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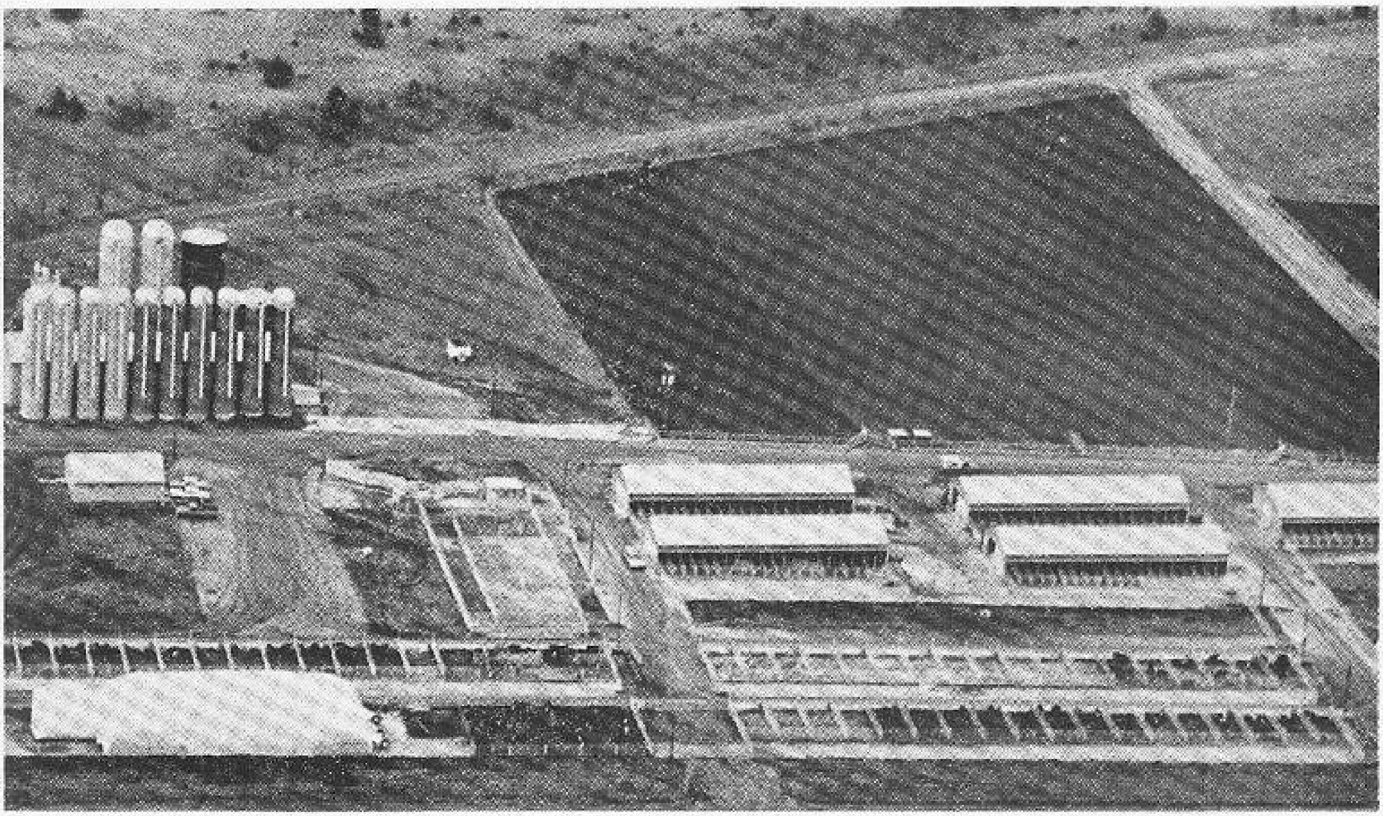
CATTLEMEN'S DAY



DEPARTMENT OF ANIMAL SCIENCE & INDUSTRY
KANSAS AGRICULTURAL EXPERIMENT STATION
KANSAS STATE UNIVERSITY, MANHATTAN
FLOYD W. SMITH, DIRECTOR

57th Annual
CATTLEMEN'S DAY

Friday, May 1, 1970

FRIDAY, MAY 1, 1970

"CHALLENGE OF THE 70's"

8:00 a.m. Weber Hall Arena

Registration—Exhibits
(Coffee and donuts served)

