Ranking Forages for Dairy Rations

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Dairy managers continue to build rations higher in forage dry matter (DM) as forage quality continues to improve with higher shelled corn prices while lower milk prices squeeze profits. One question is which type of forage should be selected – corn silage or legume/grass forage. A number of factors must be considered including forage nutrients, soil erosion risks, land fertility, growing degree days and acres available for forage production. Several factors can be considered when comparing corn silage to legume/grass forage sources.

Focus 1. Harvesting a Consistent Forage

Corn silage wins this comparison when looking at variation in nutrient content using NRC 2001 forage results. Standard deviations for corn silage are lower compared to alfalfa resulting in less variation (Table 1). Nutritionists can build rations with more confidence and lower nutrient levels with less variation.

Focus 2. Physically Effective Fiber

Legume/grass wins this battle as more effective fiber can be produced based on Penn State particle separator results (>70% in the top two boxes for alfalfa). Plant or kernel processing of corn silage has narrowed this advantage when correctly adjusted.

Focus 3. Buffering Capacity

Legumes win this comparison as the mineral levels lead to high natural buffering capacity, favor higher rumen pH values and less response to adding rumen buffers.

Focus 4. Protein Aspects

Legume/grass wins this area as these forages contain higher levels of crude protein (CP) (Table 1). High protein degradability values (>70%) in legume/grass silages can be a challenge to capture higher rumen ammonia levels from degradable protein as microbial protein.

Focus 5. Carbohydrate Considerations

Corn silage wins hands down as it contains 30% starch or higher with lower levels of NDF, ADF and lignin (Table 1). NDF digestibility or NDFD is also higher for corn silage (>55% compared to legume/grass forages at 50%).

Focus 6. Harvesting Factors

Corns silage wins this competition as one harvesting process is required compared to 3-6 harvest events for legume/grass forages, plus several trips across the field (cutting, turning/raking and/or consolidating windrows). The harvest window for optimal quality is longer (10-14 days for corn silage compared to 5-7 days for legume/grass forages).

Focus 7. Ration Costs

Corn silage wins this calculation using current forage, grain and protein feed costs. High corn silage rations (>70% for forage DM) compared to low corn silage rations (33% corn silage) can result

in 20-30¢ lower feed costs/cow/day using least cost ration software. Corn and soybean prices are critical in this comparison. With distillers grains priced competitively low, corn silage continues to benefit with lower protein supplements costs.

Focus 8. Fermentation Profiles

Corn silage wins this comparison as high levels of fermentable carbohydrate lead to lower silage pH (<4), higher levels of lactic acid (5-8%) and lower levels of ammonia.

Focus 9. Milk Yield per Acre

Corn silage wins this comparison calculating milk/ac using the University of Wisconsin Milk 2006 equation. Using 5 tons DM/ac for legume/grass forage, milk yield/ac was 14,314 lbs. Using corn silage data from the University of Wisconsin test plots (1995-2008), milk yield/ac was >26,000 lbs.

When totaled, corn silage has an advantage in this comparison. But this ranking depends on categories selected and data sources. The dairy manager's challenge is to rank these nine focus areas, change the categories listed above and add other important factors (such as nutrient plan and erosion control) as appropriate. Future forage improvements in plant breeding will modify this ranking due to the manipulation of legume protein (more rumen undegraded protein), fiber levels and digestibility (less lignin), genetic traits (such as weed and pesticide control), DM yields through breeding and variety selection and corn and protein prices. **Happy ranking!**

	Crude Protein	NDF	ADF	Lignin
	% DM basis			
Corn Silage (1,033 samples)	8.5	44.5	27.5	4.0
Standard Deviation	1.2	5.3	3.3	1.0
Alfalfa Silage (8,567 samples))	20.0	36.7	30.2	6.2
Standard Deviation	3.0	6.5	4.8	1.8

Table 1. Nutrient variation in corn silage & alfalfa silage (NRC, 2001).