THOMSON & JOSEPH
The Mineral Specialists

ALS
ALBION LABORATORY SERVICES

Magnesium Bulletin 2015 Edition

SPRING GRASS AND THE RISKS OF MAGNESIUM DEFICIENCY

Spring 2015

Winter 2014/2015 was the sunniest on record since 1929 with temperature and weather being nothing out of the ordinary. It was a benign season. Predictions for spring are a largely average temperature with rainfall more likely to be slightly higher than typical for the season. As the warmer temperatures set in Potassium driven grass growth will take off. Due to this rapid growth grass Magnesium and Sodium levels are at there lowest point of the growing season (April-October) particularly in May and June. This presents the potential risk of Magnesium Deficiency (hypomagnesaemia) in all grazing stock (dairy, beef and late lambing ewes). Staggers occurs due to the amount of Magnesium absorbed in the rumen is less than the Magnesium lost through essential processes, particularly pregnancy and milk production. The high Potassium and low Sodium levels of spring grass reduces the ability of the rumen to absorb Magnesium - which is already low - further elevating the problem.

Staggers can be avoided by following three key guiding principles:

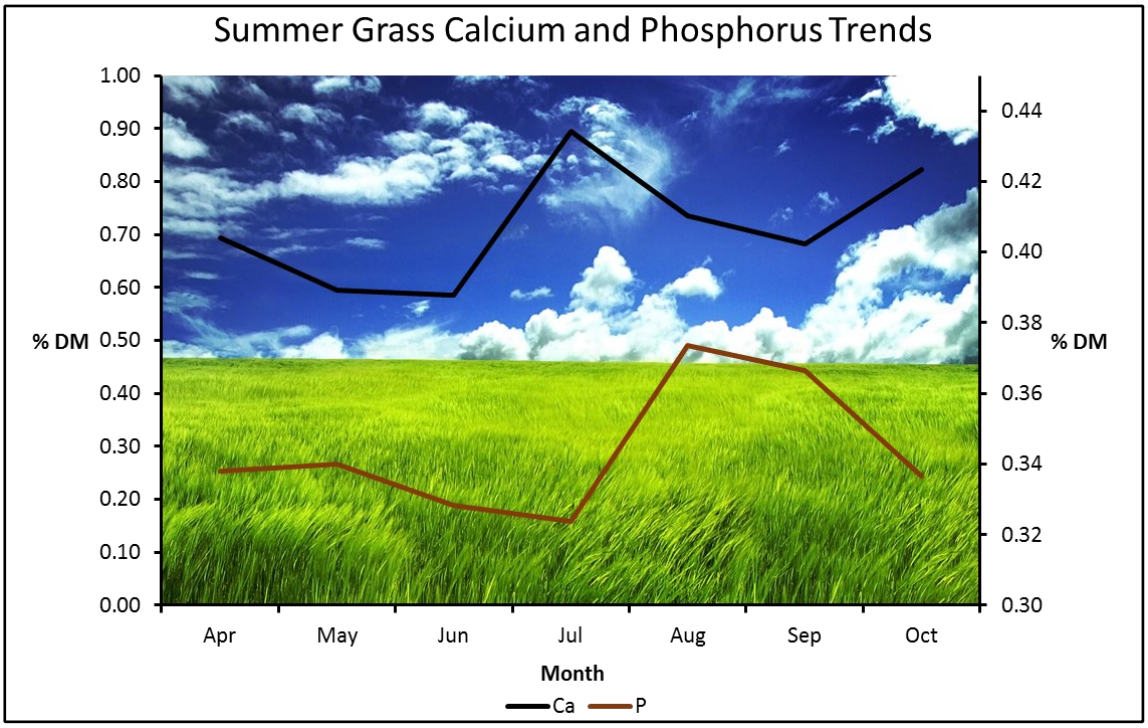
- Magnesium supplementation linked to Potassium challenge.
- Ensure stock have access to Magnesium in a palatable form.
- Offer Free Choice Salt.