10:00 a.m. Weber Hall Arena

Dr. Philip A. Phar, Department of Animal Science and Industry, presiding

- Current Nutrition Research
  Dr. Calvin L. Drake, Department of Animal Science and Industry, KSU
- Animal Waste Control
  Dr. Harry L. Manges, Department of Agricultural Engineering, KSU
- Beef Type for the 70's
  Dr. Don L. Good, Head, Department of Animal Science and Industry, KSU
- Beef Processing and Merchandising for the 70's
  Mr. David Stroud, President, National Livestock and Meat Board, Chicago
- Remarks
  Mr. George H. Fritz, President, Kansas Livestock Association, Medicine Lodge, Kansas

12:00 noon Weber Hall Arena

Smoked, round-roast lunch

1:00 p.m. Weber Hall Arena

- Presentation of Beef Production Winners
  Mr. George Smith, Kansas Farmer, Topeka, Kansas; Prof. Herman W. Westmeyer and Dr. Keith O. Zoellner, Department of Animal Science and Industry, KSU
- "The Challenge of the Beef Industry in the 70's"
  Dr. Roy M. Kottman, Dean of the College of Agriculture and Home Economics at Ohio State University, Director of the Experiment Station and the Ohio Cooperative Extension Service, Columbus, Ohio

Dr. Kottman accepted his position with Ohio State University in 1960. He has been associated with the livestock industry, agricultural education and research activities his entire life. While Dean Kottman's basic field is animal science, specifically genetics and breeding, his interests and activities encompass all aspects of education in agriculture. He currently is a member of the Commission on Education in Agriculture and Natural Resources of the Agricultural Board, Division of Biology and Agriculture, National Academy of Sciences, National Research Council. Dr. Kottman is a graduate of Iowa State University and has advanced degrees from the University of Wisconsin and Iowa State University.

2:15 p.m. Beef Cattle Research Center

Tour of the Beef Cattle Center (about 2 miles north, at end of College Avenue).

6:30 p.m. Kansas State Union Ballroom

Block and Bridle Banquet for parents and visiting stockmen

FOR THE LADIES

Thursday, April 30, 1970

6:30 p.m. "The Den"—Holiday Inn, Manhattan
Kansas Cow Belles Dinner
Reservations by April 28 to: Mrs. Don L. Good, 2027 Sunnymeade Road, Manhattan, Kansas 66502

Friday, May 1, 1970

10:00 a.m. Weber Hall, Staff Memorial Library
Coffee for visiting ladies

11:00 a.m. Weber Hall, Room 107
Program—Meals in Minutes for the 70's
Mrs. Sandi Sleichter, Home Economist, Kansas Power and Light Company, Manhattan, Kansas

ACKNOWLEDGMENTS

The Department of Animal Science and Industry appreciates the support of the following:

1. Thomas Olson, Thermo-Flex Inc., Salina, Kansas
2. Roy Erbes, Empire Automatic Water, LaCrosse, Kansas
3. Sam Marcus, Excell Packing, Wichita, Kansas
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7. Auerst Lab., New York, New York
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9. W. R. Grace, Clarksville, Maryland
10. Charles Pfizer and Company, Chicago, Illinois
11. Ross Manufacturing Company, Oklahoma City, Oklahoma
12. Salisbury Harvestore Systems, Kansas City, Missouri
13. Kansas Cattle Feeders Committee of the Kansas Livestock Association
14. Dodson Silo Company, Wichita, Kansas
15. Salina Concrete Products, Salina, Kansas
16. Kansas-Missouri Silo Company, Topeka, Kansas
17. Superior Boiler Company, Hutchinson, Kansas
18. Funk Brothers Seed Company, Lubbock, Texas
19. Anderson, Clayton, and Company, Belmond, Iowa
20. DeKalb Seed Company, Lubbock, Texas
21. Northrup, King and Company, Lubbock, Texas
22. Robinson Seed Company, Waterloo, Nebraska
23. Kansas Independent Meat Packers Association
24. Grain Belt Manufacturing Company, Salina, Kansas
25. S. N. Moffett, First National Bank, Larned, Kansas
26. C. M. Miller, Farmers and Merchants State Bank, Colby, Kansas
27. Cromer Brothers Enterprises, Inc., Sawyer, Kansas
28. Duane Van Horn, Lyons, Kansas
29. Wallace Wolf, South Haven, Kansas
30. Elmer H. Goering, Moundridge, Kansas
31. Carl Safley, Scottsdale, Arizona
32. Hydraulics Unlimited Manufacturing Company, Eaton, Colorado
33. Orville Burtis, Manhattan, Kansas
34. Jasper DeVore, Arkansas City, Kansas
35. Fred Germann, Dwight, Kansas
36. Dorsey Elliott, Garden City, Kansas
37. E. I. DuPont, Inc., Wilmington, Delaware
38. Jim Flanders, Edson, Kansas
39. Walter Lewis, Alfalfa Lawn Farms, Larned, Kansas
40. Robert Lewis, Larned, Kansas
41. Stanley Winchester, Winchester Packing Company, Hutchinson, Kansas
42. Wayne Rogler, Matfield Green, Kansas

Following is a list of donors responsible for providing Kansas State University with steam-flaking equipment.

