Grass Nutritive Value

Lactating dairy cows have the greatest need for energy and protein. Adverse health effects of high grain rations and high grain prices make it very important to minimize grain use in dairy rations by optimizing nutritive value (called forage quality in this publication), and maintaining high production. High forage quality will maximize use of on-farm feeds and improve feeding efficiency.

A forage is a crop that can meet the effective fiber needs of a ruminant animal when fed as the primary forage source in the diet. The same factors influence forage yield and quality, but the relative importance of these factors is very different (Fig. 1).

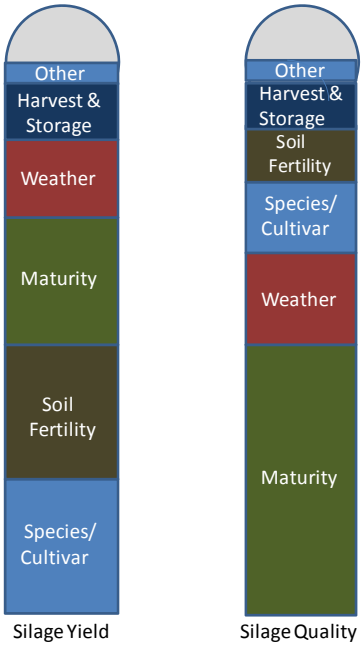

Figure 1. Relative importance of major factors influencing yield and forage quality in perennial grasses.

Grass yield is influenced most by grass species, soil fertility and plant maturity. Without species selection to match the soil type, the species may yield poorly or not persist at all. Cultivar selection is included with species selection, but is less important.

Quality is influenced primarily by plant maturity in grasses. The maturity window for optimum NDF is small, and weather may prevent harvest at optimum NDF. Soil fertility is important for quality primarily due to the impact of soil N on CP content (Fig. 2). Fertilization with 100 lbs of will increase CP in a late May harvest by 6 percentage units. Regrowth N applications do not follow the same pattern. Frequently, application of 50-60 lbs N/acre to grass regrowth results in a slight decrease in forage CP compared to no N applied. The significant yield response dilutes out the additional N applied.

Species and cultivar were very important to forage quality in the past, due to the presence of anti-quality factors in some species/cultivars. It is no longer possible to find high alkaloid reed canarygrass for sale. Likewise forage tall fescue cultivars are now either endophye-free or novel endophyte types. There is one remaining quality issue for species: CP content. Reed canarygrass, orchardgrass and perennial ryegrass can have over 2 percentage units higher CP than timothy. Reed canarygrass averages 2.5 percentage units higher than timothy in Fig. 2, regardless of N rate.

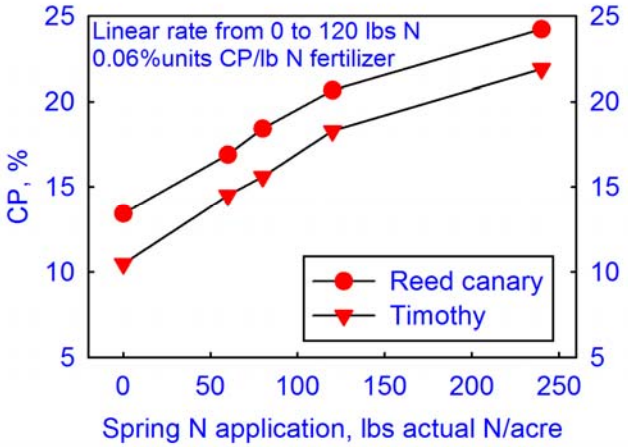

Figure 2. Crude protein (CP) in late May for reed canarygrass vs. timothy. Averages of 3 sites, 3 years, and 4 replicates.

We need to harvest forage grasses to optimize fiber content (NDF) for the class of livestock being fed. Therefore NDF provides the most useful harvest date target, typically 50-55% NDF for lactating dairy forage. Grass NDF is variable in the early spring growth but by mid-May enters into a rapid linear increase phase, coordinated with stem elongation (Fig. 3).

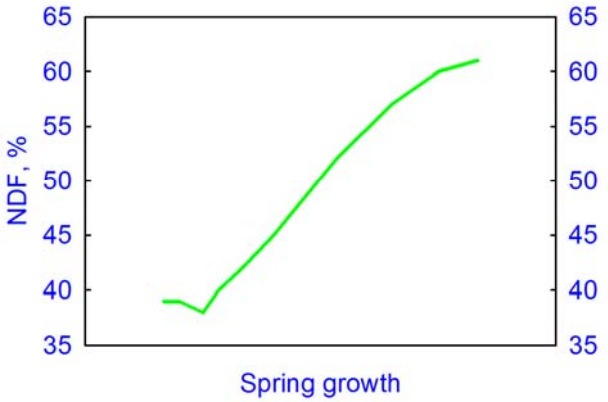

Figure 3. General pattern of NDF content of perennial grasses from early May to early June in NY.

Nitrogen fertilization has some impact on fiber content of grass (Fig. 4). A modest amount of N fertilization will increase NDF at a given harvest date, compared to no N applied. This effect goes away with higher rates of N in the spring. The impact of N on NDF is overshadowed by the rapid rise in NDF during stem elongation (Fig. 3).

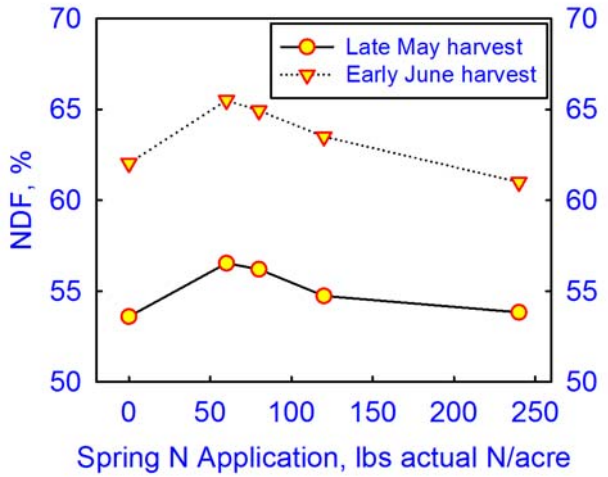

Figure 4. Fiber (NDF) in late May vs early June as influenced by N fertilizer rate. Averages of 2 species, 3 sites, 3 years, and 4 replicates.

Nitrogen fertilization has very little impact on digestibility. Fiber digestibility declines in the spring about 1 percentage unit per day. Dry matter digestibility and fiber digestibility decline as rapidly as NDF increases. In grasses, fiber digestibility is almost perfectly correlated with dry matter digestibility, this is not true for annuals such as corn silage. This means that both digestibility estimates work equally well for ranking different forages. Neither digestibility estimate works for actually balancing rations, as neither is generally included in ration balancing programs.

Summary

High quality grass requires a higher level of management than does alfalfa. High quality means high digestibility, which is primarily influenced by the maturity of the grass. High digestibility allows for a maximum amount of forage in the diet, minimizing concentrates and maximizing economic return.

Additional Resources

- 2011 Cornell Guide for Integrated Field Crops Management. Electronically accessible at: http://ipmguidelines.org/Fieldcrops/.
- Cherney, J.H., D.J.R. Cherney, and D. Parsons. 2006. Grass Silage Management Issues. p. 37-49. In Proceedings from "Silage for Dairy Farms: Growing, Harvesting, Storing, and Feeding". NRAES-181. 23-25 Jan., 2006. Harrisburg, PA. Natural Resource, Agriculture, Engineering Service, Ithaca, NY.

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