



Effects of Protein Source on *In Vitro* of Prairie Hay By an Equine Cecal Microorganisms Inoculum



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Introduction

- Adequate fermentation of dietary fiber is of great importance when discussing equine nutrition.
- Microbial fermentation of structural carbohydrates can provide up to 70% of a horse's DE requirement.
- Protein supplementation in cattle consuming low quality forages has shown to increase fiber digestibility
- Given the similarities between the rumen and the cecum, it is hypothesized that the same may be true for the equine

Objective

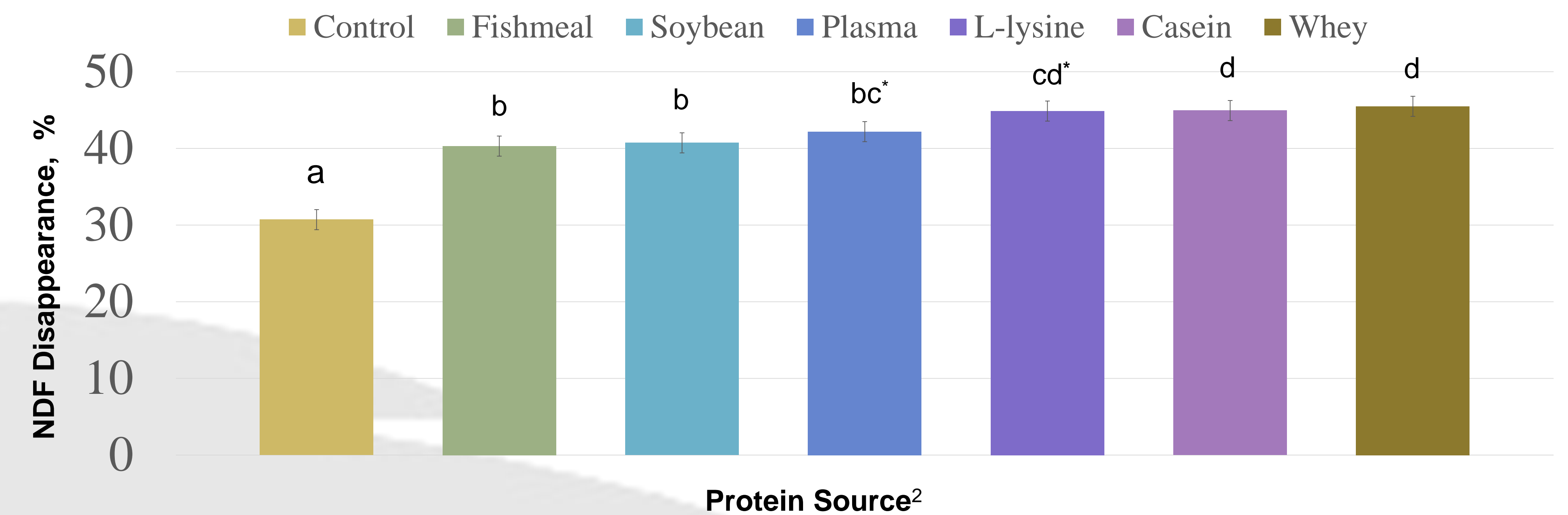
Evaluate the effect of protein source on NDF disappearance and total VFA production of native prairie hay inoculated with equine cecal fluid.

Experimental Procedures

- Cecal fluid was collected from 4 cecally cannulated horses consuming a diet of Smooth Bromegrass hay (1.5% BW) and commercial concentrate (0.5% BW).
- Four replicates (horse) were used in a completely randomized design with 6 treatments (no protein, casein, whey, soybean meal, plasma, L-lysine, and fishmeal).
- Treatments were applied so that each protein source supplied an additional 2.0% CP. Appropriate levels of cellulose were added to keep treatments ISO-DM.
- Five g (DM) of prairie hay was added to 250-mL screw top fermentation flasks containing 140 mL of McDougall's buffer 7 h addition of cecal inoculum to allow for substrate saturation.
- Ten mL of strained and stratified cecal fluid was added to each flask along with their respective protein source, sealed, and placed into a shaking incubator (New Brunswick Scientific Inc., New Brunswick, NJ) at 39°C for 48 hours. Bottles were then removed and uncapped to expose content to oxygen to stop the fermentation process
- Fluid was transferred via pipette in 4 mL aliquots into 2 microcentrifuge tubes containing 1.0 mL of 25% metaphosphoric acid. Acidified samples were centrifuged at 10 x g for 20 min. Supernatant was transferred into gas chromatography vials and VFA were measured using an Agilent 7890 gas chromatograph (Agilent Technologies, Santa Clara, CA) equipped with a DB-WAX capillary column (10 m x 0.10 mm x 0.1 mm film thickness; Agilent and J&W columns, Santa Clara, CA) and flame ionization detector.
- Remaining contents were dried 55°C for 48 h, ground, and analyzed for NDF using an ANKOM A200 Fiber Analyzer according to the procedures described by Goering and Van Soest (1970).
- Data was analyzed using the Glimmix procedure of SAS (Version 9.4). The model included fixed effect of treatment (protein) and random effect of replicate (horse) to determine the least-square means. Significance was declared at $P < 0.05$, and a tendency was considered to be present when $0.10 > P > 0.05$. Differences among LSMEANS were determined using the PDiff option of SAS