Earl Brookover, Garden City
Brookover Feed Yards, Inc., Garden City
William Maurer, Kansas City
Ross Machine and Mill Supply, Oklahoma City
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Farr Better Feeds, Garden City
Mark Cattle Company, Strong City
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Trusler-Cook Grain Company, Emporia
Seward County Land and Cattle Corp., Liberal
Pioneer Feed Yards, Inc., Oakley
Polkinghorn Feed Yard, Dodge City
Farmaster Products, Inc., Shenandoah, Iowa
Fairfield Engineering and Manufacturing Company, Fairfield, Iowa
Mr. and Mrs. J. W. Shaw, Ashland
Barr Cattle Company, Leoti
Coon Valley Feeding Company, Wichita
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Delbert L. Campbell, Holcomb
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Crofoot Cattle Company, Inc., Strong City
Fairleigh Feed Yards, Scott City
Hi-Plains Enterprises, Inc., Leoti
Ingalls Feed Yard, Inc., Ingalls
Kansas Feed Yards, Scott City
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S & F Cattle Company, Scott City
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Rex Stanley Feed Yard, Inc., Dodge City
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Walnut Hill Feed Yard, Inc., Great Bend
Urban Cattle Company, Scott City
Ward Feed Yard, Inc., Larned
Haskell Land Company, Satanta

Nutritive Value of Forages as Affected by Soil and Climatic Differences (Project 430) Seven-year Summary

F.G. Clary, B.E. Brent, D. Richardson, A.B. Erhart,
E.E. Banbury, F.W. Boren

Effects of environment on the performance of beef steers in Kansas have been studied since 1962. The experiments, in three phases, have included seven feedlot trials and one digestion trial.

Phase 1

Four feedlot trials comparing wintering, finishing, and overall performance of steers fed at Colby, Garden City, Manhattan and Southeastern Kansas (Mound Valley) Experiment Stations were reported in the 51st, 52nd, 53rd, and 54th Live-Stock Feeder's Day Reports. Wintering gains at Mound Valley were significantly ($P<.05$) greater than those at Colby. During the finishing period, cattle at Garden City outgained ($P<.05$) those at Manhattan and Mound Valley. Total gains, (wintering plus finishing) were greater at Garden City ($P<.05$) than at Manhattan and Mound Valley.

Phase 2

In the first phase of the study, ration ingredients were produced at each station but all cattle were from a common source. In the second phase, all feed was grown and processed at the Garden City Experiment Station, so observed differences should result from factors associated with location alone, not from feed. The 55th and 56th Livestock Feeder's Day Reports carried the results. When the feedlot data for both trials were combined, wintering gains were highest at Colby and lowest at Mound Valley. Highest finishing gains were at Manhattan, lowest at Colby. The differences approached statistical significance. Wintering plus finishing differences among locations were not significant.

Phase 3

Recent experiments compared the feeding value of a single variety of sorghum grain produced in the area of each station, randomly assigned and self-fed. Sorghum silage was produced at Manhattan. The rations were made isonitrogenous with a urea premix (table 1). Feedlot and carcass data are shown in table 2. Because of animal variability, neither total gains nor carcass traits differed significantly.

The apparent digestibility of the four rations was determined in a digestion trial using eight crossbred western lambs. Results of the digestion trial are shown in table 3. Since lambs received only the concentrate portion of the ration, digestion coefficients are quite high. The digestibility of ether extract and crude fiber was significantly (P<.05) higher for Colby grains than for Mound Valley grains. Other coefficients were similar.

Table 1. Composition of Premix Used at Indicated Experiment Stations

Origin of grain	Colby	Garden City	Manhattan	Mound Valley
Ground sorghum grain, lbs.*	64.0 lb.	78.0 lb.	78.0 lb.	72.0
Urea (45% N)*	20.0	6.0	6.0	12.0
Ground limestone, lbs.	15.0	15.0	15.0	15.0
Vitamin A (10,000 IU, gm.	150.0	150.0	150.0	150.0
Aurofac-10, gm.	380.0	380.0	380.0	380.0

* Varied to make all rations isonitrogenous; premix at 100 lbs./ton of grain.

