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Abstract
Earlier experiments have shown that cattle may perform differently at different Kansas locations. Feeds from four locations (Manhattan, Mound Valley, Colby, and Garden City) were analyzed for several minerals to see if mineral differences might be responsible. Table 4 shows the results for alfalfa hay. Samples were taken at random and no attempt was made to choose particular varieties. Data for FS 1a sorghum silage is shown in table 5. Table 6 shows mineral analyses for two sorghum grain varieties, and one mixed sample (varieties unknown) taken at each location. The K.S.U. agronomy department carries out annual tests on eleven varieties of forage sorghum at four locations (Garden City, Manhattan, Mound Valley, and Colby). The results are in table 7.

Keywords
Cattlemen's Day, 1970; Report of progress (Kansas State University. Agricultural Experiment Station); 536; Beef; Mineral content; Sorghum grain; Alfalfa

Mineral Content of Feeds Grown at Various Kansas Locations (Project 430)

F.G. Clary and B.E. Brent

Earlier experiments have shown that cattle may perform differently at different Kansas locations. Feeds from four locations (Manhattan, Mound Valley, Colby, and Garden City) were analyzed for several minerals to see if mineral differences might be responsible.

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Using the tables

Such information should help in formulating rations, because the mineral values are established under Kansas conditions. Crops and feeds vary greatly in water content, so all water was removed before analyses. To apply the data to specific feeds, dry matter content of the feeds is needed. Grains stored in bins are usually about 87% dry matter. High moisture grains are about 70% dry matter. Silages are about 35% dry matter, but vary widely. Multiply the percentage of dry matter by the appropriate mineral level from the table. For example, the phosphorus content of Pioneer 846 sorghum grain at Colby is 0.28%. Assume a similar grain were stored under high moisture conditions (70% dry matter). The level of phosphorus in the grain, as taken from storage, would be 70% x 0.28 = 0.20%.

Table 8 shows the estimated mineral requirements for feedlot cattle. From those figures and the feed analysis data, ration adequacy can be estimated.

All biological measurements are subject to variability. Table 7 gives averages ± "standard deviation" to account for such variability. The standard deviation is a mathematical way of expressing how much you expect the data to vary. The average, plus or minus the standard deviation, should include two-thirds of the observations. The average plus or minus two standard deviations should include 95%.

Conclusions

The feed analyses show the variability of feed minerals. Some of the variation results from location. However, feed samples taken at the same, or similar locations also vary, which shows the dangers associated with accepting "book values". Book values are averages, often of data that vary widely.

Three minerals, calcium, phosphorus, and sodium chloride (salt), are routinely added to cattle rations. Comparing requirements with the analyses of Kansas feeds shows why. Sodium is almost absent from most feeds. Most combinations of feeds meet requirements for magnesium. Manganese and iron are likely to be deficient on high sorghum-grain diets. Zinc and copper are likely to be borderline or deficient in most diets.

Table 4. Mineral Analysis of Kansas-grown Alfalfa Hay [1]

Location		% Calcium	% Phosphorus	% Magnesium	% Potassium	% Sodium	ppm[2] Manganese	ppm Iron	ppm Zinc	ppm Copper
Colby(2)[3]	High	1.55	0.25	0.23	3.16	0.164	46.8	432	19.9	11.0
	Low	1.02	0.25	0.20	3.10	0.144	45.2	256	18.7	8.3
	Ave.	1.29	0.25	0.22	3.13	0.154	46.0	346	19.3	9.6
Garden City(3)	High	1.80	0.31	0.35	3.04	0.075	44.4	685	21.0	15.2
	Low	1.33	0.17	0.27	1.84	0.021	35.0	166	18.3	9.9
	Ave.	1.64	0.25	0.30	2.25	0.040	40.7	346	19.9	12.3
Manhattan (3)	High	1.73	0.34	0.33	1.93	0.042	47.6	474	25.6	14.3
	Low	1.53	0.18	0.21	1.23	0.018	39.9	124	22.3	11.8
	Ave.	1.63	0.26	0.28	1.67	0.031	42.8	275	23.9	12.8
Mound Valley(4)	High	1.62	0.39	0.42	2.06	0.173	47.5	408	48.1	12.5
	LOW	1.33	0.26	0.27	1.65	0.081	38.7	138	35.8	10.4
	Ave.	1.46	0.32	0.35	1.87	0.133	42.4	247	42.0	11.7

