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Abstract
Native grass hay meadows in three Kansas Flint Hills counties were sampled at 2-week intervals during the growing season to determine the effect of harvest date on forage quality. Each sample was analyzed for crude protein (CP), acid detergent fiber (ADF), and phosphorus (PHOS). CP and PHOS contents declined, and ADF increased as harvest date progressed into the growing season. Both CP and ADF were related highly to harvest date. PHOS content was associated only moderately with harvest date. Harvest date of native grass hay can significantly influence supplemental protein needs for beef cows.

Keywords
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EFFECT OF DATE OF HARVEST ON THE NUTRITIONAL QUALITY OF NATIVE GRASS HAY

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Summary

Native grass hay meadows in three Kansas Flint Hills counties were sampled at 2-week intervals during the growing season to determine the effect of harvest date on forage quality. Each sample was analyzed for crude protein (CP), acid detergent fiber (ADF), and phosphorus (PHOS). CP and PHOS contents declined, and ADF increased as harvest date progressed into the growing season. Both CP and ADF were related highly to harvest date. PHOS content was associated only moderately with harvest date. Harvest date of native grass hay can significantly influence supplemental protein needs for beef cows.

(Key Words: Native Grass, Hay, Forage Quality, Cows.)

Introduction

Native grass hay serves as an important roughage source for wintering beef cattle in Kansas. Harvest date is the most important management factor for native grass hay meadows, because it has a major impact on dry matter (DM) yield, forage quality, and plant vigor in the following year. Native hay harvest in the Flint Hills region normally occurs in mid-July, although it can take place from late June through September.

Because forage quality declines and DM yield per acre increases with advancing plant maturity, the optimum harvest date for native grass hay involves a compromise between yield (tons/acre) and forage quality. Additionally, sufficient time must be permitted for perennial, warm-season grasses to replenish their root carbohydrate reserves prior to winter dormancy.

Our objective was to document and develop prediction equations for the rate of decline in nutritional value of grass hay harvested at progressively later dates throughout the growing season.

Experimental Procedures

Native grass hay meadows in Butler, Cowley, and Marion counties were used in this study. Meadows consisted of mixed species of perennial, warm-season grasses and forbs that are dominant in the Flint Hills region of Kansas.

A 35 ft. long by 3 ft. wide plot was established at each county location. Within each plot, 12 blocks corresponding to harvest date were established. A 30-in.×30-in. sample was hand-clipped from the center of each block leaving a 4-in. stubble height. Samples were harvested from each block at 2-week intervals beginning on June 3, 1997 and concluding on November 4, 1997.

[2]County Extension Agricultural Agents in Cowley, Butler, and Marion Counties, respectively.

Immediately after clipping, forage samples were sealed in an airtight bag and submitted to a commercial forage testing laboratory for chemical analysis. Samples for each harvest date were analyzed for DM, crude protein (CP), acid detergent fiber (ADF), and phosphorus (PHOS) contents and regression equations were developed to describe their relationship with harvest date. Julian calendar date (JCD) was included as the independent variable (June 3 = day 155, November 4 = day 309). Feed costs were estimated for lactating beef cows consuming native grass hay of various CP content.

Results and Discussion

Individual county data were pooled into one overall regression equation for each indicator of forage quality evaluated. Harvest date accounted for the majority of the variation for CP (R^2 =.89) and ADF (R^2 = .81). As anticipated, CP content declined with advancing maturity throughout the growing season (Figure 1), where % CP = 30.13 - (.1753 x JCD)+(.00029 x JCD^2). Conversely, ADF content increased by 1 percentage unit every 12 days (% ADF = 21.75 + .0836x JCD) within the window of the sampling period (Figure 2). Harvest date was less effective for predicting PHOS content (R^2 = .36) (Figure 3). However, the PHOS content of the native grass hay sampled in this study did tend to decline with advancing maturity and ranged from .18 to .05% (% PHOS = .1822 - [.00036xJCD]).

The CP content of the base forage influences the amount of supplemental protein needed to meet nutritional requirements. Therefore, beef cows or stockers that consume forages harvested beyond the optimum date will require more supplemental protein to attain requirements. Table 1 illustrates the influence of harvest date and CP content of native hay on the supplemental protein requirements for a 1,100 lb lactating beef cow. In this example, cows consuming 4.0% CP native grass hay would require an additional .88 lb of supplemental protein at an added cost of $.30/day, compared to cows consuming 8.0% CP hay. Represented another way, there is an approximate cost savings of $4.43 per cow per percentage unit improvement in CP from 4.0 to 8.0% in the native grass hay. Based on the results of this study, native hay meadows should be harvested by mid-July in order to optimize forage quality, while allowing adequate time for range grasses to replenish root carbohydrate reserves prior to fall dormancy.

