Greater NDF Digestibility Improves Dairy Cow Intake and Production

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Forages typically are half or more of the diet of lactating dairy cows, and profoundly affect energy and carbohydrate intake. Maximizing digestible carbohydrate intake from forage is an important management goal, because energy needed for maintenance and milk production often exceeds the amount of energy high-producing cows can consume.

The objective of this University of Wisconsin study was to determine how diets that differ in dietary NDF concentration and NDF digestibility (NDFD) affect DM intake, rumen fermentation, and milk production in early-lactation dairy cows. Twelve Holstein cows from the UW-Madison Dairy Cattle Research Center, averaging ~40 days in milk and producing ~90 lb of milk daily, were used for this replicated feeding trial.

Treatment diets were 28 or 32% dietary NDF (DM basis) and two levels of wheat straw NDFD: high (HD), wheat straw treated with anhydrous ammonia, resulting in 76% NDF and 62% NDFD; low (LD), untreated wheat straw with 77% NDF and 41% NDFD. The in vitro 48-hour NDFD procedure was used. All four diets consisted of wheat straw, alfalfa silage, corn silage, and a concentrate mix of cracked corn grain, corn gluten meal, 48% soybean meal, vitamins and minerals. Wheat straw comprised 8.5% DM of the 28%-NDF diets and 16% of the 32%-NDF diets.

Cows fed 28%-NDF and HD diets produced more milk, fat, and protein than those consuming 32%-NDF or LD. However, milk fat and protein percentages were not affected by NDFD. DM intake was greater for cows consuming 28%-NDF diets, but intakes of DM and total NDF were not affected by NDFD. Intake of digestible NDF was greater for cows consuming HD diets. Given that DM and NDF intake were not affected by NDFD, the positive milk production responses observed with HD diets were likely due to the increased digestible NDF intake (Table 1).

Table 1. *Effects of dietary NDF concentration and NDFD on intakes of DM, NDF and digestible NDF; and on milk production and composition of early-lactation Holstein cows.*

	28% NDF Diets		32% NDF Diets	
	Low NDFD	High NDFD	Low NDFD	High NDFD
DM Intake				
Lb/day	50	52	48	49
% Body Weight	3.56	3.63	3.36	3.49
NDF Intake				
Lb/day	13.8	14.1	15.1	15.3
% Body Weight	0.98	0.99	1.06	1.09
Digestible NDF Intake (Lb/day)	6.5	7.3	6.9	8.2
Milk Production (Lb/day)	87	90	80	85
4% Fat-Corrected Milk (Lb/day)	79	82	73	76
Milk Composition (%)				
True Protein	2.8	3.0	2.7	2.7
Fat	3.4	3.4	3.3	3.3
Lactose	4.8	4.8	4.7	4.8
Milk Component Yield (Lb/day)				
True Protein	2.4	2.8	2.2	2.3
Fat	3.0	3.1	2.7	2.9
Lactose	4.1	4.3	3.8	4.1

Rumen fermentation was not affected by diets that differed in NDFD. Ruminal NDF passage rate was slower for cows fed HD than cows fed LD. No interactions of dietary NDF concentration and NDFD were observed for any measurements.

Regardless of dietary NDF concentration, increased NDFD improved intake and production in early-lactation dairy cows. Diets with improved fiber digestibility could increase energy intake. Analyzing forage for NDFD is an additional tool to better predict forage quality and utilization by dairy cows.