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## Composition of South Dakota Silages

A. W. Halverson

### Introduction and Procedure

Questions are sometimes raised about the nutritional quality of silages which are harvested and put up in South Dakota. Therefore, chemical data on 1973-75 samples from throughout South Dakota were averaged and subjected to statistical treatment by the coefficient of variation method. Comparisons were made with United States values on similar feed as reported in the Atlas of Nutritional Data on United States and Canadian Feeds and published by the National Academy of Sciences (NAS, 1971). Total digestible nutrient values (TDN's) were calculated on the South Dakota feeds by use of the digestion coefficients listed in the NAS (1971) reference.

### Results and Discussion

The results on South Dakota alfalfa, corn and oat silages and the values reported on these same silages for the United States at large are shown in table 1. In general, higher dry matter contents were evident with the South Dakota silages as compared to the national averages. When compared on a dry basis, the contents of the other constituents of the South Dakota silages generally showed reasonable agreement with the United States values (table 1). In relation to the United States values, alfalfa silages from South Dakota varied slightly in ash, crude fiber, ether extract, TDN, calcium and phosphorus composition. Similarly, the corn silages from South Dakota showed slight variations in composition from the national values with respect to ash, crude fiber, ether extract, nitrogen-free extract, protein and calcium and the oat silages from South Dakota showed variations for ash, crude fiber, nitrogen-free extract, protein and TDN. Moreover, the difference in crude fiber and protein contents of the South Dakota oat silage samples from the United States values was noticeable.

The results of statistical treatment of the South Dakota data by the coefficient of variation method show that differences in variability were evident for the silage constituents (table 1). This was also evident for the United States results reported in the NAS (1971) publication as shown in table 1. The comparison of coefficients between alfalfa silage data for South Dakota and the United States showed the values to be higher on dry matter, ash, ether extract, protein, calcium and phosphorus for the South Dakota samples, thus indicating a greater variability with these measurements than that reported for the United States at large. At the same time, comparable degrees of variability were shown for crude fiber. However, the coefficients of variation as shown with the different constituents of the alfalfa silage from South Dakota were still reasonably low, since the values were ordinarily below the  $\pm 20\%$  level with the exceptions of total dry matter ( $\pm 31\%$ ), ether extract ( $\pm 33\%$ ) and phosphorus ( $\pm 21\%$ ). The especially low coefficient ( $\pm 3\%$ )

for TDN on the South Dakota samples was noticeable (Note that the United States coefficient for TDN was not given). The high dry matter coefficient ( $\pm 31\%$ ) on the South Dakota samples was in contrast to the low United States value ( $\pm 12\%$ ) for this measurement.

The dry matter data on the South Dakota corn silage samples also showed a greater degree of variation than that reported for United States samples (table 1). Greater variability was also shown in the ether extract and protein constituents of the South Dakota corn samples than for United States samples. However, lesser variation was shown with the calcium and phosphorus constituents of the South Dakota samples and little or no difference in variation was shown for the ash, crude fiber and nitrogen-free extract constituents between the South Dakota and United States samples. In general, the South Dakota coefficients for total dry matter, ash, ether extract, calcium and phosphorus were above the  $\pm 20\%$  level, while those for crude fiber, nitrogen-free extract, protein and TDN were below that level. As with the alfalfa silage, the TDN coefficient on the South Dakota corn silage was very low ( $\pm 3\%$ ) which indicated a low degree of variability between samples (Note that the United States coefficient for TDN was not given).

The results of the coefficient of variation determination on oat silage indicated a nearly equivalent variability in dry matter content with South Dakota samples as compared to those reported in the NAS (1971) publication (table 1). Equivalent variability was also evident with the crude fiber constituent between the samples of each source, while lesser variability was shown for the protein, calcium and phosphorus of South Dakota samples. With South Dakota samples, the coefficients for dry matter, ash and calcium were above the  $\pm 20\%$  level, while those for crude fiber, ether extract, nitrogen-free extract, protein, TDN and phosphorus were below that level. The low coefficient ( $\pm 4\%$ ) for TDN on the South Dakota samples was noticeable. Comparison of the South Dakota coefficients with published values was not possible in the case of ash, ether extract, nitrogen-free extract and TDN since the NAS (1971) publication did not list values.

#### Summary

Alfalfa, corn and oat silage samples were analyzed for total dry matter, the proximate constituents, calcium and phosphorus. The samples were sent in by farmers and ranchers to the Agricultural Experiment Station laboratories during the 1973-75 crop years. TDN was also calculated on the samples by use of the proximate data together with the digestion coefficient values published by the NAS (1971). The various results were compared with values published for the United States at large (NAS, 1971). The South Dakota measurements on dry matter content with each of the three silages were somewhat high as compared to the United States values. Also, the variability of the dry matter measurements with two of the South Dakota silages (alfalfa and oat) was higher than that reported with the United States samples. This variability in the dry matter content of the South Dakota samples was the most noticeable with alfalfa silage. Otherwise, alfalfa and corn silages did not differ appreciably in nutrient composition from the values reported by the NAS (1971). However, the barley silage was shown to be lower in crude fiber content and higher in protein content than the reported values. In general, the variability of the TDN calculations with each of the silages was very low.

Table 1. Composition of South Dakota Silages in Comparison to United States Tables

Constituents	Percent of different constituents											
	Alfalfa silage				Corn silage				Oat silage			
	Mean values <sup>a</sup>		Coeff. of variation		Mean values		Coeff. of variation		Mean values		Coeff. of variation	
	S.D.	U.S. <sup>b</sup>	S.D.	U.S.	S.D.	U.S.	S.D.	U.S.	S.D.	U.S.	S.D.	U.S.
As fed												
Total dry matter	46.0 (169)	38.1	31	12	35.6 (368)	26.3	25	21	44.2 (75)	32.4	24	26 <sup>c</sup>
Dry												
Ash	11.0 (30)	8.6	17	9	6.7 (70)	5.7	27	25	11.2 (14)	8.4	26	
Crude fiber	28.8 (35)	30.9	12	12	21.3 (85)	23.1	12	13	26.0 (23)	35.5	13	14 <sup>c</sup>
Ether extract	2.1 (31)	3.6	33	14	2.0 (73)	3.1	37	12	3.1 (15)	3.1	17	
Nitrogen-free extract	39.5 (30)	39.1	8		60.9 (69)	58.5	6	6	47.2 (14)	44.1	8	
Protein (N x 6.25)	18.2 (167)	17.8	14	9	9.5 (362)	8.9	17	8	11.9 (75)	8.9	19	50 <sup>c</sup>
Total digestible nutrients <sup>d</sup>	55.6 (30)	58.5	3		66.0 (69)	65.7	3		56.3 (14)	58.6	4	
Calcium	1.56 (19)	1.40	17	8	0.30 (43)	0.50 <sup>c</sup>	32	98 <sup>c</sup>	0.35 (8)	0.36 <sup>c</sup>	32	44 <sup>c</sup>
Phosphorus	0.22 (20)	0.33	21	13	0.19 (46)	0.20 <sup>c</sup>	20	29 <sup>c</sup>	0.26 (8)	0.25 <sup>c</sup>	14	34 <sup>c</sup>

<sup>a</sup> The number of South Dakota samples involved with each measurement is shown in parenthesis.

<sup>b</sup> Listed under alfalfa, aerial part, wilted, ensiled.

<sup>c</sup> In these instances, the values were taken from Canadian data since United States figures were not listed.

<sup>d</sup> The digestion coefficients used in the TDN calculation were for cattle.