Experimental Results

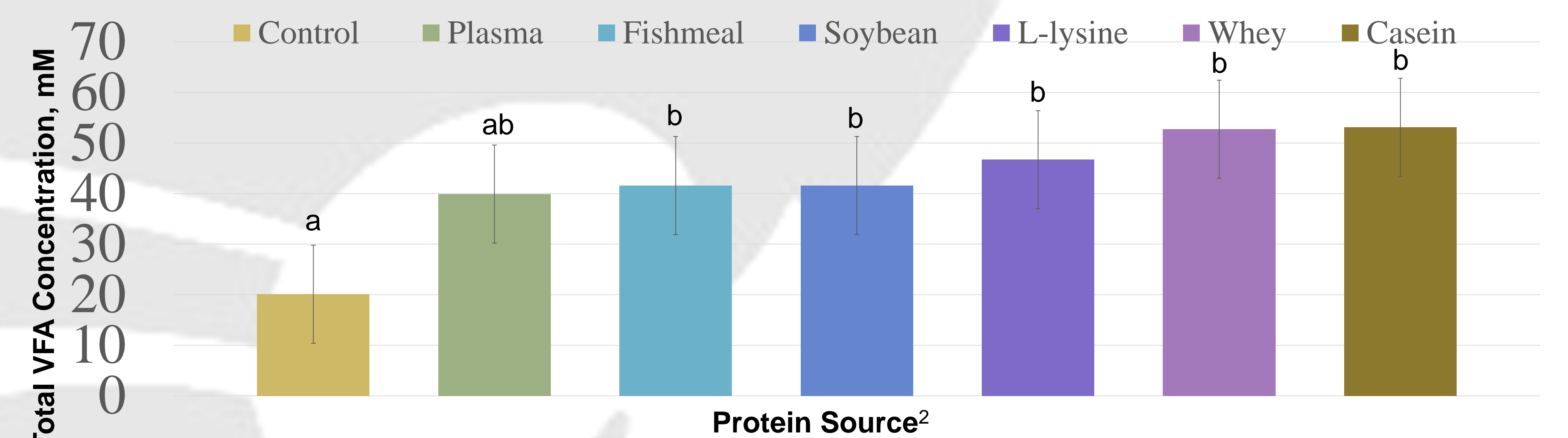
Figure 1. Effect of protein source on NDF Disappearance¹



¹ Fermentation cultures containing 140mL McDougall's buffer, 10mL equine cecal fluid, and protein were incubated at 39°C for 48 h.

² Protein sources supplied an additional 2.0% CP (DM). Cellulose was used to keep the treatments ISO-DM. a,b,c,d Means without common subscripts differ, ($P < 0.05$). *Bars with * differ with $0.10 > P > 0.05$.

Figure 2. Effect of protein Source with total VFA Concentrations¹



¹ Fermentation cultures containing 140mL McDougall's buffer, 10mL equine cecal fluid, and protein were incubated at 39°C for 48 h.

² Protein sources supplied an additional 2.0% CP (DM). Cellulose was used to keep the treatments ISO-DM. ab Means without different subscripts different $P < 0.05$

Conclusions and Future Work

- Results support the hypothesis that supplementing protein may increase fiber disappearance and VFA production in equine
- All protein sources had greater ($P < 0.001$) NDF disappearance when compared to control.
- Higher soluble protein sources (casein, whey, and lysine) had the greater ($P < 0.05$) NDF disappearance.
- All protein sources had greater ($P < 0.05$) VFA production when compared to control.
- Increasing cecal N levels may increase fiber digestibility and energy production in the equine consuming a low quality forage. Assessment of this theory would need to be conducted *in vivo* to validate theory