Voluntary Intake of Cattle on Range: Esophageal and Hand Clipped Forage Samples Compared

M. R. Rao, L. H. Harbers, and E. F. Smith

To determine the nutritional value of an animal's diet, it is necessary to know the amount of each kind of feed consumed and its digestibility. A problem in range and pasture nutrition is accurate assessment of chemical and botanical composition of diets. Little detailed information on nutritive value of range and pasture forage is available.

Esophageal fistulae in grazing animals permit dietary samples to be taken and more accurate measurements of nutritive value of the forages consumed. Diet samples of animals grazing Flint Hill range have not been studied.

Reported here are: (1) an evaluation of esophageal samples, (2) total fecal output, (3) dry matter and nutrient intake, and (4) *in vitro* dry matter digestibility of esophageal samples.

Experimental Procedure

Eight 8-month-old Holstein steers weighing 550 pounds were used. Two each were allotted at random to four pastures of approximately 60 acres each. They were tamed and managed carefully for easy handling during sample collection. The steers were fitted with cannulae three months before the experiment started, and were trained to carry fecal collection bags.

Five digestion trials were run during June, July, August, September, and October, 1971. Total feces were collected for 48 hours before the esophageal collection. Animals were fasted overnight and esophageal samples were collected the next morning, transferred to a deep freezer, and stored until used.

Esophageal and feces samples were analyzed for dry matter, organic matter, ether extract, ash, crude fiber, and Kjeldahl nitrogen by the AOAC (1965) methods. Cell wall constituents were determined by procedures Goering and Van Soest described (Agriculture Handbook 379, USDA, 1969).

Discussion

The proximate analyses of esophageal and hand clipped forage samples are given in table 7 and cell wall constituents in table 8. The average crude protein content was higher in esophageal samples during all five months (6.94 vs. 4.29%), as was ash content (10.12 vs. 8.24%). Average crude fiber and NFE were lower in esophageal samples (28.22 vs. 30.69%; 42.96 vs. 44.96%). Considerable experimental evidence confirms that the plants the animals select influences crude protein and crude fiber content consumed.

Cell wall constituents were lower in esophageal samples than in hand clipped samples (48.49 vs 54.66). The *in vitro* dry matter and organic matter disappearance (IVDMD and IVOMD) data for esophageal and hand clipped forage samples are in table 9. Percentages of IVDMD and IVOMD were higher in esophageal samples than in hand clipped samples (47.32 vs 44.16 and 48.49 vs 46.34).

Animals on pasture selected diets more digestible than hand clipped forage samples. The forage the animals selected was higher in crude protein but lower in crude fiber, NFE, and acid detergent fiber. Studies to estimate total intake during different months are continuing.

Table 7. Chemical composition percentages of pasture samples obtained by esophageal or hand sampling techniques.

Time	Type*	Ash	Crude protein	Crude fiber	Nitrogen-free extract	Ether extract	Dry matter	Organic matter
June	ES	8.32	8.84	28.53	44.00	2.36	92.07	83.75
	HC	7.61	5.84	28.99	45.71	2.47	90.63	83.02
July	ES	9.58	8.35	30.13	40.96	2.39	91.43	81.85
	HC	8.06	5.36	30.19	42.62	2.33	88.57	80.50
August	ES	10.22	6.23	30.98	42.04	1.982	91.46	81.24
	HC	8.66	4.01	30.91	45.75	2.29	91.64	82.97
September	ES	11.87	6.16	24.88	44.56	3.46	90.94	79.07
	HC	8.54	3.91	29.74	44.19	2.36	88.73	80.18
October	ES	10.62	5.12	26.76	43.27	2.41	89.39	78.76
	HC	8.25	2.37	33.65	46.57	1.88	92.79	84.48

*ES = esophageal sample, HC = hand clipped sample.

Table 8. Cell wall constituents of pasture samples obtained by esophageal or hand sampling techniques.

Time	Type*	Percentage of organic matter			% of cell wall		
		Neutral detergent fiber	Neutral** detergent fiber	Acid detergent fiber	Hemicellulose	Cellulose	Lignin
June	ES	83.23	80.37	46.69	39.58	46.88	8.11
	HC	76.45	73.77	51.14	33.20	50.62	9.16
July	ES	87.82	84.40	47.75	39.33	54.63	7.76
	HC	80.48	77.70	52.87	34.29	48.94	8.76
August	ES	84.64	81.21	51.17	32.32	49.01	10.80
	HC	78.81	76.16	53.06	32.64	48.99	9.29
September	ES	78.75	72.36	45.64	31.04	48.17	12.96
	HC	80.93	77.16	56.54	29.70	49.44	10.09
October	ES	81.50	77.64	51.23	28.33	48.68	9.07
	HC	85.75	82.35	59.71	30.34	49.72	10.12

*ES = esophageal sample, HC = hand clipped sample.

**Ash free basis.

Table 9. In vitro dry matter and organic matter disappearance (IVDMD and IVOMD) of esophageal and hand clipped forage samples.

Nutrients	Type	June	July	August	September	October
IVDMD	ES	50.44	52.87	42.04	45.27	40.79
	HC	47.34	48.48	41.65	42.03	38.82
IVOMD	ES	51.79	53.78	44.45	44.79	43.61
	HC	50.11	50.24	42.65	43.02	42.01

ES = esophageal samples, HC = hand clipped samples.