Quality of Iowa Forages for Beef Cows

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Summary and Implications

Production systems have many options to meet a cow's nutritional needs. Harvested hay and other forages, stockpiled pasture, and summer pastures were sampled and tested to determine nutritional content. While the average forage test results were adequate for beef cow needs, all classes of forages had a wide range in both crude protein and digestibility, supporting the need for forage analysis in ration development. The variability in forage test results emphasize the need to balance rations to determine appropriate supplementation needed to meet cow requirements at the various stages of production.

Introduction

Iowa has a competitive advantage in livestock production thanks to the low cost of the state's available feed resources. Beef cow operations need to use that competitive advantage through both grazing and harvested feeds to compete. Determining the nutrient quality of available feedstuffs and how to best utilize the feed in meeting the cow's requirements at different production stages is the key to managing feed cost. The objective of this project was to analyze the nutrient value of common Iowa feedstuffs and pastures utilized by Iowa beef cow herds.

Materials and Methods

Throughout the project, stored forage and pasture samples were collected from the cooperators and a feed analysis was completed at Dairyland Laboratories in Arcadia, Wisconsin, using NIR-NDF 48 hour digestibility (Near Infrared Testing plus Neutral Detergent Fiber digestion). This test provided a more thorough analysis compared to the basic NIR test. The Ohio Agricultural Research and Development Center (OARDC) energy calculations used in this analysis are similar to those developed in 2001 by the Nutrient Research Council (NRC) for dairy cattle. Both calculations use a summative approach by assigning digestibility and energy values to adjusted crude protein (CP), neutral detergent fiber (NDF), fat, and ash. Both the OARDC and NRC utilize the relationship between lignin and NDF to determine NDF digestibility. The number of samples and analysis are shown in Table 1. This variation in nutrient content of forages supports the importance of feed testing for proper ration development.

Results and Discussion

Hay quality: The hay samples collected reflect the considerable range in quality previously observed in Iowa beef cow feeds based on prior hay testing projects conducted by the Iowa Beef Center in 1994-95 and 2010-11, and reported in the Iowa State University Animal Industry Reports.

The range in quality of Iowa cool season grass and grass-legume hay is due primarily to the type and percentage of forages in the mix and maturity at harvest. Conservation Reserve Program (CRP) acres are often harvested for emergency hay in drought years or as part of routine CRP haying. These acres are harvested after the nesting season in late summer and are much more mature than hay harvested earlier in the summer. Waterway hay is also quite variable depending on the stage of maturity when harvested. Many cool season grass hayfields also are harvested late resulting in reduced quality.

The 84 hay samples were grouped into a high quality third and a low quality third based on nutrient values. Table 2 compares the average along with the high and low third values. While these protein levels would be adequate for mature gestating beef cows in the last trimester, additional protein supplementation would likely be required for the lower quality third and some samples within the middle third for lactating cows. Likewise, developing heifers would require additional protein supplementation for the bottom half of the hay sampled in this project.

The energy levels expressed as Total Digestible Nutrients (TDN) as calculated in the forage analysis, demonstrated an even larger variation (Table 2). The higher quality hays would be adequate for beef cow requirements in all stages of production, while the lower quality hays would not meet the requirements for mature pregnant or lactating cows. The average energy level would be marginally adequate for pregnant cows in good condition, but would not meet requirements for higher milk or thinner cows, and would be inadequate for lactating cows.

Silage quality: Different types of silage are important ingredients in beef cow diets. Forty-three silage samples were collected from project cooperators and included baleage, corn silage, small grain silage, and haylage. Dry matter, adjusted crude protein and energy expressed as total digestible nutrients (TDN) are presented in Table 1.

The energy and protein values in the corn silage samples were lower than standard reference values. Adjusted crude protein of corn silage samples averaged 6.2 percent, with TDN at 69.9 percent. The dry matter

(DM) average of corn silage samples was 40.6 percent, which is a sound level for proper fermentation.

Net energy values were summarized to allow for comparison to other Iowa data. Cooperator corn silage nutrient analysis are quite similar to data collected in a statewide corn silage survey completed in 2016 and 2017 by ISU Extension and Outreach beef specialists, which also demonstrated the wide range in dry matter percentage and nutrient values. The study showed averages of 43.26 percent dry matter, 6.72 percent adjusted crude protein, and 71.55 percent TDN.

