

Use of the mobile nylon bag method to determine phosphorus disappearance in common dairy cattle ration ingredients



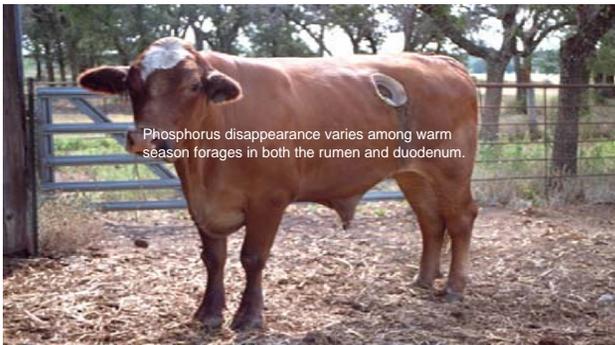
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Abstract

Phosphorus (P) excretion in manure has become a major problem facing dairy producers in much of the United States. Excess P released into the environment may contaminate surface waters leading to eutrophication and excess algal growth. One approach to reducing P excretion is to avoid excess dietary P. Data regarding P availability in warm climate feedstuffs is limited and more precise means of measuring P availability in the digestive tract are needed. In this experiment the mobile nylon bag method was used to determine the disappearance of dry matter (DM) and P in ground corn, corn silage, alfalfa hay, coastal bermudagrass hay, and Tifton-85 bermudagrass hay in steers after ruminal (24 hrs), ruminal + pepsin/HCL (rumen + PH), and ruminal + pepsin/HCL + intestinal (rumen + PH + I) incubation. Ruminal degradation of both P and DM differed ($P < 0.05$) between feedstuffs, and by site of incubation. DM total-tract (rumen + PH + I) availability for ground corn, corn silage, alfalfa hay, coastal bermudagrass hay, and Tifton-85 bermudagrass hay were 90.35, 51.89, 41.66, 69.04, 71.79% respectively. Total tract (rumen + PH + I) P availability for ground corn, corn silage, alfalfa hay, coastal bermudagrass hay, and Tifton-85 bermudagrass hay were 99.22, 92.22, 94.81, 84.55, and 85.36%, respectively. The variability in the availability in P (~15%) indicates that inclusion of a P availability coefficient in ration balancing software could have a measurable impact on subsequent P excretion from dairy cattle. More data concerning P availability as affected by feed ingredient or warm climate plant species, maturity and quality are needed to more accurately define P availability in dairy cattle feeds..



Objective

Experiment 1: To use the mobile nylon bag method (MNBM) to determine the extent of P release in the rumen and small intestine of steers using common dairy ration ingredients (ground corn, corn silage, alfalfa hay, coastal bermudagrass hay, and Tifton 85 hay)

Experiment 2: Determine effects of forage quality, maturity, and warm climate species on total tract P availability in steers

Hypothesis

Experiment 1: The amount of P released from various feedstuffs in the digestive tract of cattle does differ

Experiment 2: Forage species and or maturity will affect the amount of P released in warm climate forage species

Materials and Methods

Experiment 1

- 2 ruminally cannulated and 2 duodenally cannulated steers
- Ground corn, corn silage, alfalfa hay, coastal bermudagrass hay, and Tifton 85 hay
- Ruminal incubation for 24 h
- Pepsin/HCL wash to simulate abomasal digestion
- Intestinal incubation
- Samples collected in a fecal bag

Experiment 2 (on going)

- Same procedure as experiment 1 except that differing maturities of forages will be used
- 14, 21, 28, and 35 day maturities will be used for alfalfa, coastal bermudagrass, and Tifton 85

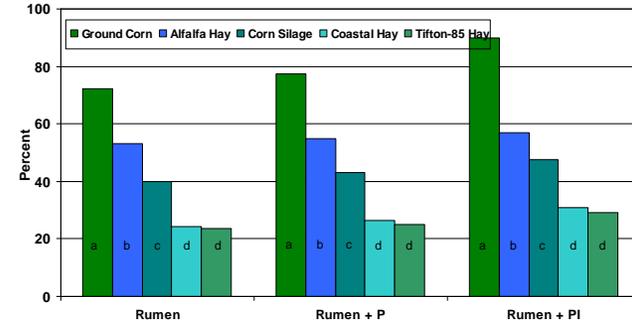
Statistical Analysis

Mixed procedure of SAS (SAS Inst. Inc., Cary, NC)

- Experiment 1: effect of feedstuff, replicate, site of incubation, and site of incubation x feedstuff were included in the model
- Experiment 2: effect of species and maturity will be included in the model

Results

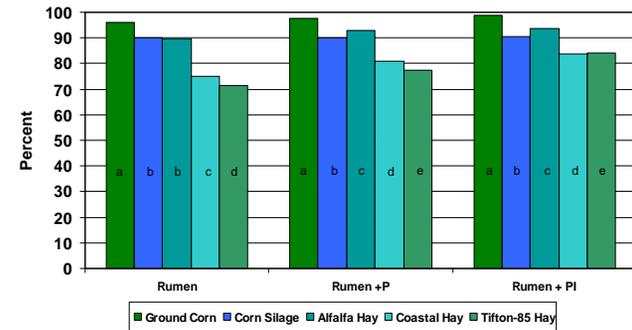
Percentage of DM disappearance after ruminal (Rumen), ruminal and pepsin HCL (Rumen +P), or ruminal, pepsin HCL, and intestinal incubation (Rumen + PI)



Feedstuff by site interaction ($P < 0.05$)

Values with different superscripts (A,B,C) differ ($P < 0.05$)

Percentage of phosphorus disappearance ruminal (Rumen), ruminal and pepsin HCL (Rumen +P), or ruminal, pepsin HCL, and intestinal incubation (Rumen + PI)



Feedstuff by site interaction ($P < 0.05$)

Values with different superscripts (A,B,C) differ ($P < 0.05$)

Conclusion

There were differences among feedstuffs and sites of digestion for P and DM disappearance which suggests that there is variability in feedstuffs for release of P.

Experiment 2 (on going) will determine P variability among forages differing in species and maturity level.

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