

ROCK RIVER LABORATORY, INC. AGRICULTURAL ANALYSIS

INTRODUCTION:

Corn silage is a staple feed for many commercial dairies. Variation in corn silage kernel processing and ensiling extent may impact rumen and total tract starch digestibility (TTSD, % of starch), however there is question about the variation in rumen and total tract starch digestibility for fermented silage in dairy cattle. The objective of this study was to survey a range of Midwestern US dairy farms and evaluate if corn silage kernel processing score (KPS), corn silage rumen starch digestibility, and fecal starch content (and calculated TTSD) varied substantially for herds feeding fermented corn silage.

MATERIALS AND METHODS:

Fecal and corn silage samples were collected from 59 commercial dairy farms in Wisconsin during summer 2018. Total tract starch digestibility for dairy cattle was calculated using the Fredin et al. (2014) equation (TTSD = 100 - 1.25 x Fecal starch, % of DM). Silages were assumed to have fermented for at least 6 months as the project centered on sampling from farms feeding 2017 grown corn silage crop. Samples were collected between May and August, 2018. Fecal starch content, corn silage starch, KPS (% starch <4.75mm) and in situ rumen starch digestibility (% starch; 6mm grind) at 0h (isSD0; washout fraction) and 7h (isSD7) were determined by a commercial laboratory (Rock River Laboratory, Watertown, WI). For starch digestibility, samples were microwave oven dried at a low intensity, ground to pass a 6 mm screen and incubated for either 0 or 7 hours within the rumen of 3 lactating dairy cattle consuming a high-forage diet.

Corn silage samples were further analyzed for nutritive parameters, including uNDF at multiple time points, and by NIR as would be done for commercial forage samples. Dairies were surveyed for TMR nutrient composition by requesting the formulated diet, dry matter intake (DMI, kg) per farm records, milk production (kg), milk fat (MF, %), and protein (MP, %) per cow, per Dairy Herd Improvement Association records. Energy corrected milk (ECM, kg) was calculated as (12.95 x milk kg x BF) + (7.65 x milk kg x MP) + (0.327 x milk kg) and feed conversion (FCE) as ECM/DMI.

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KEYWORDS:

Corn silage, kernel processing, starch digestibility

MIDWESTERN US COMMERCIAL DAIRY SURVEY RESULTS: CORN SILAGE KERNEL PROCESSING, RUMEN STARCH DIGESTIBILITY, AND FECAL STARCH CONTENT

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Table I: Corn silage and fecal sample population statistics for Midwestern US commercial dairies feeding 6 month or more fermented corn silage.				Table 2: Independent pair WISF correlations for key parameters.					
PARAMETERS	MEAN	STD. DEV.	COEFF. VAR.	PARAMETER 1 (Y)	PARAMETER 2 (X)	INTERCEPT	LINEAR REGRESSION COEFFICIENT	STANDARD ERROR	P <
Corn Silage				TTSD	KPS	92.24	7.77	2.03	0.05
Dry Matter	33.0	4.4	13.3	isSD0	KPS	53.17	0.42	8.69	0.01
Starch	33.3	4.7	14.2	TTSD	isSD0	87.75	0.12	I.80	0.00
KPS	65.5	7.0	10.7	isSD7	isSD0	69.13	0.24	2.97	0.00
isSD0	80.9	7.0 9.1	II.3	DMI, kg	isSD0	20.65	0.07	2.43	0.05
isSD7	88.7	3.7	4.1	TTSD	isSD7	85.24	0.14	2.04	0.07
Dairy Measures				ECM	isSD0	31.17	0.11	4.22	0.07
Fecal Starch	21	Ι.7	78.0	ECM	isSD7	34.18	0.62	9.31	0.07
Total Tract Digestibility, % starch	97.3	2.1	2.1	STATISTICAL AI	-212ΥΙΔ				
DMI, kg	26.3	2.5	9.5	Kernel processing score and rumen starch digestibility independent pairwise correlations with TTSD, milk productio (ECM) and milk production efficiency per pound of dry matter intake (FCE) were explored by multivariate methods with JMP Pro v14.0.					
ECM, kg	40.3	4.3	10.7						
ECM/DMI	I.5	0.1	7.3						
TMR (Formulated Nutrier	nt Composition)			CONCLUSIONS:					
CP	16.8	0.6	3.6	The coefficients of variation in excess of 10% of the mean suggest variation exists in kernel processing and starch digestibility for fermented silages. Further, the significant independent correlations and regression coefficients describ in Table 2 suggest relationships exist between commercial laboratory kernel processing score, rumen starch digestibil fecal starch and performance metrics. However further work is warranted, via controlled experiments, to elicit more insight into the magnitude of the responses.					
aNDF	28.0	2.6	9.2						
Starch	26.4	2.4	9.0						
Percent Corn Silage	36.9	7.9	21.3						
Percent Forage	57.3	4.9	8.6	RESULTS AND	DISCUSSION:				

and TTSD (r=0.52), isSD0 and isSD7 (r=0.60). Trends were evident (P<0.10) for isSD0 and DMI (r=0.26), isSD7 and TTSD (r=0.24), ECM and isSD0 (r=0.24) and ECM and isSD7 (r=0.24). Survey population statistics are presented in Table I, and regression coefficients for the relationships presented in Table 2.