NUTRIENT VALUES FOR HARVESTED FORAGES FROM NORTHEASTERN KANSAS

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Summary

Forage testing is an important management tool available to cattle producers. Hay samples (n=42) from Shawnee, Douglas, and Osage counties of various forages (mostly alfalfa, brome hay, and prairie hay) recently were analyzed for nutrient composition. Results indicate that variability in crude protein and fiber (ADF and NDF) content exists. Alfalfa samples possessed crude protein content greater than reported values, whereas prairie samples were close to National Research Council reported values. In contrast, brome hay samples often had less crude protein than their NRC book values. Single samples of other forage types revealed that nutrient profiles of alternative forages could be successfully integrated into cattle feeding programs. These results strongly support the continued need for producers to practice forage sampling to optimize cattle feeding costs.

Introduction

Forages harvested in Kansas are the primary ingredients used in winter cow diets. Many factors affect the nutrient value of mechanically harvested forages, such as variety, plant maturity, weather, harvesting techniques, fertilization, and storage. Often, producers rely on nutrient values reported in nutritional publications (like the NRC) instead of using forage testing to formulate diets. Reported values have significant usefulness, but, because of the differences between operations in forage quality, forage testing allows producers to more accurately formulate diets to meet their particular needs. Therefore, our objective was to report differences in key nutrient concentrations in mechanically harvested hay samples from northeastern Kansas.

Procedures

Hay samples (n = 42 from 25 different operations located in Shawnee, Douglas, and Osage counties) were taken from round bales stored outside from harvest to early October. Hay samples were collected by inserting a hay probe perpendicular to the side of the bale. Samples were immediately placed into plastic bags and later analyzed for dry matter, nitrogen, acid detergent fiber (ADF), and neutral detergent fiber (NDF) at the Analytical Laboratory, K-State Department of Animal Sciences and Industry. Crude protein was assumed to equal the nitrogen content times 6.25. Total digestible nutrients (TDN) were calculated from ADF values. Reported nutrient values were taken from the NRC 2000 publication, The Nutrient Requirements of Beef Cattle.

Results and Discussion

Nutrient compositions of forage samples are listed in Tables 1 and 2. Table 1 contains data from alfalfa, brome, and prairie samples. Enough samples were collected within each of these forage types to calculate means and standard deviations. Other forage types had only one or two samples, so only the individual sample values are reported.

Many producers increase the protein content of cattle diets by feeding alfalfa hay. The average alfalfa hay sample tested contained

5.5% more crude protein than listed in the NRC. This would indicate that producers would be able to reduce the use of alfalfa hay if they perform forage testing instead of relying strictly on reported book values. The wide range (more than 10%) and large standard deviations of crude protein concentrations indicates the necessity of forage testing to correctly formulate cattle diets. Further statistical analysis indicated that harvesting sequence (cuttings) also had an effect on crude protein content. Crude protein content increased as cuttings progressed from first to fifth cuttings (see Table 3). Measurements of fiber, both NDF and ADF, and energy (total digestible nutrients, TDN) follow similar patterns as producers harvested alfalfa throughout the growing season. Fiber values decreased and energy content increased as the alfalfa crop advanced through the harvesting sequence. Relative feed value (RFV) of the alfalfa hay increased from first to fifth cutting. Crude protein and RFV are often used to evaluate alfalfa hay, so hay producers should give particular attention to these measures.

Results from brome hay samples reflect the difficult haying conditions experienced by many of the producers this past year. Lower crude protein concentrations, along with greater NDF (fiber) contents (compared with reported book values), reveal that producers may have either delayed baling until the brome grass was mature, left the hay in windrows longer than anticipated, or both. The percentage of TDN in the harvested brome grass bales was nearly the same as reported NRC values. It is common for cow/calf producers to use brome hay with minimal protein supplementation when feeding cows in mid and late gestation. This year's results indicate that some producers should consider small amounts of protein supplementation (up to 0.5 lb of crude protein) to satisfy gestating, dry cow requirements.

