Growing Grasses to Add Digestible Fiber to Dairy Rations

by Geoffrey Brink, USDA-ARS, U.S. Dairy Forage Research Center

As interest grows in adding grasses to dairy rations (to add digestible fiber and improve cow performance and health), many dairy producers find themselves learning about a feedstuff they have not grown or used in many years. This article will explore some reasons for feeding grasses, discuss some of the agronomic considerations producers need to think about when growing grasses for dairy rations and consider some differences between growing alfalfa versus grasses. It is not an article on grazing, or growing grasses in mixture with alfalfa, or on harvesting whatever is growing on the "back 40" as an emergency source of forage; it is an article on growing grasses as an intentional source of high quality forage for dairy rations.

Photo 1. *For dairy-quality forage, harvest at boot stage in the spring (credit: Dan Undersander).*

From a ration perspective, grasses are an effective source of fiber (measured as NDF) and also a fiber that is highly digestible (measured as NDFD). Grasses also have a positive effect on milk fat. With today's high-producing dairy cows being fed a high proportion of grain, producers must be extra cautious about feeding adequate fiber. David Combs, an extension dairy scientist at the University of Wisconsin-Madison, lists the following reasons for adding some grass into dairy rations:

- A TMR mixture of grass and legumes has more total fiber compared to alfalfa alone.
- Grass has a higher proportion of digestible fiber than either alfalfa or corn silage alone.
- Grass can be a good fit with corn silage, which is lower in fiber and is high in non-fiber carbohydrates (the grain portion).

But, because grasses increase the fiber content of a ration, they also slow the passage of feed through the cow. If all other ration components remain the same, this will also reduce intake. Research has shown that grass-based diets have little negative effect on cows that have lower nutrient demand, such as late-lactation cows, dry cows and heifers. But adding grass can reduce milk production when cows are at peak lactation because of the reduction in intake.

Growing Grasses

From an agronomic perspective, advantages of growing grasses include: grasses are adapted to a wide range of soils; there are fewer problems with pests and winterkill with grasses compared to alfalfa; grasses dry faster than alfalfa; grasses are highly responsive to nitrogen; and, for dairy producers growing their own feed, grass fields provide an additional option for applying manure and managing manure nutrients.

Agronomist Everett Thomas, Oak Point Agronomics, once commented on his observations of how farmers select plant varieties. Their criteria for selecting an alfalfa variety or corn hybrid, he said, are: What genetic traits are available that I need? How has the variety/hybrid performed in yield trials? For corn, what relative maturity do I need? For alfalfa, what are the disease resistance and persistence ratings for the variety?

However, when selecting a grass, the criteria are a little less stringent, he said: What does the local feed mill have in stock? What's cheap? What did I plant last time? What did my father/grandfather plant?

Grass seed and varieties should be chosen with as much care as corn and alfalfa. Choose seed with a named variety as opposed to "variety not stated" on the label. Choose varieties with medium to late maturity for maximum flexibility in scheduling harvest; and with rust resistance to avoid forage quality and palatability problems. One good source for comparing grass varieties is University of Wisconsin Team Forage website at www.uwex.edu/ces/crops/teamforage/ (select "UW Forage Resources", then "Grasses." Another good source is Cornell University, www.forages.org/, (select the "Forage Species Selector").

To attain successful establishment in a new grass field, first follow the seeding rates recommended by a local university. More persistent grass may be sown with less persistent grass for faster cover and improved seeding year yield. For example, seed tall fescue or orchardgrass at 10 lb/ac with Italian ryegrass or Festulolium at 2 lb/ac. Seed in the spring (April-May) or summer (July-August) into a firm, well-prepared seedbed at a depth of ¼-¾", depending on seed size. Apply 30-40 lb nitrogen/ac when seedlings are 4-6" tall. Control broadleaf weeds with herbicides and annual grass weeds by frequent clipping in establishment year.

Alfalfa fixes its own nitrogen, but grasses need some help via fertilizer and/or manure. Applications made in early spring, before and after the first harvest, have the greatest impact on yield due to seasonal growth patterns. As shown in Figure 1, the annual yield of grass continues to climb as more nitrogen is applied. Figure 2, however, shows the efficiency of yield production, or the pounds of DM produced/lb nitrogen applied.

Figure 1. *Response of orchardgrass, tall fescue and meadow feasue to N application rate at two locations (Brink et al., 2010).*

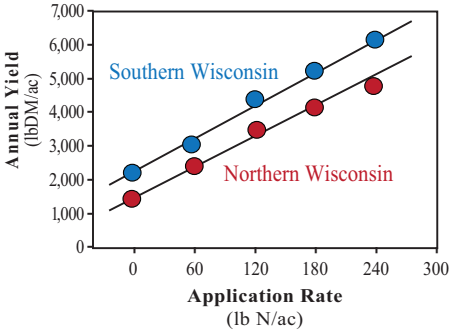
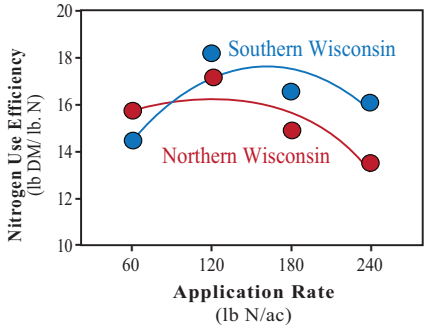


Figure 2. *Efficiency of yield production (lbs DM/lb N applied) at various application rates (Brink et al., 2010).*



This peaks at 120-150 lbs nitrogen/ac/year, so the maximum annual rate for nitrogen on grasses is generally 120-150 lbs/ac. Use a split application, with no more than 60 lbs nitrogen/ac in each application, to improve the utilization efficiency by the crop and the cows; excess nitrogen fertilizer leads to more protein in the crop and consequently more nitrogen excreted in the manure.

