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CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Nutrient Composition of Grazed Forage and Intake by Beef Steers Grazing Native Rangeland at the Clayton Livestock Research Center

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Cow-calf and stocker production systems in New Mexico depend almost entirely on the native rangeland resource. Beef cattle producers often make management decisions (i.e., supplementation, stocking rate) that depend on an estimate of the nutritional value of rangeland forage. Unfortunately, very little information is available to producers relative to nutrient content of such forage. From 1985 to 1988, several experiments were conducted at the Clayton Livestock Research Center with beef cattle grazing native rangeland; the focus of these experiments was to obtain estimates of forage intake and grazed forage nutrient content.

In each of the four experiments from which data in Tables 1 and 2 were obtained, mature beef steers fitted with esophageal cannulas were used to collect samples of grazed forage. This method of collection provides the best available estimate of forage composition because it allows the animal to select various plants and plant parts; selective grazing cannot be modelled or duplicated effectively by clipping. After collection, samples were freeze dried and ground in preparation for analysis of nutrient composition. In the two experiments for which forage intake data are reported (Table 1, 1985), beef steers fitted with ruminal cannulas grazed the same pasture from which forage samples were collected. Fecal output was estimated with chromic oxide as an inert marker, and organic matter (OM) intake was estimated from the ratio of fecal output and forage indigestibility (determined by in vitro digestion techniques with ruminal fluid taken from the steers). All experiments were conducted in pastures on or adjacent to the Research Center. Precipitation was recorded for either a 3-week period before forage collection (Table 1) or for the month in which the collection occurred (Table 2).

In 1985, forage collection and intake measurements began in mid-June. Based on botanical composition estimates (Table 1) determined from esophageal samples, about 34% of forage species selected by the steers in June (6/2 to 7/3) were broad-leafed annuals (forbs). As the grazing season progressed (7/21 to 9/5), major plant species selected (90%) were warm season grasses (mostly blue grama); however, from late September through November (9/19 to 11/27) proportion of forbs in the diet increased, averaging 22%. Previous studies at the New Mexico State University ranch at Fort Stanton also demonstrated shifts in cattle diets from forbs and cool-season grasses to warm-season grasses and vice versa, indicating the importance of forbs in the nutrition of cattle grazing native rangelands.

Forage nutrient composition in 1985 (Table 1), especially crude protein (CP), appeared to be related to precipitation patterns. Available CP values represent an attempt to measure that part of the total CP that is not bound in an unusable form; hence, these values may more accurately represent protein supply to the grazing animal than total CP does. Total CP content varied from 13.1% in mid-September to 7.1% during drought-induced summer dormancy in late July. Beef cows (1,000 lb) of average milking ability that consume 2% of their body weight (BW) in forage/day require 9.6% CP in their diet, while medium-frame steer calves (600 lb) gaining 1.5 lb/day with an intake of 2.5% of BW require 9.8% CP (NRC, 1984).

Fiber constituents of grazed forage (NDF, ADF, ADL; Table 1) varied with sampling periods; these fiber techniques measure various components of the plant cell wall (NDF = cellulose, hemicellulose and lignin; ADF = cellulose and lignin; ADL = lignin). Fiber content usually increases as a single forage matures, but changes in fiber (especially NDF) content of grazed forage samples from native rangeland often reflect selection of various plant species as the season progresses more than changes in maturity of one particular plant.

In vitro organic matter digestion (IVOMD) was measured only from June to late August, 1985 (Table 1); this value represents an estimate of forage digestibility. In 1985, forage IVOMD did not vary greatly across time, except for a slightly lesser digestibility during the initial stages of drought-induced summer dormancy (6/22 to 7/3).

Despite changes in forage composition across season, forage OM intake did not differ greatly among sampling periods (Table 1). Intake averaged about 2.5% of BW, with the exception of November, when intake fell below 2% of BW. Forage intake can be multiplied by forage nutrient composition and compared with published nutrient requirements of beef cattle (NRC, 1984) to determine if certain nutrients are deficient; such comparisons can be used by beef cattle producers to determine type and amount of supplemental nutrients needed.

Forage nutrient composition data in Table 2 illustrate the extent of year-to-year variation that occurs in grazed forage composition. Forage CP content was low (6.1 to 8.6%) in 1987 samples, but was similar to 1985 values for the two samples collected in 1988. Composition changes probably reflect rainfall that occurred before sample collection.

Present data should be considered as initial observations on the nutrient composition of native rangeland forage in northeastern New Mexico. Collection of further data should provide beef cattle producers in the region with a greater understanding of the nutritional quality of the available forage resource.

References

NRC. 1984. Nutrient requirements of beef cattle. (6th Ed.) National Academy Press, Washington, DC.

Table 1. Dietary chemical composition, precipitation and forage intake by beef steers grazing native rangeland at the Clayton Livestock Research Center in 1985

Item	Date						
	6/2-6/13	6/22-7/3	7/21-8/1	8/25-9/5	9/19-9/29	10/20-10/30	11/17-11/27
Botanical composition, %							
Grasses	63.8	69.3	85.0	95.3	74.5	88.8	71.0
Forbs	36.2	30.7	15.0	4.7	25.5	11.2	29.0
Forage composition, %[a]							
CP	11.6	8.1	7.1	11.1	13.1	9.4	11.3
Available CP	10.0	6.9	5.9	9.9	11.9	7.5	9.4
NDF	68.1	79.8	78.9	79.3	68.3	82.6	77.1
ADF	39.4	41.8	41.5	43.6	38.1	41.8	40.9
ADL	5.8	5.1	5.5	6.7	5.7	5.0	5.5
IVOMD	63.6	57.5	63.0	64.9	-	-	-
Precipitation, in[b]	1.7	1.9	.4	2.6	4.2	3.2	.3
Intake[c]							
No. of steers	6	6	6	6	2	2	2
Steer BW, lb	512	548	599	653	659	812	708
OM intake, % of BW	2.5	2.7	2.6	2.7	2.5	2.6	1.9

[a]Percentage of organic matter. CP = crude protein, NDF = neutral detergent fiber, ADF = acid detergent fiber, ADL = acid detergent lignin and IVOMD = in vitro organic matter digestibility.
[b]Precipitation was recorded for a 21-day period before forage collection and intake measurements.
[c]OM = organic matter.

Table 2. Chemical composition of forage selected by beef steers grazing native rangeland at the Clayton Livestock Research Center in 1987 and 1988

Item[a]	1987				1988	
	6/6-6/18	7/5-7/17	8/2-8/14	9/24-10/5	7/11-7/19	8/1-8/9
CP, %	7.6	6.1	6.9	8.6	11.6	9.3
Available CP, %	6.3	4.8	5.6	7.3	10.3	7.8
NDF, %	74.9	78.6	79.0	74.5	78.7	83.0
ADF, %	46.7	51.9	51.9	51.6	41.1	42.0
ADL, %	6.2	6.9	7.1	9.2	4.8	5.5
Precipitation, in	2.8	.8	4.8	1.3	1.7	1.8

[a]See Table 1 for definition of abbreviations.
[b]Precipitation was recorded for the entire month during which forage as collected.

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