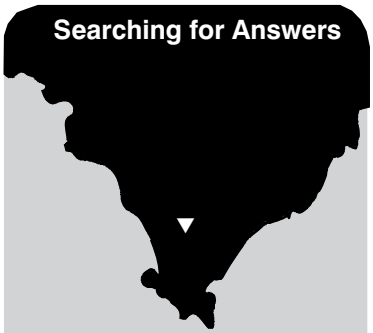
Manganese response in barley at Wharminda

RESEARCH

Cathy Paterson, Linden Masters, Wade Shepperd and Ian Richter
SARDI, Minnipa Agricultural Centre



Location:
Wharminda
Ed Hunt
Wharminda/Arno Bay Ag Bureau
Rainfall
Av. Annual: 322 mm
Av. GSR: 222 mm
2011 Total: 338 mm
2011 GSR: 189 mm
Yield
Potential: 2.7 t/ha (B)
Actual: 1.2 t/ha
Paddock History
2010: Wheat
2009: Pasture
Disease
Nil
Yield Limiting Factors
Mice damage early in the growing season
Below average rainfall June-Sept

Key message

- **In a below average rainfall year there was no response to manganese (Mn) in barley on a deep sand at Wharminda.**

Why do the trial?

During the 2010 growing season the Wharminda Ag Bureau questioned the value of applying manganese with nitrogen as this practice is common with some farmers in the area. As a result unreplicated treatment strips of foliar Mn were applied to barley in a small area in the 2010 EPFS 3 Wharminda Focus Paddock. There appeared to be a yield increase in response to added Mn in combination with N in an above average growing season rainfall year.

In 2011 it was decided to establish a trial looking at Mn application only to unravel this issue.

How it was done?

A trial was sown with Scope barley @ 55 kg/ha and DAP @ 50 kg/ha at Wharminda on 13 May 2011 with 15 treatments applied (Table 1). These treatments were established to begin investigating the benefit in applying Mn at different rates, different timings of application, method of application as well as Mn sulphate vs. Mn chelate.

Soil chemical analysis performed before sowing indicated that the Colwell P level (0-10 cm) was 21 mg/kg, mineral N (0-60 cm) was 81 mg/kg and DTPA Mn (0-10 cm) was 2 mg/kg. Measurements taken during the year included plant establishment (not reported), dry matter at early tillering and anthesis, grain yield and grain quality.

What happened?

Mice damage early in the growing season meant that it would have not been possible to detect a response to added Mn at early tillering. However, by anthesis there was a dry matter response to all of the split applications of Mn sulphate compared to the nil Mn (Table 2). There was no response to Mn added in terms of yield or grain quality, the low test weights are most likely due to the below average growing season rainfall.

Table 1 Mn treatments applied to Scope barley, Wharminda 2011

Treatment 1	3 L/ha MaxiMang 2-3 leaf stage
Treatment 2	1.1 kg/ha Mn Sulphate 2-3 leaf stage
Treatment 3	1.1 kg/ha Mn Sulphate 2-3 leaf stage + early tillering
Treatment 4	0.55 kg/ha Mn Sulphate 2-3 leaf stage + early tillering
Treatment 5	1 kg/ha Mn Sulphate banded with seed
Treatment 6	1 kg/ha Mn Sulphate banded with seed + 0.55 kg/ha late tillering
Treatment 7	Mn seed dressing 3 L/t seed
Treatment 8	Mn Seed dressing 3 L/t Seed + late foliar spray 0.55 kg/ha Mn Sulphate
Treatment 9	Nil Mn
Treatment 10	1.1 kg/ha Mn Chelate 2-3 leaf stage
Treatment 11	2 L/ha Mn Chelate 2-3 leaf stage
Treatment 12	1.5 L/ha Mn Sulphate 2-3 leaf stage + Mn Chelate at 3 L/ha end of tillering
Treatment 13	1.5 L/ha Mn Sulphate 2-3 leaf stage + Mn Sulphate at 3 L/ha end of tillering
Treatment 14	Mn Seed dressing 6 L/t seed
Treatment 15	Mn Seed dressing 6 L/t Seed + late foliar spray 0.55 kg/ha Mn Sulphate

Table 2 Barley dry matter, yield and grain quality response to Mn, Wharminda 2011

Treatment	Anthesis DM (t/ha)	Yield (t/ha)	Test Wt (kg/hL)	Protein (%)	Screenings (%)
Nil Mn	5.4	1.1	59.6	11.9	9.9
Mn seed dressing 3 L/t seed	5.5	1.2	59.2	11.5	10.8
Mn Seed dressing 6 L/t seed	5.8	1.1	58.8	11.3	10.8
1 kg/ha Mn Sulphate banded with seed	5.8	1.1	59.9	12.3	10.1
3 L/ha MaxiMang 2-3 leaf stage	5.6	1.0	58.3	11.8	12.0
2 L/ha Mn Chelate 2-3 leaf stage	5.6	1.1	59.7	11.6	10.0
1.1 kg/ha Mn Chelate 2-3 leaf stage	5.9	1.0	58.6	11.3	10.9
1.1 kg/ha Mn Sulphate 2-3 leaf stage	4.7	1.1	57.7	11.7	11.2
0.55 kg/ha Mn Sulphate 2-3 leaf stage + early tillering	6.1	1.2	59.7	11.5	11.9
1.1 kg/ha Mn Sulphate 2-3 leaf stage + early tillering	6.3	1.0	59.4	11.6	10.6
1.5 L/ha Mn Sulphate 2-3 leaf stage + Mn Chelate at 3L/ha end of tillering	5.0	1.0	58.8	11.5	11.9
1.5 L/ha Mn Sulphate 2-3 leaf stage + Mn Sulphate at 3L/ha end of tillering	6.0	1.1	58.0	12.3	11.7
1 kg/ha Mn Sulphate banded with seed + 0.55 kg/ha late tillering	6.0	1.1	59.8	11.5	10.3
Mn Seed dressing 3 L/t Seed + late foliar spray 0.55 kg/ha Mn Sulphate	4.8	1.0	58.9	11.6	11.9
Mn Seed dressing 6 L/t Seed + late foliar spray 0.55 kg/ha Mn Sulphate	6.0	1.1	59.9	11.5	10.1
LSD (P=0.05)	*0.6*	*ns*	*ns*	*ns*	*ns*

What does this mean?

Although this site appears to be on the borderline of Mn deficiency at 2 mg/ka Mn (The Wheat Book-Principles and Practice), there was no yield response to Mn in 2011 and responses in dry matter growth seemed variable and showed no clear pattern. This could be due to the below average rainfall at this site from June to September in 2011 resulting in the crop being unable to fully utilise any additional nutrients.

The response in barley to added Mn needs further investigation over a range of seasons in the Wharminda area. In 2012 we will also determine whether the addition of Mn to N applications increases yield.

Acknowledgements

We acknowledge the funding from GRDC project UA00107 for this work. Thanks to Nigel Wilhelm for advice on this trial. Thanks also to Sue Budarick for her technical assistance during the year.

Maximang® is a registered product of Agrichem Pty LTD.