Forage Intake By Cattle Grazing Wiregrass Range[1]

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In the South, range herds that are not given feed supplements usually lose weight during a part of the year, even though ample amounts of wiregrass forage are available. Whether or not nutritive value, intake of forage, or both, are limiting factors has not been demonstrated. This paper reports a test designed to answer the question.

The degree to which nutritive value, intake of forage, or both, contribute to cattle performance cannot be measured directly. Established procedures are available for determining chemical composition and digestibility of wiregrass forage (Halls et al., 1957). Indirect methods employing an index substance provide an opportunity for estimating intake (Kane et al., 1950). Animal nutritionists have shown that if a completely indigestible index material such as chromic oxide is incorporated in the diet, the amount of feed from which the feces was derived can be calculated (Schürch et al., 1950). This method avoids the necessity of total measures on either food intake or feces output.

Accordingly, the study reported here was undertaken to estimate daily intake of native forage by cattle grazing wiregrass-pine range using chromic oxide as the index material. In addition to intake, chemical analyses and digestibility coefficients of the cattle diet and weight changes by the test cows were obtained.

Materials and Methods

Tests were conducted in April, June, September, and December 1956, in the wiregrass-pine grazing type of range (Williams et al., 1955) at the Georgia Coastal Plain Experiment Station's Alapaha Experimental Range in south Georgia. Principal forage species were pineland threeawn *(Aristida stricta)*, Curtiss dropseed *(Sporobolus curtessii)*, bluestems *(Andropogon* spp.), carpetgrass *(Axonopus affinis)*, panicums *(Panicum* ssp.), and paspalums *(Paspalum* spp.). In previous digestibility trials at Alapaha (Halls et al., 1957), these grasses comprised the bulk of the cattle diet.

Five mature grade Hereford and Brahman-Hereford cows with calves grazed a single range unit from March 15 through December 1956. Ample forage was available throughout the year on range burned over in January 1956. Cows had continuous access to a complete mineral mixture. From October 15 to December 31, cows were fed 2 pounds cottonseed meal per head daily, expect for the period December 8 to December 22. Calves were weaned October 16.

For each test, chromic oxide was placed in a large gelatin capsule and given orally during a 14-day period. One capsule containing 7.5 grams of the index substance was given each cow daily about 6:00 a.m. and another about 6:00 p.m.

Herbage samples approximat-

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[1] *Cooperative investigations of the Animal Husbandry Research Division, Agricultural Research Service, U. S. Department of Agriculture; the Forest Service, U. S. Department of Agriculture; and the University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Experiment Station, Tifton, Georgia. Published with the approval of the Director as Journal Series Paper No. 89.*

FIGURE 1. Gentle cows enabled close observation of exact kind and portion of plant eaten.

ing the cattle diet were obtained on the 11th and 12th days of each trial in accordance with procedures devised by Halls (1954). Two collectors, working separately, followed the cows and sampled the forage on separate days. Gentle cattle enabled close observation and selection of plant portions actually grazed (Figure 1). Collections were composited and dried for 24 hours at 70° C.

Fecal samples were taken on 2 successive days beginning on the second day of the forage collection period. A small portion of feces from each cow was taken when grazing began in the morning and again in the afternoon. All samples were composited, oven dried at 70° C., ground, and stored in airtight jars at room temperature.

Plant and fecal samples were analyzed for ash, crude protein, and ether extract as outlined by the Association of Official Agricultural Chemists (1950). Lignin was determined by the method suggested by Davis and Miller (1939), and percent of carbohydrates other than lignin was obtained by difference. Chromic oxide content of feces was determined by the method of Dansky and Hill (1952). The lignin ratio technique described by Kane et al., (1949) was used to calculate digestion coefficients.

With values for the indigestibility of the forage determined by the lignin ratio technique and the total fecal output calculated from the chromic oxide content of a representative fecal sample, the amount of forage consumed was computed by use of the formula:

Total forage intake = Total weight of feces/Percent indigestibility of forage.

Results and Discussion

Grasses furnished a major portion of the cattle diet on winter-burned wiregrass-type forest range. Cattle exhibited a strong preference for pineland threeawn and bluestems in the spring, various bluestems in summer and fall, and Curtiss dropseed in winter (Table 1). Shrubs including saw palmetto *(Serenoa repens)* and a wide variety of other browse plants contributed about one-third of the total diet in winter. Grasses averaged 77 percent of the total forage collections, broad-leaved herbs 6 percent, and shrubs 17 percent.

Chemical analysis of diet samples was unusually high in ash content in April and September collections, and the lowest in December (Table 2). Raindrop spatter of mineral soil apparently contributed a considerable amount of ash in addition to the amount contained in the vegetation itself.

As the grazing season advanced, crude protein declined gradually to critically low levels in September and December. Ether extract, which comprised only a small fraction of total dry matter, followed the same trend until winter, when it increased due probably to greater consumption of highly resinous browse. Lignin was high, even in April, but did not increase sharply until December after grasses had matured and large amounts of browse plants were consumed.

