

# A Comparison of Two Grass Sampling Methods for Digestibility Trials Conducted on Pasture<sup>1</sup>

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Hand plucking to simulate grazing and plot-clipping techniques have been recognized as methods of sampling vegetation for digestibility studies by a Joint Committee on Pasture and Range Research Techniques (1952).

The objective of this experiment was to compare the hand plucking method with a plot clipping method for obtaining grass samples for use in computing digestion coefficients. Differences between the two methods were measured by comparing the chemical analysis of the samples obtained by the two methods as to: crude protein,

ether extract, crude fiber, nitrogen free extract, and ash.

## Methods

The trials were conducted at Kansas State College on native bluestem pastures located six miles northwest of the campus. The vegetation has been described by Anderson (1951) as typical true prairie. Big bluestem (*Andropogon gerardi*), little bluestem (*Andropogon scoparius*), and Indiangrass (*Sorghastrum nutans*), make up between 50 and 60 percent of the total vegetation on the ordinary upland and limestone breaks sites as described by Anderson and Fly (1955).

Three trials were conducted, one each during September 1953, June 1954, and August 1954. To obtain the hand plucked samples, four steers used on each of three digestion trials were followed, and an attempt was made

to pluck vegetation similar to that which the steers were eating.

Forage samples, obtained by following each of the four steers one or two days before each digestion trial started and one or two days after each trial closed, were analyzed separately for crude protein, ether extract, crude fiber, nitrogen free extract, and ash. Eight forage samples were analyzed for each digestion trial, two for each of the four steers used, for a total of 24 samples for the three trials conducted.

These forage samples obtained from following the steers were compared with others obtained by clipping plots.

Clippings were obtained from three caged plots located in each quarter of the pasture, 12 cages in all. The pasture was the same one from which the hand plucked samples were obtained. An attempt was made to locate the cages on similar sites with similar vegetation and on vegetation similar to that which had been grazed by the steers. The cages were established at the start of the pasture season, about May 1 of each year. Within each cage a one-foot square of grass was outlined with the use of a one-foot square metal frame; stakes were driven into the soil to mark the square. One-half of the square foot area was clipped to a height of one-quarter to one-half inch above ground level one

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to two days before each trial started. The other half was clipped one to two days before each trial closed. The three samples taken from each quarter of the pasture before each trial started were composited for chemical analysis, leaving only four samples for analysis (one composite from each quarter). The three samples taken from each quarter of the pasture shortly before the trial closed were also composited for chemical analysis, leaving only four samples for analysis also. This made a total of 8 samples from the clipping plots for each trial or a total of 24 samples for the three trials.

The 24 forage samples clipped from the plots and the 24 samples obtained by following the individual steers were compared as to content of crude protein, ether extract, crude fiber, nitrogen free extract, and ash. The samples were analyzed according to standard methods of the Association of Official Agricultural Chemists (1950). Analysis of variance as described by Snedecor (1956) was used to detect significant differences in chemical composition.

### Results and Discussion

Table 1 shows the average crude protein, ether extract, crude fiber, nitrogen free extract, and ash content of forage samples from clipped plots and of plucked samples obtained while following steers. The analyses of variance for the data are shown in Table 2.

In Trial 1 of September 1953 the two methods of sampling produced different results. The samples obtained while following the steers were significantly higher in crude protein, ether extract and ash and were significantly lower in crude fiber and nitrogen free extract. The date of sampling within the test had no effect.

In Trial 2 of June, 1954 neither method of sampling nor date

**Table 1. A comparison of the chemical analysis of forage plot clippings with the chemical analysis of plucked forage samples obtained by following steers (dry basis).**

Method	Plot Clipping		Steer Following	
	Start*	Close*	Start*	Close*
	%	%	%	%
<b>Crude Protein</b>				
Trial 1, Sept. 17-25, 1953	5.89	5.35	8.55	7.33
Trial 2, June 14-18, 1954	7.54	10.60	11.44	10.24
Trial 3, Aug. 20-27, 1954	7.44	7.22	9.02	9.73
<b>Ether Extract</b>				
Trial 1, Sept. 17-25, 1953	2.60	2.29	2.84	3.11
Trial 2, June 14-18, 1954	2.24	2.78	3.58	2.07
Trial 3, Aug. 20-27, 1954	2.66	2.82	2.97	2.39
<b>Crude Fiber</b>				
Trial 1, Sept. 17-25, 1953	33.23	33.57	32.32	31.64
Trial 2, June 14-18, 1954	31.38	26.01	32.04	29.18
Trial 3, Aug. 20-27, 1954	28.21	31.29	27.47	26.58
<b>Nitrogen-Free Extract</b>				
Trial 1, Sept. 17-25, 1953	49.48	49.88	46.45	46.90
Trial 2, June 14-18, 1954	50.51	48.22	43.68	50.22
Trial 3, Aug. 20-27, 1954	49.68	47.21	48.88	48.44
<b>Ash</b>				
Trial 1, Sept. 17-25, 1953	8.80	8.91	9.80	10.88
Trial 2, June 14-18, 1954	8.48	12.58	9.27	8.28
Trial 3, Aug. 20-27, 1954	12.01	11.48	11.64	12.85

