Grass for High Producing Dairy Cows – Is a Little Grass Good?

by David Combs, University of Wisconsin

Including grass in dairy rations appears to be a feasible strategy to reduce the NFC level of early lactation diets and increase levels of fiber without reducing milk yield. Alfalfa and corn silage are the primary forages grown and fed to dairy cattle in the Midwest, however, there is renewed interest in incorporating perennial and annual grasses into forage cropping systems. High quality grass silages could be a good fit with diets formulated with high quality corn silage and alfalfa. Intensively-managed grass silages are high yielding forages that contain moderate concentrations of fiber (NDF) and low concentrations of non-fiber carbohydrate (NFC).

Diets formulated with excellent quality corn silage are often marginal in fiber, and high in NFC content. To balance these diets, it is necessary to incorporate feeds that are highly digestible yet contain relatively low amounts of NFC and high amounts of digestible fiber. While alfalfa can provide for some corn silage deficiencies, today's high quality alfalfas often do not contain much more fiber than corn silage, and the lower NFC levels in alfalfa are offset by the high amount of ruminally fermented protein contained in these forages. The nutrient profile of high quality grass silage complements the excesses and deficiencies of rations formulated with excellent quality corn silage and alfalfa.

The traditional way to evaluate grasses is to compare them directly to another grass or alfalfa in a feeding trial. Typically, a diet formulated with alfalfa as the only source of forage is compared to a diet formulated with an equivalent amount of grass as the only source of forage. When alfalfa is replaced by an equal amount of grass, the total fiber content of the ration increases. If the dietary levels of NDF are high enough in the alfalfa-based diets to limit feed intake by rumen fill, the cows fed the grass-based diets typically consume less dry mater (DM) and produce less milk than those fed an equivalent amount of alfalfa. The overall conclusion of these types of experiments is that grasses are inferior to alfalfa for high producing cows because the higher fiber levels depress feed intake, which in turn limits milk yield. While these types of trials provide valuable information about the energy value of grass forages, they do not necessarily address questions concerning the strategic use of a limited amount of grass to 'fine-tune' levels of NDF or NFC in dairy rations.

Figure 1. *Typical distribution of nutrients in dairy cow diets formulated for high producing dairy cows. Based on NRC (2001) feeding recommendations.*

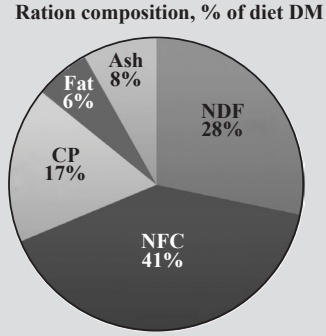
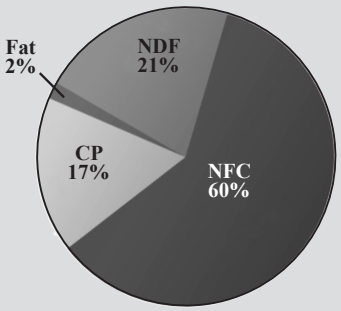


Figure 2. *Contributions of fat, protein, non-fiber carbohydrate and fiber to the total organic matter fermented in the rumen for a diet formulated to meet the NRC (2001) guidelines for high producing dairy cows.*



Researchers at Cornell University recognized the limitations of these traditional experiments, and suggested that a better way to evaluate grass in dairy rations was to feed equivalent amounts of NDF from grass as from the forage it replaces in the ration (Cherney et al, 2004, Cherney et al., 2002). Results from experiments designed this way typically show that milk yield and intake of grass-based diets are similar to control diets based on alfalfa (Cherney et al., 2004). Some have suggested that while studies designed this way show how grasses could be incorporated into dairy diets, they confirm that grasses are lower in energy and more restrictive in intake, but these 'deficiencies' can be overcome by feeding more grain. Experiments designed this way clearly show that grasses can be used in diets for high producing cows, but are usually designed to look at grass as an alternative to alfalfa as the primary forage in the diet.

Another approach to evaluating grasses is to consider the grass forage as a feedstuff that contains several nutritional attributes that could complement low-fiber, high-starch diets for dairy cattle. Early maturity grass contains higher proportions of NDF than corn silage or alfalfa, and the fiber is more digestible than alfalfa NDF. In addition, early maturity grasses contain lower levels of NFC relative to alfalfa or corn silage, and less crude protein than alfalfa forage.

