

On-Farm Evaluation of Grasses & Alfalfa/Grass Mixtures

by Paul Peterson, Doug Holen, Dan Martens, Dave Nicolai, Jim Paulson, Betsy Wieland, Nathan Winter, and Russ Mathison, University of Minnesota

Alfalfa and corn silage are the primary forages fed to dairy cows in total mixed rations (TMRs) in Minnesota and the North Central region as a whole, largely because of their high yield and forage quality potential. Grasses have usually played a lesser role, and have been less appreciated for their capacity to contribute to farm profitability. However, during the last decade, interest in forage grasses for pasture, hay, and haylage has been increasing. Data and experience to determine when and how grasses can best benefit forage and dairy production enterprises are lacking. While grass use as pasture is certainly important for sustainable agriculture, this project addresses the agronomic and nutritional potential of grasses and grass-alfalfa mixtures as harvested forage for dairy and beef animals.

Reasons for increased interest in grasses include, among others, their digestible fiber, yield and persistence potential, and responsiveness to manure. Compared to alfalfa, grasses generally have greater total fiber content, as measured by neutral detergent fiber (NDF). Greater NDF content usually implies less intake potential by dairy cows. NDF is a key negative contributor to the Relative Feed Value (RFV) calculation, so grasses usually have lower RFV than alfalfa and thus are assumed to have less dairy feeding value. However, the NDF of grasses can have double the ruminant digestibility of that of legumes, so NDF amount tells only part of the story. Commercial labs are now routinely offering NDF digestibility (NDFD) analyses. Also, a newer forage quality index, relative forage quality (RFQ), developed to incorporate NDFD, is growing in acceptance and use.

Grasses can be grown alone, but the greatest potential is likely in mixtures with alfalfa. Alfalfa-grass mixtures are the norm in areas such as the Northeast. Well-managed grasses can yield as much, or more, as alfalfa. Also, their presence in mixture with alfalfa can improve overall forage stand persistence. Since alfalfa is currently most often grown solo on Minnesota farms, this project includes several grasses in mixtures with alfalfa vs. alfalfa alone to demonstrate and document yield, forage quality, and persistence differences and potential on farms.

PROCEDURES

Alfalfa/grass mixture trials were seeded near Hutchinson (Red Cedar Farm) on August 25, 2008, near Underwood (Wold farm) on August 29, 2008, on the UMN-St. Paul campus on September 8, 2008, and near Avon (Barg farm) on May 4, 2009. Treatments included binary mixtures of alfalfa with different perennial grasses, and alfalfa seeded alone at three different seeding rates. Three alfalfa varieties were tested: Rebound 5.0, 4S419, and Spredor 4. Rebound 5.0 is a high-yielding hay-type that has performed well in previous UMN trials; the seed was coated, so 65% pure live seed (PLS). 4S419 is a hybrid that also did well in UMN trials. Spredor 4 is a grazing-type, fall-dormant variety with some yellow-flowering ('falcata') alfalfa in its genetics. Three alfalfa varieties were used to determine if different alfalfa regrowth genetics affect compatibility with grasses, and also to increase overall robustness of results. Alfalfa seeding rates in binary mixtures for the three 2008 seedings were 10 lb PLS/ac (15 lb/ac with coating) for Rebound 5.0, and 15 lb/ac for 4S419 and Spredor 4.

Table. Forage quality parameters for 'Rebound 5.0' alfalfa/grass mixtures harvested June 11 & July 10 at Underwood, MN, in 2009. Bolded values indicate statistical similarity to the largest value within the same data column.

Mixture (1 variety/species)	June 11					July 10				
	RFQ	RFV	CP	NDF	NDFD	RFQ	RFV	CP	NDF	NDFD
A+Festulolium	228	201	19	32	59	153	141	16	42	52
A+Meadow brome	226	201	20	32	59	156	149	18	40	50
A+Meadow Fescue	205	185	18	35	57	153	140	15	43	55
A+Orchardgrass	239	213	21	31	58	153	143	17	42	51
A+Perennial Ryegrass	242	215	21	30	59	145	143	16	41	47
A+Reed Canarygrass	243	217	20	30	59	149	144	17	42	50
A+Smooth bromegrass	201	177	19	36	58	147	135	16	44	53
A+Tall Fescue	211	189	19	34	56	157	143	16	42	53
A+Timothy	199	184	17	35	55	139	133	14	45	51
Alfalfa alone	237	213	21	31	58	147	147	17	41	47
LSD (0.05)	16	14	1	2	NS	NS	NS	NS	NS	3
Overall Average	223	199	19	33	58	150	142	16	42	51

Two varieties of each of nine different grass species were also included in the trials. Grass species (and seeding rates) included smooth bromegrass (10 lb/ac), meadow bromegrass (10 lb/ac), timothy (4 lb/ac), reed canarygrass (6 lb/ac), orchardgrass (6 lb/ac), perennial ryegrass (8 lb/ac), festulolium (8 lb/ac), tall fescue (8 lb/ac), and meadow fescue (8 lb/ac) (Table). Individual plots were 3' x 20', with alfalfa and grass seeded together in 5 rows/plot. Two replications were seeded at all sites with alfalfa varieties as whole plots ("internal replications") and grass species as subplots. The two varieties of each grass species mixed with each alfalfa variety were seeded in side-by-side plots. Estimated seeding depth was 1/2"-1". Initial fertility and pH at Hutchinson and St. Paul were at optimum levels, so no amendments were added. P and K fertilizer was top-dressed after seeding at Underwood to bring levels to optimum. At Avon, pH, P, K, and OM (coarse-textured soil) were suboptimal prior to seeding; so lime, N, P, K, and S were applied and incorporated prior to seeding.

To date, two 2009 harvests have been obtained at Underwood: June 11 and July 10. The Hutchinson site has been harvested twice: May 29 and July 1. Plots were harvested to a ~4" residual using a flail harvester to determine fresh weight yields. Samples were obtained from 28 selected plots per site per harvest for DM determination and forage quality analyses. These samples were placed in paper bags, dried in a forced-air oven at 140°F for 3-5 days, and sent to the University of Wisconsin Forage Testing Lab at Marshfield for processing and analyses via the NIRS Consortium equations.

RESULTS TO DATE

Establishment data were not collected, but general observations were made. The August 2008 seeding at Hutchinson followed a fallow period, so there were some annual weeds, but not enough to appear to be of competitive significance. Temperature and moisture conditions were near-optimum for alfalfa, so alfalfa established rapidly and uniformly. In contrast, grass establishment was fair at best. Thus, at Hutchinson, initial stands are generally very alfalfa-dominant. This alfalfa dominance is believed to be due largely to weather conditions in fall 2008 and spring 2009.