\* Start and close of trial refer to the dates the samples were taken within a particular trial. Start of trial refers to samples obtained on or about September 17, 1953, June 14, 1954 and August 20, 1954. Close of trial refers to samples obtained on or about September 25, 1953, June 18, 1954 and August 27, 1954. Each percentage figure is an average of four samples.

produced significant differences, with the exception of crude fiber content, due to a significant dates x method interaction. The June 14 forage samples were higher in crude fiber than those taken June 18. The significant interactions present in Test 2 may have been due to a combination of factors. It rained on June 12, 1.23 inches; June 13, 0.14 inches; June 15, 0.33 inches and on June 16, 0.44 inches. The plots were clipped at near ground level and some new growth may have been included on June 18, whereas the plucked samples tended to be the upper half of the plants.

In Trial 3 of August 1954, the date of sampling had no effect except on ether extract and ash content, where there was a significant interaction. The protein content was higher in the sam-

ples taken following the steers; crude fiber was significantly lower. The nitrogen-free extract was unaffected by method of sampling in Trial 3. It rained 0.99 inches on August 19, 0.59 inches on August 22, 0.17 inches on August 23, 0.99 inches on August 24 and 0.26 inches on August 27.

A great deal of variation existed among the three trials. However, there was little evidence to indicate that these two methods of sampling produce similar results. The samples collected in trials 1 and 3 by following the steers were higher in crude protein and lower in crude fiber than those samples clipped from the plots, indicating that the steers were selective in their grazing habits, as measured by the steer following method and that plot clipping does not meas-

**Table 2. Analyses of variance. A comparison of the chemical analysis of forage plot clippings with plucked forage samples obtained by following steers.**

	Degrees of Freedom	Mean squares		
		Trial 1	Trial 2	Trial 3
<u>Crude Protein</u>				
Source of Variation				
Dates	1	3.066	3.497	.247
Methods	1	21.505**	12.602	16.707***
Interaction	1	.464	18.190***	.850
Individuals	12	1.538	.287	.880
<u>Ether Extract</u>				
Source of Variation				
Dates	1	.002	.955	.171
Methods	1	1.124**	.412	.014
Interaction	1	.290	4.214***	.565**
Individuals	12	.086	.087	.034
<u>Crude Fiber</u>				
Source of Variation				
Dates	1	.143	65.237*	5.256
Methods	1	7.882***	15.662	30.831**
Interaction	1	1.107	5.676	16.505
Individuals	12	.389	7.358	4.478
<u>N.F.E.</u>				
Source of Variation				
Dates	1	.718	16.443	8.453
Methods	1	36.150**	21.437	.187
Interaction	1	.003	85.450***	4.091
Individuals	12	3.525	3.806	2.437
<u>Ash</u>				
Source of Variation				
Dates	1	1.422	9.751	.472
Methods	1	8.835**	12.338	1.004
Interaction	1	.936	19.069*	9.047**
Individuals	12	.603	2.157	.256

\* Significant at 5.0 percent level.

\*\* Significant at 1.0 percent level.

\*\*\* Significant at 0.1 percent level.

ure the intake of crude protein and crude fiber.

Hardison *et al.* (1954), reported the chemical composition of clipped herbage as an unreliable index of the composition of the herbage being taken by grazing animals. It should be emphasized that the steer following method may not be an accurate method of evaluating the composition of grazed forage and probably should be compared with the method outlined by Torell (1954).

The late season trials, trial 1 and trial 3, of September, 1953 and August, 1954, respectively, indicated the two methods may differ more late in the growing season than early in the growing season. This difference could be due to more selective grazing by the steers as the grass matures.

### Summary

Three trials were conducted comparing the hand plucking method (simulated grazing)

with a plot clipping method for obtaining grass samples for use in computing digestion coefficients. The two methods were compared on the basis of chemical analysis as to crude protein, ether extract, crude fiber, nitrogen-free extract, and ash. Some variation in results occurred in the three trials, but there was little evidence to indicate that the two methods of sampling produced similar results. In two of the trials the samples collected following the steers were higher in crude protein and lower in crude fiber than the samples taken by clipping the plots, indicating that the steers were selective in their grazing, and that plot clipping does not measure the composition of the forage being grazed.

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