This variation in nutrient content of corn silage and hay samples supports the importance of feed testing for proper ration development.

Stockpiled grass quality: Many producers with extended grazing and traditional systems utilize fall saved or stockpiled pastures. Thirty-three fresh stockpiled grass samples were tested for forage quality. The nutrient values of average, low third, and high third grass samples are shown in Table 2. As shown in Iowa extended grazing research, stockpiled grass quality is adequate in crude protein for pregnant beef cows. Energy can be limiting in late pregnancy so supplementation may be needed.

Most of the southern Iowa extended grazers were grazing endophyte infected tall fescue based pastures, which could have high enough ergovaline levels to affect the cattle. Alkaloid levels were detected in stockpiled pastures on three cooperator farms sampled in this project in 2017. Levels ranged from 151-883 parts per billion (ppb) ergovaline, which were high for winter stockpiled grass. This variation was due in part to the maturity of the stockpiled grass. These herds have little trouble grazing stockpiled fescue with adapted pregnant cows with little supplementation, but have adopted different management with more feed substitution for cows with calves at their side, and on pregnant first and second calf cows.

Stockpiling recommendations for quality suggest fall growth of 75-100 days to get optimum quality and adequate forage volume.

Summer pasture quality: With less available pasture acres, many producers have utilized management intensive grazing or other rotational grazing methods to improve forage quality, increase stocking rates, and extend the grazing season. Forage analysis on 48 fresh pasture samples found high quality feed in many pastures. As expected the quality deceases as grass matures later in the season, but in many cases grazing management kept the grass vegetative.

Protein was adequate for most classes of cattle, but energy was marginal in the lower quality cool season grass pastures. Results are similar to a summary of 495 samples collected for Iowa State projects (Strohbehn et. al., 2004a) between 1994 and 2002, which found that research pastures with adequate forage supplied sufficient protein (113-220 percent of requirements) and sufficient energy in most months (87-118 percent) to maintain a 1,400 pound beef cow during lactation. While sampling pasture gives us a snapshot of what is available for the cattle, grazing selectivity often results in cattle consuming higher quality feed than predicted. Research has shown that cattle tend to select forages that are 18-30 percent greater in crude protein and three percent greater in digestible dry matter than pasture clippings would indicate. With this grazing selectivity, even the low quality pastures should support the nutrient requirements of a lactating cow.

Table 1. Nutrient analysis of feedstuffs and pasture[1]

Feed Class (samples)	DM, %	Adj. CP	TDN, %	NEm[2]	NEg[2]	NDF	ADF	NFC, %	Lignin	SP[3], %
Hay (84)	84.5	12.1	54.7	52.2	27.1	58.7	41.4	22.1	7.4	27.8
Corn silage (13)	40.6	6.2	69.9	72.1	44.8	38.9	26	48.2	4	50.9
Small grain silage (9)	33.1	9.2	50.1	45.5	23.6	60.8	42.1	21	6.2	51.7
Baleage (12)	46.1	12.6	56.1	55.1	29.4	54.4	38.6	24.8	6.6	47.5
Haylage (9)	42.5	12.5	54.5	53.1	27.6	57.6	41.1	21.7	7.5	34.9
Stockpile (33)	38.9	14.5	60.6	62.4	36	55.1	35.4	24.2	5.9	35.6
Summer pasture (49)	28	17.7	61.9	65.4	32.8	51.4	34.7	22.6	5.8	31.2

[1]Nutrients provided on DM basis
[2]Nutrient provided in Mcal/cwt
[3]Soluble protein

Table 2. Crude protein and TDN analysis of sampled forages expressed as average of all samples, average of low third samples, and average of high third samples, %DM

	Crude protein			TDN, OARDC		
Feed class (samples)	Average	Low third	High third	Average	Low third	High third
Hay (84)	12.2	9.8	15.4	54.7	47.5	60.8
Stockpile (33)	14.5	10.4	17.9	60.6	52.4	67.2
Summer pasture (49)	17.7	14.0	21.7	61.9	55.9	67.3

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