FACTSHEET

Hill Country Futures: Calcium and magnesium requirements

April 2022

Magnesium (Mg) and calcium (Ca) are both essential nutrients for plants and animals. They are present in the soil as cations (i.e. positively-charged ions), salts and minerals and play a role in soils' ability to retain nutrients.

Key messages

- On most New Zealand farms, pasture production is not limited by Ca and Mg levels in the soil.
- Despite adequate soil levels of these nutrients, supplementation of cows and ewes with magnesium oxide and lime flour may be required to prevent metabolic disorders during calving and lambing.

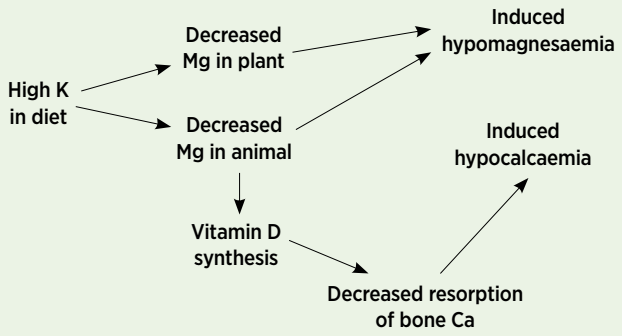
Calcium (Ca) and magnesium (Mg) in New Zealand soils

Method	Calcium (Ca)	Magnesium (Mg)
Role	Within soil, Ca helps soil aggregates remain stable, which supports soil structure. For plants, Ca is part of the carbohydrate structure.	Mg is essential for photosynthesis, as it is a component of chlorophyll. It is also needed for protein synthesis in both plants and animals.
Status of New Zealand soils	Ca deficiency is rare in New Zealand, because adequate plant-available Ca levels are maintained – and are often actually increasing – in the soil. This is because New Zealand soils are young and much of the Ca is still to be made available by weathering. Furthermore, commonly applied superphosphate and lime contain 20% and 40% Ca, respectively.	New Zealand soils are generally well supplied with Mg because they are young soils and much of the Mg is still to be made available by weathering. Near the coast, up to 10 kg/ha/yr of Mg can be deposited from rainfall, with the Mg arising from sea spray.
Measuring in soil	Based on a Quick Test Ca (QT Ca), levels of 5 and over meet plants' requirements. Most hill country soils have levels greater than 10. To yield a meaningful pasture growth response from applying Ca, you need a test result of <2.	Based on a Quick Test Ca (QT Mg), levels should be maintained above 8. Low soil Mg can induce hypomagnesaemia (grass staggers). To reduce the incidence of hypomagnesaemia, soil test results of 20-30 are needed. To yield a meaningful pasture growth response from applying Mg, you need a test result of <4.
Applying fertiliser	If long-term test results show Ca levels are declining into the 5-10 range, consider switching to superphosphate or apply lime to maintain or increase soil pH.	Soil Mg levels should be monitored by observing soil test trends over time. To maintain adequate soil Mg levels, apply 5-10 kg Mg/ha/yr. The most cost-effective option is to add serpentine to superphosphate. If a liming material is required, apply dolomite, which is a mixture of Ca and magnesium carbonate (11% Mg).

Impact of potassium (K) on Ca and Mg

High soil Quick Test K (QT K) levels displace Mg from exchangew sites and so reduce Mg levels in plants and animals, which can cause hypomagnesaemia (grass staggers). See diagram below. Supplementing animals with magnesium oxide before and after calving/ lambing can alleviate symptoms.

Role of K in Metabolic disorders



High K can also restrict plant uptake and absorption of Ca into the bloodstream. A lack of Ca generally shows up as hypocalcaemia (milk fever) when beef cows calve. Supplementing with lime flour before calving can help alleviate symptoms. Delaying the application of potash until after calving is another strategy to reduce the risk of hypocalcaemia.

Conclusion

Ca and Mg levels in New Zealand soils are generally adequate, however, high levels of soil potassium can restrict the amount of Ca and Mg uptake by plants. This can restrict the availability of these two nutrients to animals and cause metabolic disorders during spring. Therefore, cows and ewes may require Mg supplementation with magnesium oxide and lime flour prior to and during calving and lambing, to prevent metabolic issues.

Further reading

This factsheet is part of the Hill Country Futures soil and fertiliser series. The full series can be found at www.hillcountryfutures.co.nz/resources/soil-and-fertiliser-series

"Fertiliser use on New Zealand sheep and beef farms" booklet, produced the Fertiliser Association of New Zealand booklet. Download at: www.fertiliser.org.nz/Site/resources/booklets.aspx

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