Nutritionists sometimes add as much as 2-4 lbs of straw to corn silage based diets to increase the proportion of dietary fiber. While adding straw increases the total fiber content of the diet, it decreases the digestible energy intake because the fiber in straw is poorly digested and contributes significantly to rumen fill. Grasses would appear to be a better forage to incorporate into high NFC/low fiber diets because unlike straw, the fiber in grasses is more digestible than fiber in corn silage or alfalfa. This suggests that replacing part of the corn silage and alfalfa with high quality grass fiber could shift the proportion of fermented energy from NFC to NDF while minimally reducing the overall digestibility of the diet. This shift in fermentable components would be expected to provide a more steady supply of fermentable substrate to rumen microbes, which could, in turn, help stabilize the production of rumen acids and minimize the occurrence of ruminal acidosis

Ruminally fermented energy comes from dietary NDF, NFC, CP and fat. If a diet is balanced according to NRC (2001) guidelines (Figure 1) about 60% of the organic matter fermented in the rumen is from the NFC component of the diet (Figure

2). The NFC and CP fractions degrade quickly in the rumen to form acids, which tend to decrease rumen pH. The NDF fraction contributes about 21% of the fermented energy supply in the rumen, but since this fraction degrades more slowly, its degradation contributes less to the rumen pH change shortly after feeding than the NFC and CP fractions. If one assumes that optimal milk production and rumen health are achieved when cows are fed to meet the above diet and rumen parameters, producers can begin to identify opportunities for incorporating feeds like high quality grass to adjust or fine-tune diets for high producing cows.

A high quality alfalfa silage, when added to a mix of high moisture corn and a high quality corn silage, may not improve the balance of quickly degraded organic matter and degradable fiber because in alfalfa the proportions of fermentable energy from NDF are only 10-15% lower than in excellent quality corn silage. This suggests that it would be necessary to replace a large amount of corn silage with alfalfa to significantly shift the profile of ruminally-fermented substrates.

It would require much less grass to reduce the proportion of fermented NFC and increase fermentable energy from NDF than with alfalfa. Approximately 45% of the ruminally fermented organic matter in grass silages is associated with the NDF fraction. This is more than twice the proportion of fermentable energy from NDF than is contained in corn silage. The proportions of fermentable energy in the rapidly degraded NFC and CP fractions are much lower in excellent grass silages than in either alfalfa or corn silage. This approach would suggest that high quality grass silages could be used much like nutritionists use high fiber co-products, such as beet pulp or soy hulls to add fiber and maintain optimal rumen pH.

Table 1. *Partial replacement of corn silage & alfalfa with Italian ryegrass silage did not affect intake & production.*

Item	CS-ALF	CS-ALF-IR
Feed, % of TMR		
Corn Silage	25	17
Alfalfa Silage	25	16
Italian Ryegrass Silage	0	17
High Moisture Corn	30	30
Protein/Vitamin/Mineral	20	20
Diet Constituent, % of TMR		
NDF	25	27
NFC	48	46
4% FCM Yield, lb/cow/day	96	96
Fat, %	3.6	3.75

To test this experimental approach, a study was recently completed in which a high quality Italian ryegrass silage was used as a source of digestible fiber in dairy cattle diets (Table 1). Forty-eight cows were used to test 2 diets. One diet was formulated with corn silage and alfalfa silage as the only forage - designated as a 'hot' diet that was high in NFC and low in NDF (CS-ALF). Italian ryegrass was used in the second diet to replace ~⅓ of the corn silage and alfalfa (CS-ALF-IR). Replacement of ~⅓ of the corn silage and alfalfa mix with Italian ryegrass raised the total fiber content and lowered the dietary NFC of the diet. Thus, the amount of ruminally-digested NFC was reduced and the amount of ruminally-digested NDF was increased slightly by adding Italian ryegrass to the diets. Cows fed the diet including ryegrass silage produced similar levels of milk (96 lbs of 4% fat corrected milk) as those fed no grass.

SUMMARY

High quality, well-managed grasses have potential as a source of highly digestible fiber for high producing dairy cows. The fiber in early maturity grasses is more digestible than alfalfa fiber, and when grasses are used to replace alfalfa fiber, milk production and intake of high producing cows do not appear to be affected. Perhaps the greater opportunity for grasses in dairy rations is as a feedstuff that is high in digestible fiber, and low in NFC. There appears to be a need for these types of feedstuffs when excellent quality corn silage and alfalfa are the core forages in dairy rations.

References

Cherney, D. J. R., J. H. Cherney, and L. E. Chase. 2002. Performance of lactating Holstein cows as influenced by forage species and maturity, and level of inclusion. Prof. Anim. Sci. 18:316-323.

Cherney, D. J. R., J. H. Cherney and L. E. Chase. 2004. Lactation performance of Holstein cows fed fescue, orchardgrass, or alfalfa silage. J. Dairy Sci. 87:2268-2276.

National Research Council. 2001. Nutrient Requirements of Dairy Cattle. 6th rev. ed. National Academy Press, Washington, D. C.