Watch Potassium Levels

As beef cow-calf operators well know, a high potassium concentration in grasses can cause problems with cows after freshening. High dietary potassium levels raise the blood pH, which interferes with calcium absorption from feed and mobilization from bones. This can lead to milk fever (hypocalcemia, or low blood calcium) which affects ~6% of freshening cows. To reduce the risk of milk fever, stop feeding high-potassium grasses three weeks prior to calving; orchardgrass and perennial ryegrass have the highest levels of potassium.

Ways to manage grasses to reduce their potassium concentration include: grow on low- to medium-potassium soils, if possible; because the potassium concentration is highest in the spring, feed first cutting to heifers and dry cows; apply manure in the summer or fall when potassium content of the grass is lower.

Harvest and Storage

When harvesting grass for hay or silage, cutting height is a major consideration. A closer cut means a higher yield. In one study conducted for two years (3 harvests/year) at both Marshfield and Lancaster, WI, average yields for grass hay cut with a 2" stubble were 6,900 lbs/ac/year while the fields cut with a 4" stubble yielded 5,400 lbs/ac/year. However, a shorter cutting height led to a less persistent stand. If stand persistence is important, leave an adequate stubble height of ~4". If grass will be rotated in two or three years, do not worry about stubble height.

Photo 2. *When grown and harvested for dairy rations, grasses derserve as much management attention as alfalfa (credit: Geoff Brink).*

Timing of harvest is another major consideration. The quality of grass is higher in the spring but declines more rapidly compared to subsequent cuttings when the quality is lower, but declines more slowly. Therefore, timing of the first cutting is more critical whereas timing of summer and fall cuttings can be delayed a bit if needed.

Timing of harvest also depends on the class of livestock being fed. Figures 3 and 4 show how the NDF (fiber content) increases and NDFD (digestibility of that fiber) decreases as grass plants mature. Producers should know the optimum forage NDF for the class of livestock being fed. For dairy-quality forage, harvest at boot stage in spring.

Figure 3. *Neutral Detergent Fiber (NDF) of alfalfa and grass at various stages of maturity (Brink and Casler, 2005; Brink et al., 2010).*

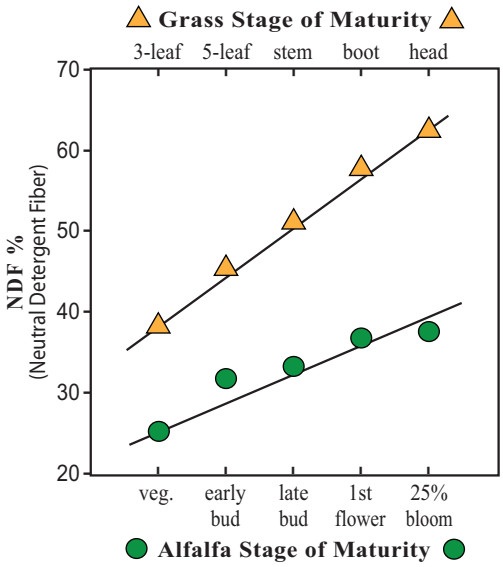
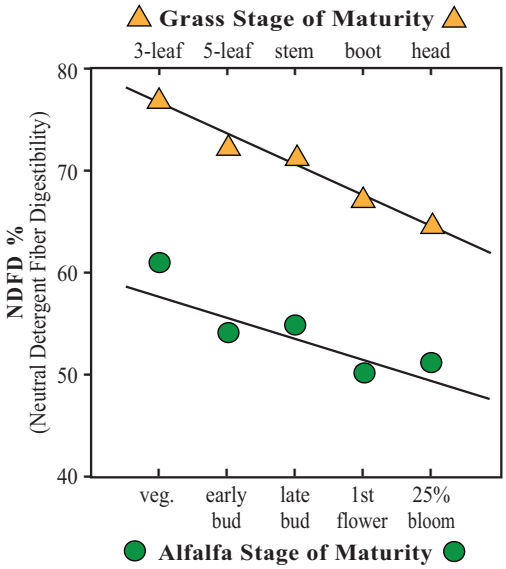


Figure 4. *Neutral Detergent Fiber Digestibility (NDFD) of alfalfa and grass at various stages of maturity (Brink and Casler, 2005; Brink et al., 2010).*



When ensiling, grasses should be put up at 60-65% moisture. Remember that grasses dry faster than alfalfa, so monitor the moisture closely. And do not judge just by the feel – a "soft" feel does not mean that it is wet (as it does with alfalfa). Compaction is critical to making both grass silage and alfalfa silage. However, at equal moisture and packing rates, the density of grass silage is generally less than alfalfa silage, so pay particular attention to packing. Silage inoculants have been shown to be beneficial with grass silage, but they are not a substitute for good management.