

## FACTSHEET

# Molybdenum in pastures – on-farm field testing

October 2023

Molybdenum (Mo) is an essential micronutrient particularly for clovers as it plays a key role in N-fixation.

This factsheet is in draft form because we will be testing a range of options for on-farm Mo tests in the autumn of 2023 and assessing the results in the spring of 2023.

This will provide 1) practical testing methods for farmers and fertiliser reps and 2) quantify the impact of Mo addition on the pasture as a whole (grass and clover).

Molybdenum (Mo) is an important micronutrient for nitrogen (N) metabolism in plants. It helps create proteins in plant leaf cells and is required for N fixation in legumes.

### Molybdenum in the soil

As soil pH declines below 6, the plant availability of Mo decreases. While liming acid soils (pH <5.5) can increase Mo availability, some New Zealand soils are naturally low in Mo, so periodic applications of Mo fertiliser may be required.

There are no suitable soil tests for Mo so testing clover foliage is the best tool currently available to assess pasture Mo status.

Fertiliser application rates of Mo are low, at 20 to 40 g Mo/ha, and reapplication is only required every 4 to 5 years (Morton 2019). Because of the very small amounts, Mo is usually applied with other fertilisers such as superphosphate.

## Mo field testing

### Background

Several experiments have shown a clover response to Mo fertiliser application.

At Wairarapa, the sub clover was visually unhealthy. The foliar concentrations of Mo were <0.1 mg/kg and N was 4.1% which confirmed that Mo was required. Foliar concentrations of other nutrients, such as phosphorus (P), potassium (K), and sulphur (S) were also low. Therefore, a range of fertiliser treatments including Mo, P, K, and S were applied. The best visual response of clover occurred when Mo was applied with P and/or K.

Similarly, an experiment on the Port Hills, Canterbury, found that the best visual response by the sub and white clover occurred when Mo was applied with P and S.

Based on these results, it is important to look at soil test results – particularly Olsen P, Quick Test K, sulphate and organic S, and pH – and sample clover foliage in the spring prior to any field-testing to ascertain what nutrients may be required. This will help determine what on-farm field test should be used.

### On-farm field test for Mo response

The following on-farm field tests offer several ways of testing pasture for a Mo response. The first is based on liquid-applied Mo and can be used where the macronutrients appear to be adequate. The second uses molybdenum superphosphate, which is a common way of applying Mo to the pasture, that also supplies P and S.

The tests are based on applying 50 g Mo/ha. This is at the upper end of what is recommended.

A good time of year to put in the field test plots is autumn to see the effect on the spring growth. Foliage samples can then be taken to confirm visual observations.

A positive response to the Mo treatment will be an observed improvement in clover vigour.

## Liquid Mo field test

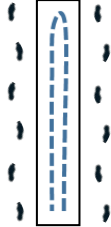
**Equipment needed:** plot markers (e.g., pegs, electric fence standards), measuring tape, 10 litre watering can (with a fine rose), concentrated Mo solution, 1/3 cup measure, water (~5 litres/treated plot).

The Wairarapa and Early Valley Rd experiments used sodium molybdate in solution to apply the Mo. While this was effective, chemical grade sodium molybdate is not available to the general public and buying a 25 kg bag of sodium molybdate from a fertiliser company, when only a few grams is required, seems unrealistic.

The 2023 test will use 'Biomim Molybdenum' which is a water-soluble chelated Mo product available to the general public. We will compare this product with sodium molybdate, and solid fertiliser options, to ensure it has the same effect.

Aim is to prepare a concentrated solution from which a known amount (e.g., 1/3 cup) is put in a watering can and diluted with ~ 5 litres of water. This solution will be applied to a plot.

**Tip:** practice spreading ~5 litres of water with the watering can over a 5 x 1 m area e.g., walk up and down each side of the plot watering the adjacent half to avoid walking on the plot. Aim for an even spread. The amount of water is not critical and can be changed.



**How many sites?** This depends on what clover foliage sampling and observations suggest. There needs to be data driving this decision.

### Method

1. Choose a representative area of the paddock where there is clover. Avoid gateways, stock camps etc.

This step will include more information about the amount of clover that should be looked for. Suggestion is at least 10% in the area.

2. Measure and peg out a 5 m x 1 m plot. This plot will be compared to the surrounding area.

Plot size needs to be manageable. A width of 1 m should be sufficient.

3. Put 1/3 c of Mo solution into the watering can and add ~5 litres of water. Apply the Mo solution to the plot as suggested above or whatever works for you.
4. Ensure the location of the plot is known. For instance, GPS the location.
5. Protect the plot from grazing.

A factor to consider is the impact of grazing animals. The testing area should be protected from stock so that a visual response can be observed.

6. Late spring - compare clover growth in the Mo treated and control plots. Is there a visual difference? If there is, consider taking separate clover foliage samples from each treatment and get them analysed to check Mo and N concentrations.

### Fertiliser Mo field test

**Equipment needed:** plot markers (such as electric fence standards); measuring tape; a source of Mo (such as granular Mo prills); river sand; ice-cream container; measuring cup.

### Method

1. to 2. Same as the previous method.

Because of the small amount of fertiliser, options for spreading it easily will also be looked at. Traditionally we have mixed the fertiliser with river sand so there is more 'volume' to spread.

3. Mix the appropriate amount of your Mo source material with 1 cup of river sand in the ice-cream container. (Your fertiliser company can advise the appropriate amount).

4. to 6. As for the previous method.

### Health and Safety

Always check the 'Safety Data Sheet' and follow the guidelines associated with any chemical used on-farm.

**Note:** high levels of foliar Mo (i.e., >3 mg/kg) can cause a Mo-copper imbalance in grazing animals. Stick to the recommended rates and timing of Mo application and test the clover foliage to ensure Mo levels are safe.

### Acknowledgements:

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### References:

Morton J. 2019. Use of Trace Elements in New Zealand Pastoral Farming. Revised ed. New Zealand: Fertiliser Association. <https://beeflambnz.com/knowledge-hub/PDF/fertiliser-use-new-zealand-sheep-and-beef-farms>

Molybdenum in New Zealand pastures and soils, and the diagnosis of pasture Mo deficiency are described in a separate factsheet.

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