Table 1. Influence of Harvest Date and Crude Protein Content of Native Grass Hay on Supplemental Protein Cost'

Harvest Date	%CP Content of Native Grass Hay	Pounds of Supplemental CP Required[2]	Cost/day of Supplemental CP Source[3]	Total Supplement Cost[4]
7/1	8.0	.84	$.27	$15.93
7/15	7.0	1.06	.35	20.65
7/29	6.0	1.28	.42	24.78
8/26	5.0	1.50	.49	28.91
9/23	4.0	1.72	.57	33.63

[1]CP requirements for 1,100 lb mature, lactating beef cow of superior milk production (20 lb/day), 3-4 months postpartum=2.6 lb CP/day.
[2]After accounting for CP content in native grass hay; assuming dry matter intake=22 lb/day
[3]38% commercial protein cube ($250/ton).
[4]For the postcalving period February 15 to April 15 (59 days).

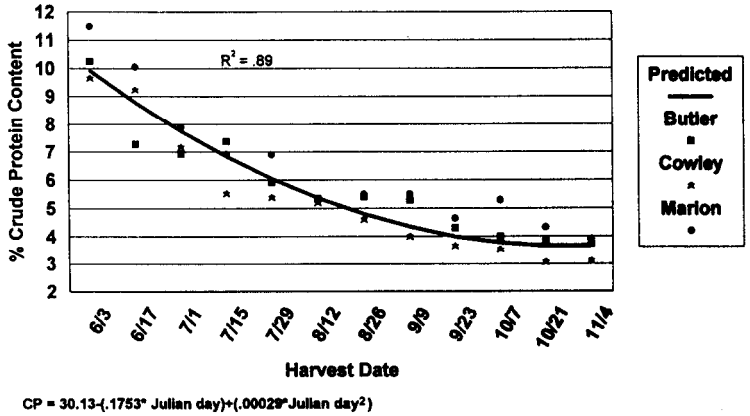

Figure 1. Crude Protein Content of Native Grass Hay.

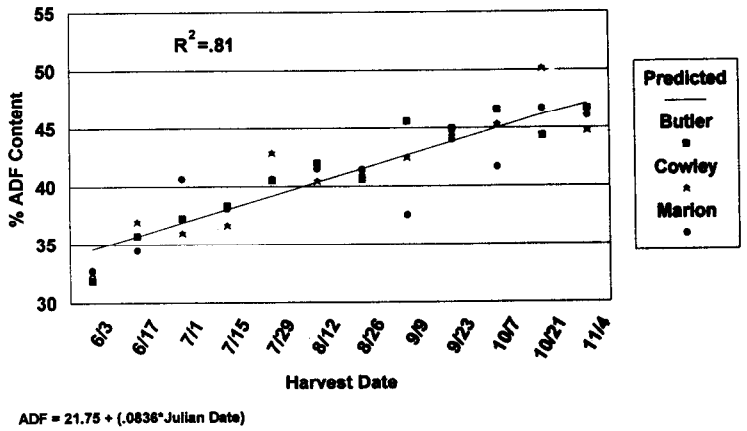

Figure 2. Acid Detergent Fiber Content of Native Grass Hay.

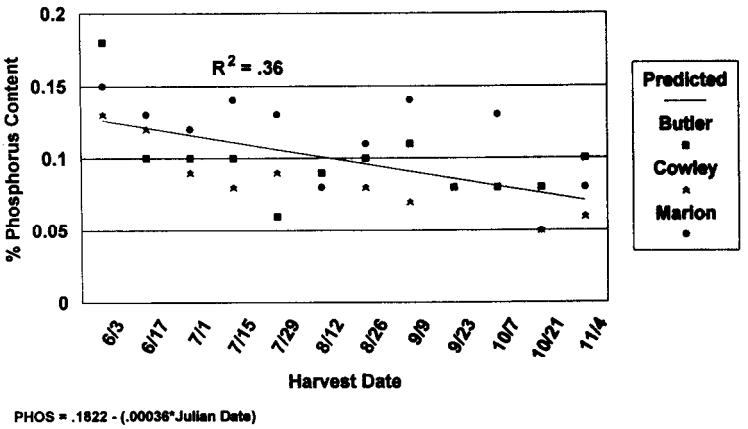

Figure 3. Phosphorus Content of Native Grass Hay.