Comparison of in situ and in vitro methods for predicting in vivo fiber digestion.

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INTRODUCTION

Estimates of in vivo NDF digestibility by in vitro TTNDFD® have been demonstrated to be closely correlated. The in situ TTNDFD® method would be a useful alternate method for predicting in vivo NDFD if validated.

OBJECTIVE

Compare potentially digestible NDF (pdNDF) and pdNDF digestion rate (kd), using in situ (IS) or traditional in vitro (TR) rumen digestion assays, and compare subsequent estimates of total-tract NDF digestibility (TTNDFD) to *in vivo* (IV) ttNDFD measurements.

MATERIALS AND METHODS

9 feed samples of high and low digestibility corn silage, high fiber concentrates, and haylage were coded so the laboratory could not identify the samples or replicates.

- All feed samples were previously characterized *in vivo* for pdNDF, k_d, and ttNDFD.

9 timepoints were used in replicated runs, using 2 method

- 6, 12, 24, 30, 48, 72, 96, 120, and 240h
- In vitro rumen digestionIn situ rumen digestion

Traditional in vitro rumen NDFD method (Goering and Van Soest, 1970)

- 0.5g, 1mm Udy mill ground placed in flasks with Van Soest buffer
- Rumen fluid from 2 cows was pooled and immediately used to inoculate samples
- 2 Replicated runs

Table 1. Feed Characterization.

Sample ID	Feed Type	NDF, % of DM	iNDF, % of NDF
1	Conv. Corn Silage	33.9%	22.3%
2	Haylage	41.2%	30.5%
3	Conv. Corn Silage	41.0%	22.1%
4	Conv. Corn Silage	42.4%	20.3%
5	High Dig. Corn Silage	39.9%	13.5%
6	Haylage	37.6%	34.3%
7	Conv. Corn Silage	44.1%	18.7%
8	Low Starch Concentrate	41.0%	0.8%
9	High Starch Concentrate	24.2%	0.8%

Table 2. Comparison of method on silage rate of digestion and predicted TTNDFD by feed type..

Feed Type	In situ k_d	Trad. k_d	In situ TTNDFD®	Trad. TTNDFD®
Haylage	5.49%	13.67%	50.8%	51.0%
HD CS	2.39%	4.64%	46.4%	52.8%
CS	1.97%	1.89%	39.5%	36.9%
Concentrate	4.23%	8.14%	69.5%	82.8%

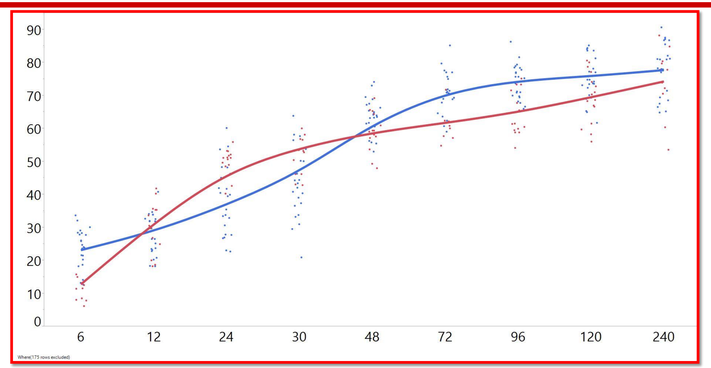

Figure 1. NDFD, % of NDF, by method over time. Red = traditional in vitro, blue = in situ rumen digestion over time for 9 feeds

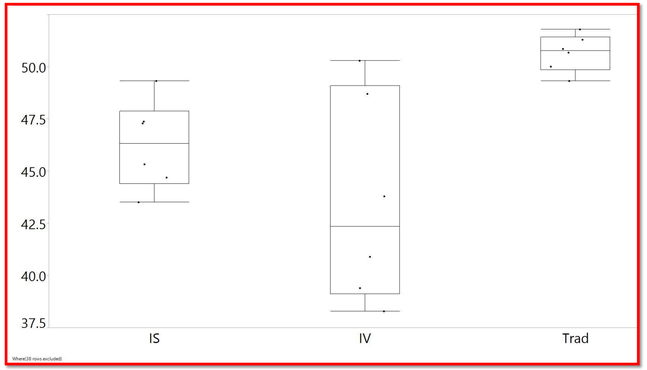

Figure 2. Comparison of TTNDFD by method. IS = in situ, IV = in vivo, Trad = traditional in vitro

MATERIALS AND METHODS

In situ rumen NDFD method (modified NorFor method)

- 0.5g 2mm Udy mill ground placed in Ankom F57 bags
- Placed in rumen in reverse order or hours, all samples removed at the same time
- 2 replicated runs, each using 3 different cows

Statistical Methods

- Ingredient results were mathematically combined to compare to in vivo results
- SAS JMP (v11.0) nonlinear option for exponential decay model to determine pdNDF and k_d for each method. TTNDFD was then calculated from those values.
- Student's T-test was used to compare techniques.

DISCUSSION

- Tradition in vitro results in a faster rate of digestion for feeds and greater estimate of TMR TTNDFD compared to the in vivo results ($P<0.01$).
- In situ predictions of TTNDFD resulted in greater variability than the traditional in vitro methods, but did not differ from in vivo results.

CONCLUSIONS

- In situ NDFD assay can be used to predict the TTNDFD in corn silages, haylage, and concentrates.

DEFINITIONS

pdNDF – potentially digestible NDF iNDF – indigestible NDF NDF = pdNDF + iNDF