Average prairie hay samples contained crude protein concentrations almost identical to reported book values. Reduced NDF and greater calculated TDN contents indicate that producers harvested an excellent grass crop in 2004. The range in contents of crude protein, fiber, and energy shows that, for the most part, the prairie hay is not only high quality but also consistent in its nutrient profile.

Complements of other forages were included for analysis (Table 2). In most instances, there was no replication within these grass/forage species, so only limited information can be garnered. Collective results show that cattle producers can utilize a wide array of forage sources to satisfy their herds' dietary needs. Forage intake increases as the protein content of forage approaches 7%. Almost all samples analyzed, with the exception of wheat straw, had crude protein contents at or exceeding 7%, indicating they would require little protein supplement for most gestating, dry-cow feeding situations.

Table 1. Nutrient Composition of Alfalfa, Brome Grass, and Prairie Hay Samples (Dry Matter Basis)

	Reported Value[a]	Mean	Standard Deviation	Minimum	Maximum
Alfalfa (15 samples)	---------- % of dry matter ----------				
Dry matter	91.0	86.7	2.0	83.3	90.2
Crude protein	17.0	22.7	3.4	16.4	27.5
NDF	49.0	42.0	6.7	30.3	52.5
ADF		31.6	5.1	23.5	39.8
TDN[b]	60.0	64.3	4.0	57.9	70.6
Brome hay (11 samples)					
Dry matter	91.0	88.0	1.5	84.3	90.3
Crude protein	10.0	8.0	1.7	5.7	12.2
NDF	57.7	67.1	1.6	65.2	69.5
ADF		41.8	1.2	40.5	44.7
TDN[b]	56.0	56.3	0.9	54.1	57.3
Prairie hay (10 samples)					
Dry matter	91.0	89.3	1.5	86.4	91.7
Crude protein	5.3	5.6	1.0	4.2	7.3
NDF	72.7	67.6	1.9	64.3	70.7
ADF		42.4	1.1	40.9	44.1
TDN[b]	48.0	55.9	0.9	54.5	57.0

[a]Reported value as listed in NRC, 2000 (Alfalfa Hay = Mid-Bloom N; Brome Hay, Late bloom; Prairie Hay).
[b]Total digestible nutrients was calculated as TDN% = 88.9 – (0.779 × ADF%).

Table 2. Nutrient Composition of Harvested Forage Samples (Dry Matter Basis)

Forage	No. Samples	Dry Matter	Crude Protein	NDF	ADF	TDN
		---------- % of dry matter ----------				
Crabgrass	1	83.3	9.4	67.0	44.3	75.5
Fescue	2	86.9	7.2	70.6	45.7	53.3
Weeds[a]	1	91.2	10.3	60.1	45.3	53.6
Straw	1	89.9	5.5	73.6	48.2	51.4
Wheat	1	87.9	12.7	52.5	37.5	59.7

[a]Sample contained an unidentified mixture of broadleaf and grass species grown in an abandoned beef cattle confinement pen.

Table 3. Nutrient Composition (Dry Matter Basis) of Alfalfa Hay Samples

Cutting	No. Samples	Dry Matter	Crude Protein	NDF	ADF	TDN	RFV[a]
		---------- % of dry matter ----------					
First	2	87.8	18.3[b]	48.9[b]	38.5[b]	58.9[b]	112[b]
Second	7	86.9	22.6[bc]	43.7[b]	32.6[bc]	63.4[bc]	139[b]
Third	1	88.5	20.1[b]	43.8[b]	33.0[bc]	63.2[bc]	134[b]
Fourth	3	86.0	24.9[c]	39.6[bc]	29.0[c]	66.3[c]	157[cd]
Fifth	2	85.2	26.1[c]	31.8[c]	24.7[c]	69.7[c]	204[d]

[a]RFV is an index that combines estimated digestibility and potential intake of a forage calculated from ADF and NDF fractions, respectively.
[bcd]Means in a column without a common letter differ, $P<0.05$.