Effectiveness of Molybdenum

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Aim

To evaluate the effectiveness of molybdenum application in soil with a pH that is perceived to be non-limiting for molybdenum.

Background

Molybdenum is required for nitrogen assimilation within the plant. Molybdenum (Mo) inputs, in compound fertilisers or as a stand alone treatment, are not common and are considered less important than "popular" trace elements such as copper and zinc. This trial examined the need for molybdenum inputs to reach optimum yield potential.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	50m x 10m. 500sq/m
Soil type	Red Sandy Loam
Soil pH	5.25
Sowing date	27/5/2010
Seeding rate	65 kg/ha Calingiri
Fertiliser	MAP at 60 kg/ha
Paddock rotation	09 Field Peas
Herbicides	Glyphosate at 1 L/ha, Trifluralin at 1.5 L/ha, Diuron at 300 g/ha, Triasulfuron at 20 g/ha
Growing Season Rainfall	141mm

Trial Design & Results

Table 1: Yield t/ha of Na_2MoO_4 treatments.

Treatments	Yield t/ha
Control	1.02
0.1 kg/ha	0.99
1.0 kg/ha	1.05
LSD 5%	NS

0.1kg/ha 7()	Control (8)	1.0kg/ha (9)	Control (10)	0.1kg/ha (11)	1.0kg/ha (12)
Control (1)	0.1kg/ha (2)	1.0kg/ha (3)	0.1kg/ha (4)	1.0kg/ha (5)	Control (6)

Figure 1: Trial Design

There was no significant difference between any of the treatments over the control (Table 1). The plant analysis results (Table 2) indicate that the plants had indeed taken up the molybdenum at the excess rate (1 kg/ha). This intake of molybdenum also corresponded with lower total N and nitrates.
While harvesting the trial, Rob Nankivell noticed a gradual decline in the yields of the plots as he started from the east (plot 6) and moved further west (plot 1). The harvest plots recorded a Coefficient of Variation (CV) of 13.4 indicating a level of variation over the plots, which may have affected the results.

Table 2: Plant Analysis Results (Taken 20/8/10).

Treatment	Nitrogen (%)	Nitrate (mg/kg)	Moly (mg/kg)
Control	4.3	398	310
0.1kg/ha Sodium Molybdate	4.2	474	292
1.0kg/ha Sodium Molybdate	3.3	155	2,167
1.0kg/ha Sodium Molybdate	3.3	129	1,286

Comments
Molybdenum deficiency can occur on lighter soils when the pH is less than 6; however serious deficiency occurs when the pH is around 4.5. In this trial the pH was 5.25 and with this pH it is often supposed that there is no need for the addition of molybdenum. Although the soil pH did not reflect a need for molybdenum, the aim of the trial was to assess the yield of the crop with the molybdenum applied. Nitrogen uptake was also assessed. One would expect in sufficient supply of Mo, that nitrates would be lower, as the plants are better able to use the nitrates. However, this was not transferred into total N. This may be due to a dilution effect or simply that Mo in excess may have been inhibiting the plant's use of nitrates. More research is needed here.
Although we could see no significant yield increases molybdenum is still a crucial trace element for wheat. Levels should be monitored and maintained to ensure Mo is non-limiting. Deficiency of Molybdenum can cause delayed maturity, affect pollen formation and the plant may produce empty heads.

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