Table 1. Seasonal components of herbage samples from wiregrass range representing the cattle diet.

Plant species	April	June	September	December
	— — — (Percent by weight) — — —			
Grasses: Total	83	80	87	59
Pineland threeawn	24	3	6	12
Curtiss dropseed	7	1	4	23
Florida dropseed	7	10	6	4
Bluestems	22	35	35	8
Toothachegrass	4	6	3	1
Carpetgrass	1	3	11	3
Panicum spp.	7	7	8	1
Misc. grasses	11	15	14	7
Broad-leaved herbs	7	3	8	6
Shrubs	10	17	5	35

Table 2. Chemical composition of native forage, by seasons[1]

Components	April	June	September	December
	(Percent)			
Ash	8.27	6.84	8.60	4.88
Crude protein	8.65	8.23	5.28	5.13
Ether extract	2.35	1.94	1.78	2.09
Lignin	10.26	12.92	11.75	15.38
Carbohydrates	60.47	60.07	62.59	62.52

[1] Based on 90 percent dry matter content.

Carbohydrates, other than lignin, were only slightly greater in fall and winter than in spring and summer.

Seasonal decline in nutritive value of forage (Table 3) was accompanied by a consistent declining forage intake (Table 4) and body weight of test cows (Figure 2). Both daily intake of forage and of total digestible nutrients declined during the summer and fall from their maximums in the spring, and then dropped abruptly in winter.

According to standards established by the National Research Council (1958), the diet was deficient throughout the trials (Table 3). Percent total digestible nutrients in the diet decreased from 44.48 in April to 42.64 in September, then dropped sharply to 32.16 in December. Other digestible nutrients in the animal diet followed a similar seasonal pattern. Digestion coefficients for crude protein, ether extract, and carbohydrates showed a gradual decline from April through September, and a rather noticeable decline in December. Digestible protein was deficient yearlong and the deficiency became more serious as the grazing season advanced (Figure 3).

The study demonstrates conclusively that feed supplements are necessary for maximum beef production in wiregrass-pine ranges. Cattle apparently were reluctant to eat enough low quality herbage to offset its declining nutritive content. On a 90-percent dry matter basis, forage intake dropped from a high of 20.46 pounds in April to a low of 11.66 pounds in December (Table 4). According to the National Research Council (1958), 28 pounds dry matter containing 5-percent digestible protein and 60-percent total digestible nutrients is needed to meet daily requirements of beef cows during the first 3 or 4 months of lactation. That cows were forced to draw on body reserves to satisfy their needs is evidenced by failure of test animals to maintain body weight. During the period of March 15 to October 16, cows lost an average of 59 pounds.

The animal diet apparently descended to a critical level during the winter, and death by starvation could have occurred had the test cows been left on the range without supplements. Biswell et al., (1942) reported heavy death losses in herds of cattle that grazed native range year-round without supplements. However, recent trials at Alapaha suggest that supplements for cows on burned native range may be

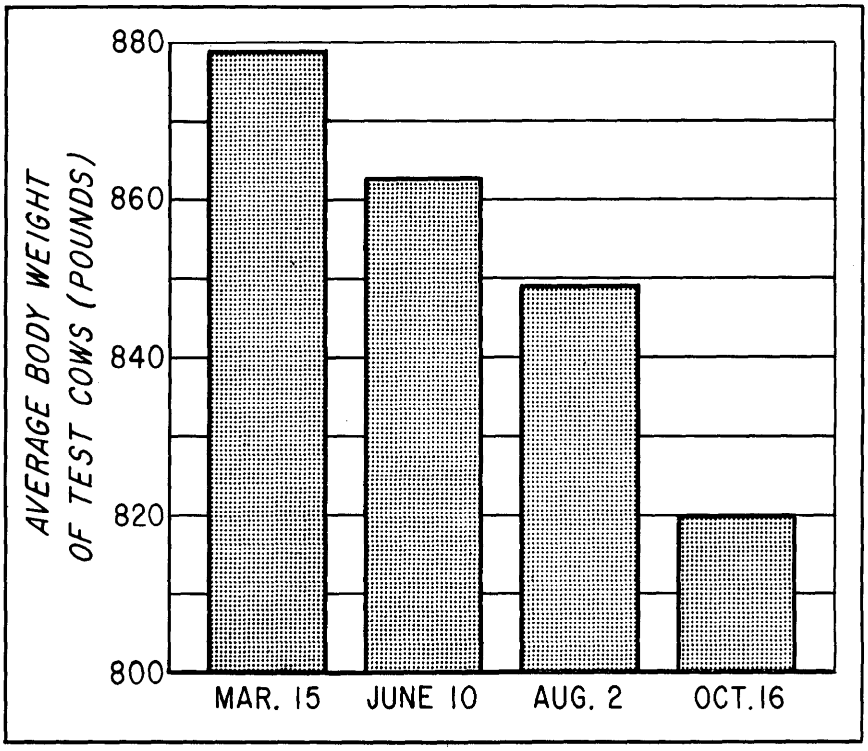

FIGURE 2. The five test cows lost an average of 59 pounds between March 15 and October 16.