Our Data

A survey of the average mineral content of over 2500 grass samples analysed in the past 5 years has confirmed recognised trends over the growing season of April to October for Calcium, Phosphorus and Potassium. These trends are presented in the following graphs, where the data is presented on a Dry Matter basis.

Calcium

After increasing in concentration through the winter when growth is stalled, Calcium declines April through to June as grass dry matter production rapidly increases. This dilution effect ends in late June/July when vegetative growth slows and flowering takes over. As Calcium is closely associated with the fibre fraction in grass where it has a role in maintaining the structural integrity of cell walls, it would be expected to follow the rise in fibre content through June to July as digestibility declines. Calcium peaks in July at 0.89% and then declines into the autumn when re-growth will occur in most years. On average, the difference in Calcium content between the highest and lowest point on the seasonal graph is equivalent to about 12g/day, which should be accommodated within the overall dietary regime.



Phosphorus

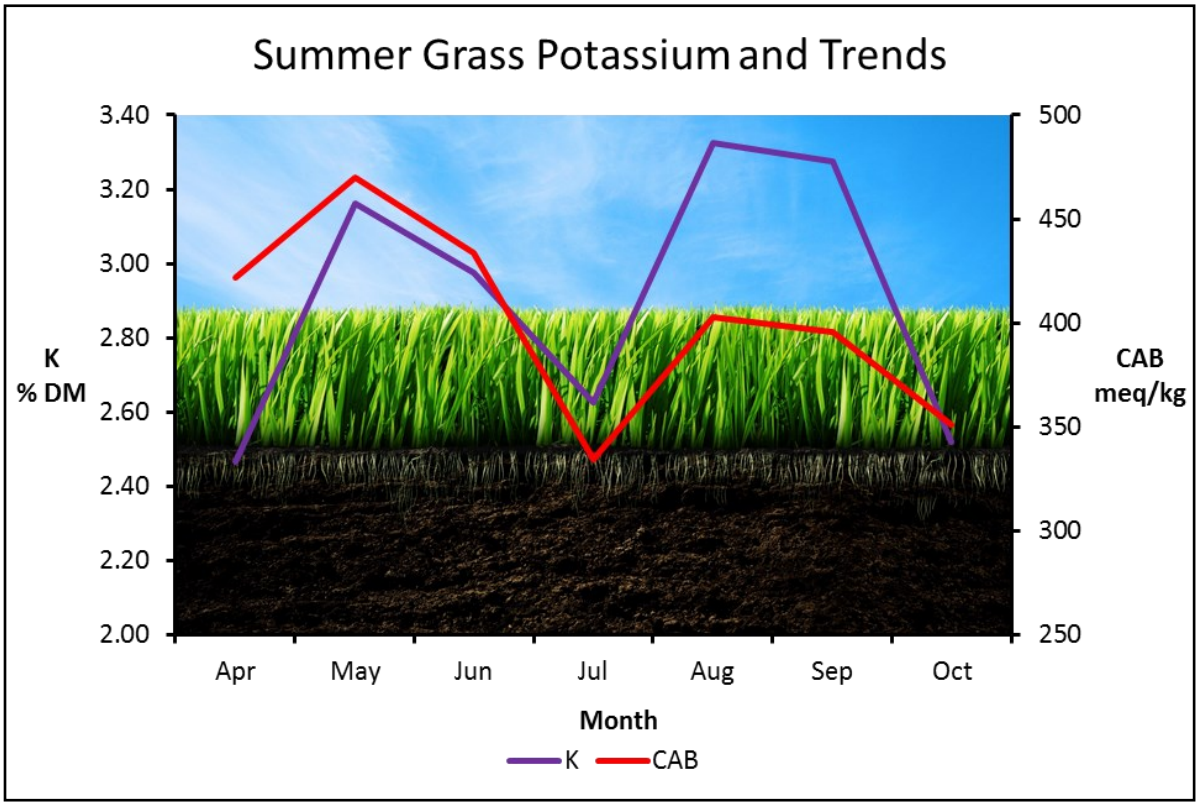
Follows an inverse pattern to Calcium although it varies very little over the summer months (0.32-0.37%). Being closely associated with the energy fraction in grass levels, Phosphorus is at its highest in the spring and end of summer growing season, declining as autumn arrives. A late season rise may occur, however, the generally poor feeding value of autumn grass would tend to suppress this possibility. In feeding terms the difference between the peak and trough of the Phosphorus cycle is equivalent to around 5g/day. Unlike Calcium, this gap is likely to be more significant in dietary terms. Consequently, increasing Phosphorus supplementation at grass as the season progresses would seem appropriate.

