

Fecal sample starch content deteriorates over time after sampling

Introduction:

- Dairy and beef cattle total tract starch D (starch digestion) varies greatly.
 - *Commercial dairy total tract starch D from 2010 and 2014 ranged from approximately 77 to 99% (Rock River Laboratory, Inc. unpublished data).
 - oThis data agrees reasonably well with the 84 to 98% total tract starch digestibility range in dairy cattle digestion presented by Ferraretto and Shaver (2013).
 - *Using NRC (2001) energy equations modified to include total tract starch D within TDN calculation, a 22 unit range could account for approximately 2.7 kg in milk difference.
- Dairy and beef cattle fecal samples are typically taken from commercial dairies and feedlots to assess starch utilization.
 - *Fecal starch content has been related to total tract starch degradation (Ferguson, unpublished; and Ferraretto and Shaver, 2012). *Decreased starch utilization leads to decreased animal performance.
- Fecal sample starch concentration may change during time in transit to analysis laboratory, which in some cases can be five days or more.

Objective:

over time and various shipping environment.

Materials and Methods:

- Dairy cattle fecal samples (at least ten, 250 g subsamples) were collected from manure piles at each of two commercial dairies in Wisconsin, in July 2013.
- Fecal subsamples were thoroughly mixed in a pail and immediately split on-farm, into air tight plastic containers (250 g per container).
- *Samples were then stored for 0 (control), 1, 2, or 5 d (days) •Samples stored for 1, 2, or 5 d were also held at approximately 2 degrees C (cold), 22 degrees C (room), or ambient (variable, daily high 27 degrees C) temperatures. *The 0 h sample was processed on the same day samples were gathered.

<u>References:</u>

Ferraretto, L.F. and R.D. Shaver. 2012. Meta-analysis: effect of corn silage harvest practices on intake, digestion and milk production by dairy cows. Prof. Anim. Sci. 28:141-149.

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- Our objective was to determine if fecal starch concentration changed
- temperatures, as to simulate

- These combinations were organized in a factorial arrangement and chosen to simulate sample environment during shipping to analysis lab.
- Samples were oven dried (50 degrees C for 48 h) and ground to 1 mm following treatment.
- Starch content (% of DM) was measured in each sample (Hall, 2008).
- Predicted Total Tract Starch Digestibility (TTSD, % of starch) was calculated using the Ferraretto and Shaver (2012) equation:
 - *100 X (0.9997 0.0125 × fecal starch content, % of DM)
- Data were analyzed with multiple linear regression using SAS JMP v10 and model effects chosen using forward selection.
- *Temperature and time were entered as fixed effects and farm was entered as a random variable.

Results and Discussion:

- - separating by temperature revealed that cold-storage appeared to numerically remain unchanged over time.

- •Fecal starch content raw data averaged 5.4 and 3.7% at 0 and 5 d, respectively.
- Predicted TTSD data averaged 93.3 and 95.4% at 0 and 5 d, respectively.

Conclusions:

- predictions will change during extended time in transit.
- •The amount of time between sampling and starch analysis should be considered and minimized.
- •Maintaining cold storage during shipping may limit microbiological starch degradation.

Ferraretto, L.F., P.M. Crump, and R.D. Shaver. 2013. Effect of cereal grain type and corn grain harvesting and processing methods on intake, digestion, and milk production by dairy cows through a meta-analysis. J. Dairy Sci. 96:533-550.

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•Temperature (P<0.05) and time (P<0.01) were significantly related to fecal starch content and predicted TTSD.

*Final model parameter slope estimates were:

- -0.017 per h for fecal starch
- •0.020 per h for TTSD
- •Fecal starch content averaged 4.3, 5.4, 4.3, and 4.1 % for control, cold, room, and ambient temperature exposures, respectively.
 - *The numerically greater starch content at cold-storage temp relative to control was unexplained.
 - *Plotting predicted TTSD (based upon fecal starch content) over time and
 - ^oDegrees of freedom limited testing this interaction
 - *Results warrant further evaluation.

Results suggest fecal sample starch content and total tract starch digestion

Hall, MB. 2008. Determination of Starch, including Maltooligosaccharides, in Animal Feeds: Comparison of Methods and a Method Recommended for AOAC Collaborative Study. J. AOAC Int. 92:42-49. National Research Council. 2001. Nutrient Requirements of Dairy Cattle. 7th Revised ed. National Academy Press, Washington, D.C.

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