## MFRP Research Report: Orchardgrass Hay Equals Alfalfa Hay as Grain Replacement in UMN-St. Paul Dairy Trial

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In a recent feeding trial with 50 UMN-St. Paul Holstein dairy cows, replacing corn and soybean meal with 10-30% orchardgrass hay resulted in similar milk production compared to replacement with alfalfa hay from 15-35% of diet DM. In addition, the orchardgrass hay had a similar rate (average 4.9%/ hour) and greater extent (79 vs. 55%) of fiber (NDF) digestion compared to the alfalfa hay.

The eight-week feeding trial was conducted with third-cutting orchardgrass hay from southwestern Wisconsin, that tested 16% CP, 33% ADF, 60% NDF and 2.4% lignin, based on weekly grab samples of chopped hay. The alfalfa hay tested 22% CP, 31% ADF, 41% NDF and 4.7% lignin. Hays were ground in a vertical mixer; five minutes for alfalfa, thirty minutes for orchardgrass.

The feeding trial had 10 treatments including alfalfa hay fed at 15, 20, 25, 30 and 35% of diet DM; vs. orchardgrass hay fed at

	Alfalfa Hay, % of Diet DM						
	15	20	25	30	35		
Corn Silage	35.0	35.0	35.0	35.0	35.0		
Alfalfa Hay <sup>1</sup>	15.0	20.0	25.0	30.0	35.0		
Corn, Ground	20.6	17.7	15.0	11.8	7.60		
Soybean Meal, 44%	6.68	4.74	2.78	0.88	0.00		
Protein/Mineral Mix <sup>2</sup>	18.0	18.0	18.0	18.0	18.0		
Molasses Mix	4.00	4.00	4.00	4.00	4.00		
Calcium Carbonate	0.56	0.34	0.00	0.00	0.00		
Monocalcium Phosphate	0.16	0.20	0.24	0.30	0.40		

<sup>1</sup>*Alfalfa hay ground using a vertical mixer prior to feeding.* 

<sup>2</sup>Protein/mineral mix composition (air dry basis) = 30.0% soybean hulls, 30.0% soypass, 18.4% corn distillers grains, 5.0% bloodmeal, 7.5% energy booster and 8.9% minerals/additives.

10, 15, 20, 25 and 30% of diet DM. These variable hay types/amounts replaced corn grain and soybean meal in TMRs that included 35% corn silage. Diet specifics are in Tables 1 and 2. For alfalfa-based TMRs, ground corn was decreased from 21 to 8%, and soybean meal decreased from 7 to 0%, as hay inclusion increased from 15 to 35% of diet DM. For orchardgrass-based TMRs, ground corn was decreased from 21 to 6%, and soybean meal decreased from 10 to 6%, as hay inclusion increased from 10 to 30% of diet DM. The TMR-treatment diets were fed once daily.

The 48-hour NDF digestibilities (NDFD) of the hays (measured in vitro via 'wet chemistry') were 71% for orchardgrass and 52% for alfalfa. Dry matter intake of the orchardgrass- vs. alfalfa-based TMRs behaved similarly, decreasing ~0.8 lb/cow/day as hay inclusion rate increased from 10 to 35% of diet DM. Milk production (3.5% fat-corrected) behaved similarly, decreasing ~0.6 lb/cow/day as hay DM increased from 10 (98 lbs 3.5%-FCM/day) to 35% (82 lbs 3.5%-FCM/day) of the diet.

	Orchardgrass Hay, % of Diet DM						
	10	15	20	25	30		
Corn Silage	35.0	35.0	35.0	35.0	35.0		
Orchardgrass Hay <sup>1</sup>	10.0	15.0	20.0	25.0	30.0		
Corn, Ground	21.5	17.7	13.8	10.1	6.06		
Soybean Meal, 44%	10.3	9.24	8.18	7.06	6.00		
Protein/Mineral Mix <sup>2</sup>	18.0	18.0	18.0	18.0	18.0		
Molasses Mix	4.00	4.00	4.00	4.00	4.00		
Calcium Carbonate	1.14	1.10	1.06	0.84	0.94		

 Table 2. Ingredient composition of orchardgrass diets.

<sup>1</sup>Orchardgrass hay ground using a vertical mixer prior to feeding.

<sup>2</sup>Protein/mineral mix composition (air dry basis) = 30.0% soybean hulls, 30.0% soypass, 18.4% corn distillers grains, 5.0% bloodmeal, 7.5% energy booster and 8.9% minerals/additives.

Acknowledgements: The authors are grateful to MFA and the U.S. Dairy Forage Research Center for their financial support of this research. A striking difference between the hays was the relationship between milk production and diet NDF concentration. For the orchardgrass-based TMRs, milk production declined ~1 lb/cow/day as total-diet NDF increased from 30 to 40% with increased hay inclusion. For the alfalfa-based TMRs, milk production declined ~2.7 lbs/cow/day as total-diet NDF increased from 29 to 36% with increased hay inclusion. Note, however, that alfalfa's greater rate of decline in milk production was due largely to substantially lower production at 35% alfalfa vs. all lesser levels.

Milk composition and body weight were unaffected by hay type and amount; averaging 3.8% milk fat, 3.0% milk protein, 4.7% milk lactose, 6.9 lbs body-weight change, and 1.9 feedefficiency. In conclusion, in this eight-week study with one orchardgrass and one alfalfa hay lot fed to Holstein dairy cows, grass and alfalfa hay had similar replacement values for corn grain and soybean meal. These results support previous research indicating that good-quality grass forage is a viable dairy-cow feed.