Potassium

With Nitrogen this element dominates the mineral profile of grass. Together they drive vegetative growth. It is therefore not surprising that Potassium follows the grass growth cycle.

Our survey shows an average peak of 3.16% in May, followed by a decline to 2.63% in July. Thereafter, Potassium picks up in the autumn in line with the late flush of grass reaching 3.33%. This continues into September with only a slight decline to 3.27% before dropping off as winter approaches. Potassium is the main driver for Cation-Anion Balance, CAB, which is important for assessing the risk factor for milk fever (hypocalcaemia). The higher the CAB value the greater the risk not only of milk fever, but the sub-clinical symptoms of retained cleansings, metritis, displaced abomasums, poor milk initiation and ketosis.

CAB peaks in May at +470 meq/kg and declines to a low of 334 meq/kg in July. A second peak is observed in August at 403 meq/kg before dropping down with the onset of winter. While of limited interest to milking cows at grass, these trends should be recognised by those herds who start the calving season at grass. Clearly the message has to be avoid calving at grass where control over the feeding of the pre-calving cow is difficult and where CABs are likely to be high and variable.



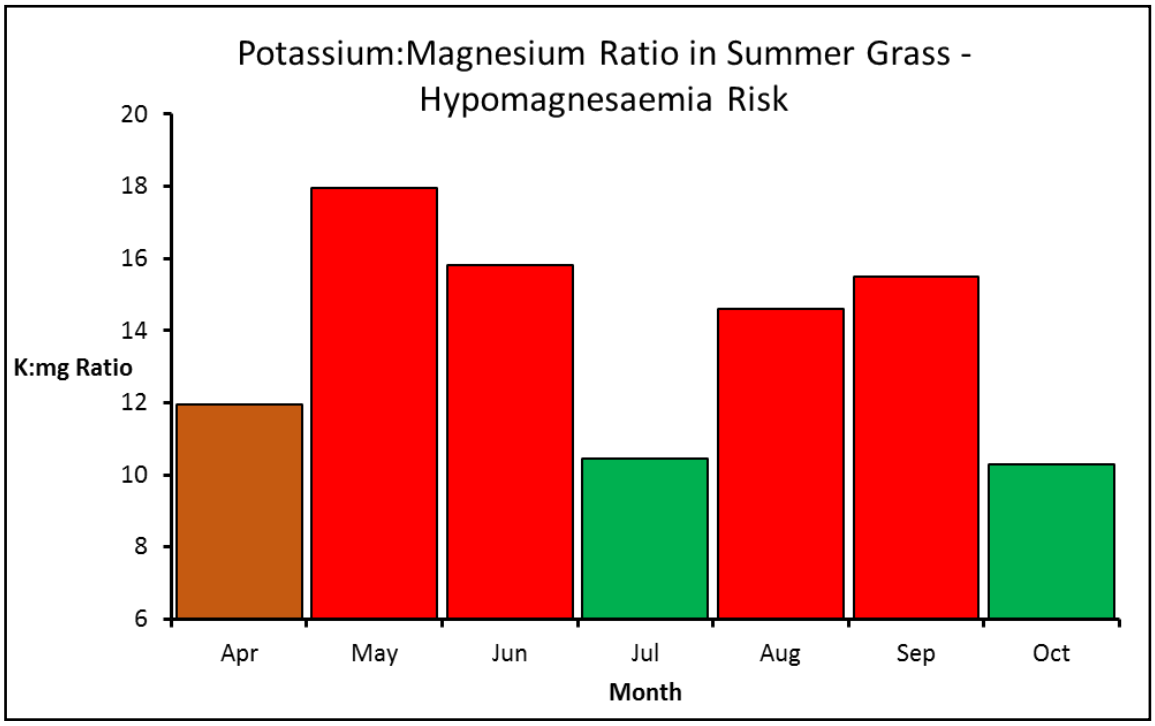
Magnesium

Trends in grass Magnesium levels through the season are difficult to identify, although there is a tendency to follow Calcium. The relationship between Potassium and Magnesium is, of course, critical to the health of stock at grass. Potassium is well recognised as reducing the absorption of Magnesium, primarily across the rumen wall. However, this relationship is indirect in that it is the suppression of Sodium uptake in grass by high levels of Potassium that is the critical factor. Sodium is essential for the transport of Magnesium across the rumen wall. Through its effect on Sodium, Potassium exerts its adverse influence on Magnesium. Hence always have Sodium (salt) available for stock at grass.

Potassium:Magnesium Ratio

Clearly maintaining a balance between Potassium and Magnesium intakes is important to avoiding hypomagnesaemia.

Within the Total Diet the Potassium:Magnesium ratio should be targeted at 7:1. Attaining this target will depend on the extent to which grass deviates from it. The K:Mg ratio in summer grass peaks at 18:1 in May, and then declines to a low of 10:1 in July. With the start of the late growing season the K:Mg ratio sees a second peak of 15:1 in September before declining to its year low of 10:1 in October.



