Test Pasture Forages to Optimize Mineral Supplementation

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Grazing cattle often require supplemental nutrients. The diverse soil types found throughout the state can impact the soil mineral profile as well as fertilization and cropping practices. To more closely match the animals' nutrient needs from the grazed forage and supplements offered, it is recommended to test forages and develop mineral supplements accordingly. This is important as mineral imbalances can be induced due to complex mineral to mineral interactions that can occur. Additionally, with regards to phosphorus supplementation, there can be both an environmental as well as an economical motive to monitor and alter supplementation based on forage tests.

A two year research trial was conducted at the University of Wisconsin Lancaster Agricultural Research Station using Holstein stocker steers to investigate the response to phosphorus supplementation. A total of 152 Holstein steers were used over the two year trial. Each year steers were divided into 4 grazing groups. Steers averaged 550 lbs and 650 lbs at turnout during the first and second year. Mineral supplements utilized were a trace mineralized salt (TMS) mixture offered free choice or TMS with dicalcium phosphate added to obtain a 6% phosphorus mineral mixture (Phos). Within each grazing group, both mineral supplements were offered using controlled access feeders so that pasture forage differences did not influence mineral treatment effects. Pasture samples were obtained from each grazing group at two week intervals to monitor pasture forage nutrient content. Cattle weight gain was the response variable measured for phosphorus supplementation. Mineral disappearance was monitored to determine differences between consumption of mineral supplements and calculate amount of phosphorus contributed to the daily phosphorus intake. A sub-group of steers was also fitted with fecal bags for four days to calculate dry matter and phosphorus intake twice during the grazing season the first year. This research was supported through a USDA CSREES HATCH grant awarded by the University of Wisconsin-Madison.

Table 1. *Forage quality analysis (DM basis) of samples taken at two week intervals from pastures of grazing Holstein steers receiving supplemental or no supplemental phosphorus[1].*

	Year 1		Year 2	
Item	**Mean**	**SE**	**Mean**	**SE**
P (mg/g)	3.28	0.08	3.27	0.11
DM (%)	21.0	1.1	19.2	0.7
CP (%)[2]	19.0	0.4	19.6	0.6
Ash (%)	10.0	0.2	10.6	0.1
OM (%)	83.6	0.4	80.7	0.2
NDF (%)	53.2	0.7	54.9	0.8
ADF (%)	31.4	0.4	35.6	0.6
48h $IVTD_{DM}$ (%)	80.2	0.6	78.6	0.8
Forage Availability (kg/ha)	2466	90	2141	133

[1]Unless otherwise noted, Year 1 n = 40, Year 2 n = 32.
[2] Year 1 n = 39.

Table 2. *Pooled performance characteristics and mineral intake of Holstein steers allowed access to a trace mineral supplement with or without phosphorus.*

Item	**TM[1]**	**TMD**	**SE**	**P**
Mineral Intake (g/d/animal)	48	44	5	NS[2]
P from Mineral (g/d/animal)	-------	3.0	0.3	-------
Apparent P Digestibility (%)[3,4]	57.4	51.8	6.1	NS[2]
ADG (kg/d)	1.08	1.05	0.05	NS[2]
Initial Weight (kg)	282	278	21	NS[2]
Final Weight (kg)	423	415	32	NS[2]

[1]TM = steers receiving supplemental phosphorus in the form of dicalcium phosphate, TMD=steers receiving no supplemental phosphorus.
[2]NS = not significant, P > 0.05.
[3]Calculated value using ADL as an internal marker (n = 48).
[4]Unequal n, largest SE reported.

Forage analysis data can be found in Table 1. From these data, it can be seen that the pastures were high in crude protein (19%+), organic matter digestibility (near 80%) and supplied a level of phosphorus averaging 0.33% which exceeded the 1996 National Research Council (NRC) recommendation of approximately 0.20% for a steer gaining 2.0 lb/day. No differences were noted in daily gain due to mineral supplementation with steers gaining approximately 1.75 lb/d during the first year and 2.5 lb/d during the second year. Mineral intake levels were similar when averaged over the entire grazing season and differed only during one 28-day period the first year. Average mineral intakes ranged 35-52 g/day or between 1.2 and 1.8 oz/head/day over the two year trial.

Mineral supplementation treatment did not impact pasture intake. Calculated dry matter intake based upon fecal collection ranged between 2.6% and 2.8% of live body weight. Calculated phosphorus intake from forage ranged 23-32 g/day. Estimated mineral phosphorus contribution was small, being less than 10%. Calculated fecal phosphorus excretion during the collection periods ranged 9-16 g/day with those receiving Phos being statistically higher in the first collection and numerically higher the second. The fecal phosphorus levels were calculated to be approximately 40-55% of that consumed.

These data indicate that for soils managed according to soil tests where cool-season pasture forages are grown, offering a mineral supplement with 6% phosphorus is not warranted for stocker Holstein steers. This is based upon the forage phosphorus data collected which allowed for a daily phosphorus intake nearly double that suggested by recent research for finishing beef cattle and well above the 1996 NRC recommendations for growing cattle. Additionally, these data provide an estimate of fecal phosphorus excretion levels for grazing Holstein steers.

Forage testing will allow for one to make decisions regarding the mineral supplement required to match the animals' needs and minimize overfeeding of these nutrients. It is recommended that livestock managers test their pasture and stored forages for minerals and other nutrient levels before designing a supplementation strategy.