Grass-Legume Mixtures for Improved Yield Distribution and Sward Density

Wisconsin Grazing Lands Conservation Initiative Grant Program

Research Brief #2

It is of the utmost importance for grazing farmers to understand the growth mechanics of a pasture in order to reap its full benefits. A farmer must know how best to grow an abundance of nutritious forage in order to maintain herd health.

It was with this thought in mind that UW Madison Agronomy researcher Ken Albrecht set out to undertake this project. Discussions with a number of Wisconsin grazing farmers aided in identifying the need to evaluate alternative grasses with nitrogen or with white or kura clover for potential use in pastures. Of particular interest to most of the farmers was performance of tall fescue, meadow fescue and reed canarygrass with white or kura clover.

The main goal of the project was to quantify growth rate, seasonal distribution of yield, species composition and nutritive value of select grasses and grass-legume mixtures. The research was also meant to determine sward density of select grasses and grass-legume mixes over the growing season.

Project Description

Seven grasses (orchardgrass, tall fescue, meadow fescue, Kentucky bluegrass, reed canarygrass, smooth bromegrass, and quackgrass) were sown alone or in binary mixtures with white clover or kura clover in 2007. Solo grass was fertilized with 200 pounds (in 50 pound split applications) of nitrogen/acre/year. Soil fertility was maintained at optimum levels for pasture, based on UWEX guidelines.

Plots containing orchardgrass, tall fescue, meadow fescue and Kentucky bluegrass were defoliated every 28 days and those with reed canarygrass, smooth bromegrass, and quackgrass were cut every 35 days. Growth rates were calculated by subsamples collected on days 14, 21, and 28. Sward density was calculated on days 28 or 35 (for respective experiments) by measuring height of sward and sampled area to get yield per volume.

Dry matter yield and species composition were measured from the harvested forage on days 28 or 35. Nutritive value of forage was measured on days 28 and 35. Field data was collected in 2008-2009 and lab analysis was completed in the summer of 2010.

Trial Results

Stands of grasses and grass-clover mixtures were excellent over the 2 years of evaluation. Growth rates of nitrogen fertilized grasses ranged from 0 to 172 lb forage/acre/day, and were greater than grass-clover mixtures in early season (April and May), similar to mixtures through mid-season, and slightly lower than mixtures in September.

Tall fescue, meadow fescue and orchardgrass, with or without legumes, tended to exhibit greater growth rates than other grasses, especially in mid-summer. Total season yields of nitrogen fertilized grasses ranged from 1.7 to 4.2 tons/acre and were almost always greater than grass-clover mixtures.

Seasonal distribution of yield tended to be better with grass-clover mixtures than with solo grass. The proportion of legume in mixtures was greatest for white clover in the first year (40 to 90%) but ice sheeting damaged white clover over the 2008 winter. In the second season kura clover proportions ranged from 10 to 80% and were greater than white clover.

It was expected that including legumes in mixture with grasses would increase sward bulk density compared to solo grass, but this was not observed. The excellent grass stands with N fertilizer had equal or greater bulk density as grass-clover mixtures. Indicators of nutritive value of forage (crude protein, digestibility, neutral detergent fiber) almost always favored grass-clover mixtures over solo grass.

The future

Observed yield (both total yield and seasonal distribution of yield) of tall fescue and meadow fescue demonstrate that these grasses have potential to perform as well as or better than orchardgrass, one of the most popular grasses in Wisconsin pastures.

Addition of legumes and suspension of nitrogen fertilizer application reduces yield but improves nutritive value of forage. Thus, there is a tradeoff that has environmental and cost of farming implications.

On one side of the coin, a farmer can save money on expensive fertilizers while at the same time prevent excess nutrients from entering ground and surface water via runoff. The farmer will also benefit from a more biodiverse forage with a higher nutritive content. The other option is that a farmer can use nitrogen fertilizer on pasture and gain a higher density of forage at a reduced nutritional capacity.

Future animal performance experiments on pastures containing tall fescue or meadow fescue with or without clovers will validate the survey data collected in the current project. One of these experiments, with beef cattle, is in progress and a second, with dairy cattle, is being planned.

Tall fescue and meadow fescue seem to have great potential as base grasses in Wisconsin pastures. We have relatively little information about performance of these grasses in Wisconsin, but our current results suggest that these two grasses, especially in mixture with legumes, deserve more attention.

Figure 1. Tall fescue growing with Kura clover

Figure 2. Meadow fescue grass and seedheads

The Grazing Lands Conservation Initiative Grant Program is a partnership between the private sector GLCI Steering Committee, the USDA Natural Resources Conservation Service and the WI Department of Agriculture and Consumer Protection. This series of research briefs summarizes projects funded by this program. Our mission is to expand the use of profitable, grazing-based livestock production systems that foster environmental stewardship. This is accomplished through high quality technical assistance to owners and operators of private land, university and producer coordinated research, and educational programs. For more information on the program or on the research in this Brief, contact: **Laura Paine, Grazing and Organic Agriculture Specialist, 2811 Agriculture Drive, PO Box 8911, Madison, WI 53708-8911, (608) 224-5120, laura.paine@wi.gov**