Table 3. Digestion coefficients, total digestible nutrients, and nutritive ratio of native forage as determined by lignin ratio method.[1]

Date of collection	Digestion coefficient: Crude protein	Digestion coefficient: Ether extract	Digestion coefficient: Carbohydrates	T.D.N.	Nutritive ratio
	(Percent)				
April	36.00	39.87	62.01	44.48	1:13
June	29.16	19.62	60.84	44.12	1:16
September	23.67	6.12	58.95	42.64	1:30
December	9.99	Negative	45.45	32.16	1:55

[1] Based on 90 percent dry matter content.

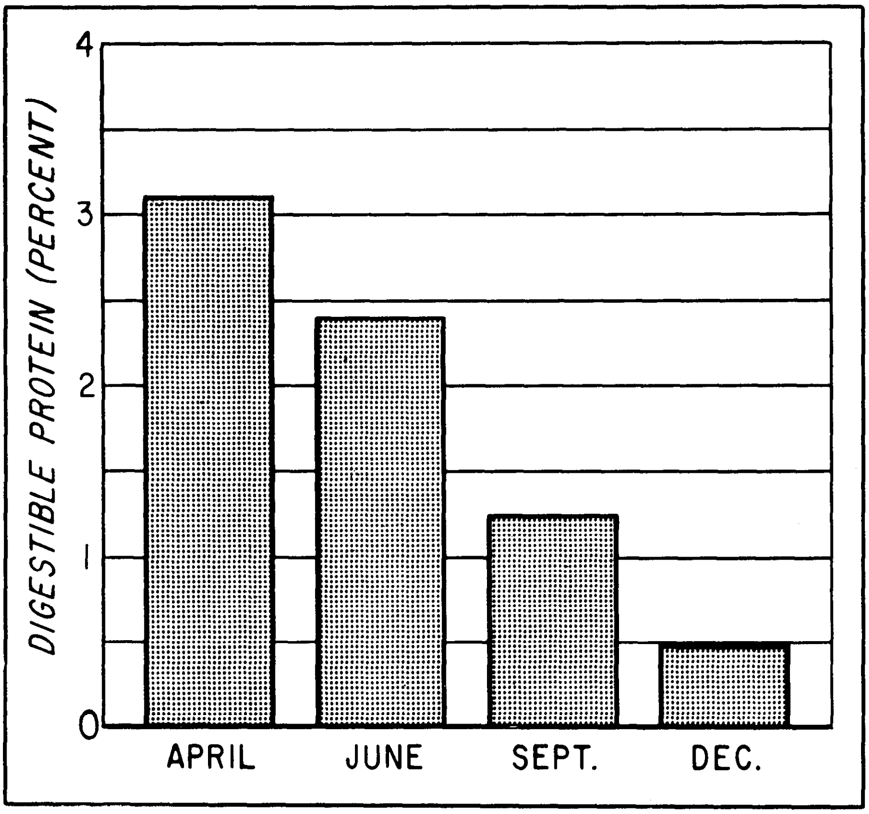

FIGURE 3. Native forage was deficient in digestible protein (crude protein based on 90 percent dry matter x percent of digestibility).

limited to the fall-winter period with good results (Halls and Southwell, 1956).

Summary

Chromic oxide was used as an index substance to estimate forage intake in April, June, September, and December, 1956, by five test cows grazing wiregrass-pine range in Georgia. Forage samples approximating the cattle diet were used to determine chemical composition and, with fecal samples, to determine digestibility of the native forage.

The data revealed a rather clearcut relationship between seasonal trend in nutritive value of the animal diet, amount of forage consumed, and weight changes of cows. Chemical composition of diet was influenced by season as well as kind of plants consumed. Digestion coefficients decreased gradually from April through September and dropped sharply in December. Average daily intake of forage was greatest in April, but even then was less than the suggested amount for optimum performance of lactating cows. By December, forage intake had dropped to less than one-half the suggested amount. Feed supplements high in digestible protein and energy were needed to offset nutrient deficiencies and low intake of native forage.

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Table 4. Daily intake of forage and of digestible nutrients by cows grazing native range.

Date of collection	Green forage (as fed basis)	Dry forage	Digestible nutrients[1] Protein	Ether extract X 2.25	Carbohydrates	T.D.N.
	(Pounds)					
April	56.40	20.46	.65	.43	7.76	8.84
June	50.91	19.58	.48	.17	7.21	7.86
September	41.04	18.48	.23	.05	6.88	7.16
December	22.32	11.66	.06	Negative	3.35	3.41

[1] Based on 90 percent dry matter content.