been a limiting factor, even in the low input plots.

Grain Quality

Significant differences were observed between the protein levels for different treatments. These differences can be seen in Table 3. A consistent protein rate response to levels of nitrogen applied was observed, with those plots which received higher rates of nitrogen generally returning higher grain protein. The type of Nitrogen (WMF N or Urea) applied did not have a significant effect on protein levels at equivalent rates of Nitrogen. Results for screenings varied (Table 3 and 4 respectively).

Hectolitre weight was not significantly affected by the Nitrogen Fertiliser Type (Table 3) or timing of Nitrogen (Table 4).

Table 3: Nitrogen fertiliser type and yield and quality

Nitrogen Fertiliser Type	Yield t/ha	Protein (%)	H/Weight (kg/hl)	Screenings (%)
Zero Urea	0.801	12.59	75.55	3.66
10 Units Granular WMF N	0.831	13.93	74.28	4.45
10 Units Granular Conventional Urea	0.819	14.06	74.74	4.51
20 Units Granular WMF N	0.808	14.71	73.92	5.11
20 Units Granular Conventional Urea	0.775	15.24	73.42	5.48
F prob	***NS***	***<.001***	***NS***	***0.024***
LSD	***NS***	***0.822***	***NS***	***1.142***
CV %	***NS***	***6.30***	***NS***	***31.9***
Grand Mean	***0.806***	***14.18***	***74.32***	***4.69***

Table 4: Nitrogen timing and yield and quality

Nitrogen Timing	Yield t/ha	Protein (%)	H/Weight (kg/hl)	Screenings (%)
No N applied	0.801	12.59	75.55	5.02
At Seeding	0.826	14.34	74.20	4.76
3WAS	0.790	14.64	73.98	3.66
F prob	***NS***	***<.001***	***NS***	***0.035***
LSD	***NS***	***0.681***	***NS***	***1.031***
CV %	***NS***	***7.10***	***NS***	***32.5***
Grand Mean	***0.806***	***14.18***	***74.32***	***4.69***

Paper reviewed by Janette Drew, DAFWA

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