1. Dry matter basis
2. Parts per million 1 ppm = 0.0001%
3. Number of samples per location

Table 5. Mineral Analysis of Kansas-grown Sorghum Silage[1]
(Variety, FS la)

Location	% Calcium	% Phosphorus	% Magnesium	% Potassium	% Sodium	ppm[2] Manganese	ppm Iron	ppm Zinc	ppm Copper
Colby	0.21	0.18	0.18	1.29	0.013	47.5	487	27.9	13.1
Garden City	0.36	0.19	0.25	1.46	0.012	75.2	724	19.8	19.2
Manhattan	0.25	0.15	0.15	1.54	0.010	43.6	159	24.0	13.1
Mound Valley	0.43	0.23	0.34	1.24	0.016	58.2	210	46.8	7.3

1. Dry matter basis

2. Parts per million. 1 ppm = 0.0001%

Table 6. Mineral Analysis of Kansas-grown Sorghum Grains[1]

Location	% Calcium	% Phosphorus	% Magnesium	% Potassium	% Sodium	ppm[2] Manganese	ppm Iron	ppm Zinc	ppm Copper
				--- RS - 610 [3] ----					
Colby	0.014	0.42	0.19	0.49	0.006	19.0	60.6	19.6	6.6
Garden City	0.018	0.37	0.20	0.50	---	19.2	62.9	28.7	10.9
Manhattan	0.029	0.55	0.25	0.62	0.005	18.9	72.1	35.6	6.7
Mound Valley	0.026	0.49	0.23	0.58	0.007	18.3	77.0	41.1	6.5
				---- Pioneer 846 ----					
Colby	0.014	0.28	0.13	0.35	0.002	17.5	39.4	12.8	5.6
Garden City	0.016	0.28	0.14	0.35	0.004	18.1	40.9	17.6	5.9
Manhattan	0.023	0.28	0.14	0.30	0.003	11.2	33.1	18.6	4.6
Mound Valley	0.011	0.22	0.11	0.28	0.003	15.2	32.6	17.8	4.2
				---- Mixed ----					
Colby	0.019	0.30	0.14	0.36	0.030	12.2	92.7	6.8	3.4
Garden City	0.022	0.32	0.15	0.36	0.012	15.8	91.4	7.7	4.0
Manhattan	0.054	0.48	0.20	0.45	0.006	14.0	85.9	17.4	5.5
Mound Valley	0.019	0.42	0.15	0.32	0.003	10.3	38.7	8.5	3.4

1. Dry matter basis

2. Parts per million. 1 ppm = 0.0001%

3. Variety

Table 7. Minerals in Kansas Dryland Sorghum Forages[1]

Location	% Calcium	% Phosphorus	% Magnesium	% Potassium	% Sodium	ppm[2] Manganese	ppm Iron	ppm Zinc	ppm Copper
Colby	0.31±.03[3]	0.17±.01	0.17±.03	1.94±.13	0.007±.004	30.7±3.4	143±31	17.0±4.0	4.9±1.9
Garden City	0.25±.03	0.ll±.02	0.20±.03	1.91±.16	0.003±.005	66.5±4.4	210±39	17.5±5.1	22.7±2.3
Manhattan	0.23±.02	0.12±.01	0.18±.02	1.50±.10	0.003±.003	33.6±2.8	135±25	18.6±3.2	6.1±1.5
Mound Valley	0.23±.02	0.15±.01	0.22±.02	0.86±.13	0.017±.003	29.0±2.9	121±27	46.3±3.4	19.5±1.6

1. Dry matter basis.

2. Parts per million. 1 ppm = .OOOl%

3. Average + standard deviation. Two thirds of the values under these conditions can be expected to fall within 1 standard deviation. For example, at Colby, two thirds of the values for calcium should fall within 0.31%+.03, or between 0.28% and 0.34%.

Table 8. Estimated Mineral Requirements of Feed-lot Catt1e.[1]

Mineral	Requirement
Calcium, %	0.4
Phosphorus, %	0.3
Magnesium, %	0.1
Potassium, %	0.5
Sodium, %	0.2
Manganese, ppm	30
Iron, ppm	100
Zinc, ppm	60
Copper, ppm	10

[1]Based on air-dry (.90% dry matter) feed.