Examination of Protein Degradability of Various Dietary Components of Midwestern Feedlot Diets Using In Situ Techniques in Rumen Cannulated Steers.

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Introduction

With today's cattle prices, producers cannot afford to give up efficiency. Dietary protein is an expensive component of any Midwestern feedlot diet, and therefore it is important to utilize them it their fullest. The NRC recommends that feedlot diets consist of 13-15% protein (NRC, 2000). However, a typical ration only consists of 7-9% crude protein. To make up for this lack of dietary protein, the animal relies heavily on their synergistic relationship with rumen microbes. Rumen microbes are able to break down protein into amino acids and combine nitrogen components with carbon chains from dietary starch components to provide a high quality microbial protein.

Along with using dietary nitrogen components, ruminants have the ability to utilize non-protein nitrogen components for rumen microbial protein synthesis (Cherdthong and Wanapat, 2010). Since microbial protein is higher quality than dietary protein, it has been of use to feed components better suited to microbial protein synthesis. Slow release urea products are utilized in feedlot diets as sources of non protein nitrogen. These products are important when entering the gut of the animal in being a major contributor to N transferred across the gut wall (Cherdthong and Wanapat, 2010). This transfer of N across the gut wall supplies microbes with N for protein synthesis. Midwestern feedlot diets are formulated towards utilizing microbial synthesis, but there are still a lot of unknowns when it comes to protein degradability in the rumen of feedlot cattle over time when looking at dietary components. However, because the rumen environment of cattle is directly impacted by the feed stuffs in the diet, it is important that protein degradability be studied in specific rumen environments. In my proposed study, I intend to study protein degradability with the goal of determining the most efficient component combination to utilize maximum microbial protein synthesis in both forage and concentrate diets.

Materials & Methods

<u>Adaptation Period</u>

- 10 ruminally cannulated Holstein steers were allowed 21 days to adapt to their respected diets

<u>Components Analyzed</u>

Forage	Concentrate	Urea Products
Soybean Meal (SBM)	Soybean Meal (SBM)	Urea
Modified Distillers Grains (MDGS)	Modified Distillers Grains (MDGS)	Optigen
Haylage	Whole Corn	NitroShure
Corn Silage	Corn Silage	Biuret
Alfalfa	High Moisture Corn	
Low Quality Green chop	Steam Flaked Corn	
High Quality Green Chop	Dry Rolled Corn	
Corn Stalks	Earlage	

- Between 0.5 – 1.0 g of each component was weighed and sealed into ANKOM dacron bags
- Soybean meal was included in each run in each steer serving as a control comparison
- Components were placed in rumen and suspended for 0, 2, 4, 8, 12, 16, 24 and 48 hour increments with time point beginning at morning feeding
- Prior to placement in rumen bags were warmed to 36° C water for 15 minutes
- Once removed from rumen after allotted time, bags were submerged in cold water to stop fermentation and sequentially individually washed to remove any attached digesta
- Once clean bags were placed in a 60° C oven for 48 hours
- Final weight after 48 hr dry was used to calculate DM disappearance of feed component

Data Analysis

- Data were analyzed using PROC ANOVA procedure in SAS
- Means separated by Fischer's protected least square difference, $\alpha < 0.05$

Results

Figure 1. Percent of forage components remaining from calves fed a forage diet

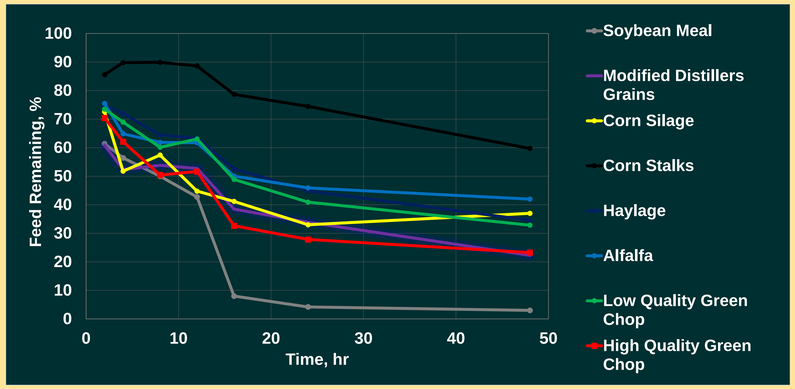


Figure 2. Percent of concentrate components remaining from calves fed a concentrate diet