Magnesium Requirements of Dairy Cows

A review of the Magnesium requirements of dairy cows by Professor Weiss of Ohio State University (J. Dairy Sci, 87:2167-2171, 2004) demonstrated that Potassium has a much greater depressive effect on Magnesium digestibility than previously recognised by NRC. His study involved summarising Magnesium digestibility data from 8 experiments with 39 dietary treatments and 162 lactating Holstein cows. Weiss concluded that lactating Holstein cows needed to consume an additional 18g Mg/day for every 1% unit increase in Potassium above 1%K in order to maintain the same intake of digestible Magnesium. When this relationship is used in conjunction with the T&J Grass Mineral Survey and compared with the target K:Mg ratio of 7:1, the following requirements are derived for a cow consuming 15kg DM grass:

Month	April	May	June	July	August	September	October
Grass Potassium (%)	2.47	3.16	2.97	2.63	3.33	3.27	2.52
J. Dairy Sci Req (g/ day)	56	69	65	59	72	71	57
T&J K:Mg of 7:1 g/ day	53	68	64	56	71	70	54

Magnesium Supplementation

The use of a 7:1 K:Mg ratio appears to correlate well with the Weiss conclusions, and in this case can be applied to both dairy and beef cows at summer grass. Assuming grass on average provides 30 g/day (15kg DMI x 0.20% Mg) then the following level of supplementary Magnesium will be required:

Month	April	May	June	July	August	September	October
Supplementary Magnesium (g/day)	23	38	34	26	41	40	24

The need for additional Magnesium can be provided through both concentrates and supplements. It should be recognised that the requirement for an additional 14g mg/day equivalent to 1oz/day Calcined Magnesite in May compared to October. These estimates are based on average grass Potassium levels, which by definition will have to be considerably higher than those reported here on a significant number of farms.

In this high risk year, take action to protect the health of stock at grass:

- **Check Potassium levels in grass.**
- **Tailor Magnesium supplementation to Potassium threat and supply in a palatable form.**
- **Ensure Free Choice Salt is always available to stock at grass.**

Use the T&J Forage Mineral Analysis Service to identify the risk of Hypomagnesaemia in your forages which will enable an effective customised Magnesium supplementation strategy to be developed for your stock.

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