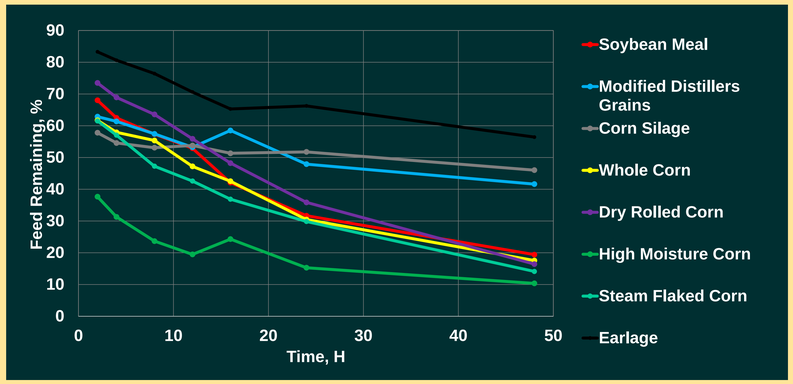
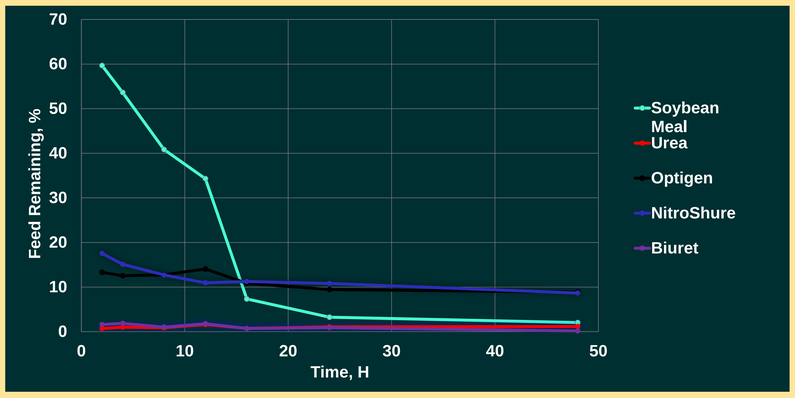


Figure 3. Percent of urea components remaining from calves fed a forage diet



Results (cont.)

Figure 4. Percent of urea components remaining from calves fed a concentrate diet

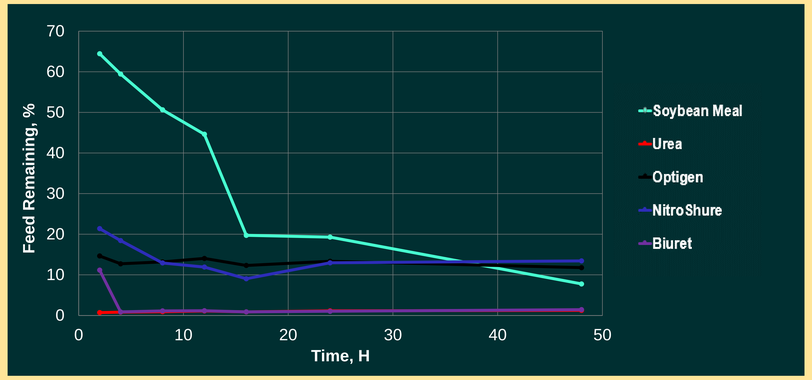
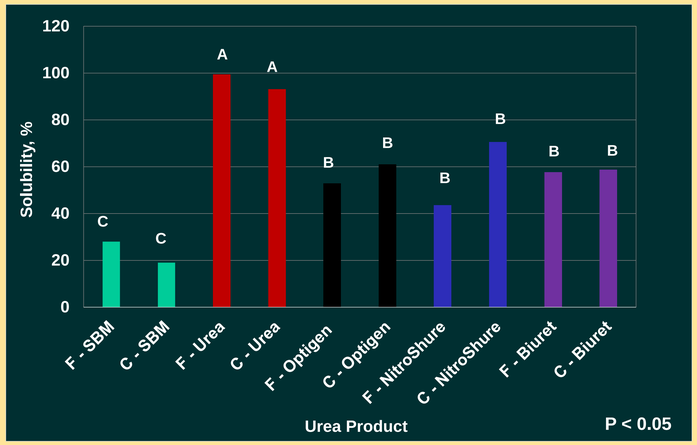


Figure 5. Percent solubility of urea products in forage and concentrate diets



	Urea	Biuret	NitroShure	Optigen	Soybean Meal
Solubility, %	96.26[a]	58.16[b]	57.05[b]	56.95[b]	23.51[c]

Conclusions

- Slow release urea products showed a slower release of nitrogen as compared to the urea product ($P < 0.05$).
- Components that are naturally higher in moisture show faster rate of disappearance in a concentrate adapted rumen environment.
- Within a concentrate adapted rumen, high moisture corn, steam flaked corn and whole corn have the fastest observed rates of disappearance, thus to improve microbial protein synthesis high moisture corn would be best paired with urea, and steam flaked corn and whole corn could be paired with slow release urea products.
- Within a forage adapted rumen, Grass (both low and high quality), corn silage, and modified distillers grains appeared to disappear faster than other components but not as fast a high moisture corn, thus urea would not be a beneficial addition to increase microbial protein in forage based diet however some benefit may be seen with slow release urea products.