Table 2. Feedlot Results from Phase 3 Trials
Dec. 21, 1968, to April 24, 1969--126 Days

Origin of grain	Colby	Garden City	Manhattan	Mound Valley
Steers per lot	10	10	10	10
Av. initial wt., lb.	793	777	787	775
Av. final wt., lb.	1082	1060	1059	1038
Av. total gain, lb.	289	283	272	263
Av. daily gain, lb.	2.30	2.24	2.16	2.08
Feed per lb. gain				
Sorghum silage	3.3	3.3	3.3	3.3
sorghum grain	14.5	16.5	17.0	16.3
Av. hot carcass wt., lb.	647	638	627.	618
Dressing %, based on Feedlot wt.	59.8	60.5	59.4	59.7
Fat thickness, 12th rib, in.	.4	.4	.4	.4
Rib eye area, sq. in.	11.26	11.50	11.49	11.06
Av. yield grade	2.7	2.7	2.6	2.5
Av. carcass grade				
Av. choice	-	1	-	-
Low choice	3	3	1	1
High good	7	6	8	8
Av. good	-	-	1	1
Low good	-	-	-	-

Table 3. Digestion Coefficients (means) for Sorghum Grains Used (all-concentrate diet)

Origin of grain	Colby	Garden City	Manhattan	Mound Valley
Dry matter	95.01	92.97	93.09	92.31
Gross energy	94.43	92.15	91.84	91.25
Crude protein	88.29	84.32	84.00	85.18
Ether extract*	89.37[a]	84.72[ab]	86.25[ab]	80.95[b]
Crude fiber*	82.95[a]	69.94[ab]	71.20[ab]	62.32[b]
Nitrogen free extract	97.59	96.44	96.60	96.04
Total digestible nutrients	97.27	94.83	96.06	94.78

*Means with unlike superscripts differ significantly ($P<.05$).

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.

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 1_a 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.

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 Cattle.[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.

A Biopsy Technique to Predict Quality in the Live Beef Animal with Emphasis on Tenderness

M.E. Dikeman, C.C. Melton, H.J. Tuma, and G.R. Beecher

Because tenderness is considered the most desired eating characteristic in meat, more emphasis should be placed on this trait in evaluating beef quality in breeding and selection programs. Both tenderness and marbling are highly heritable traits (Heritability = approximately 0.6),therefore much improvement could be made through progeny testing of sires; however, this requires considerable time and expense. This consideration, plus an increasing interest in feeding young beef bulls for market, led to an interest in applying a biopsy technique to evaluate and predict meat quality in the live animal.

Twenty-one Hereford yearling bulls representing five sire groups, owned by South Dakota State University[I], were biopsied by personnel from Kansas State University[II]. The bulls had been fed a ration moderately high in roughage for optimum growth.

The bulls were injected with a tranquilizer and a muscle sample was surgically removed from the *l. dorsi* (loin eye) muscle between the 12th and 13th ribs. The samples were frozen in liquid nitrogen and transported to Kansas State. Salt extractable proteins were determined and, in addition, total protein, moisture and ether extract (fat) were determined from the biopsy sample. Histological evaluation was employed on other portions of the sample.

Three days after the operation the bulls were slaughtered. Carcass data were obtained 72 hr. post-mortem and the loins and ribs were transported to Kansas State. A steak was removed from the shortloin, cooked, and evaluated for both tenderness and acceptability.

Results and Discussion

There appeared to be no complications or serious impairment of the bulls after the operation other than some swelling and soreness of the area. Other researchers have reported no permanent impairment of the biopsied animals.

Tenderness and acceptability as judged by an experienced taste panel were quite acceptable and were comparable with those factors from steer and heifer steaks (evaluated in an earlier study).

I Appreciation is extended to the South Dakota State University Animal Science Department for their cooperation in this study.

II Dr. J.G.E. Vestweber, DVM, College of Veterinary Medicine, Kansas State University performed the biopsies.

In this earlier study ribs were selected from steer and heifer carcasses in a packing plant. They were chosen with a modest degree of marbling (avg. Choice) and tenderness and eating characteristics were evaluated as reported here (table 9). Steaks from the bulls required slightly greater shear force and were judged slightly less tender; however, their acceptability was essentially the same as steaks from steers and heifers. The grade advantage (avg. Choice vs. low Good) for steers and heifers resulted in only slight advantage in eating quality.

Protein solubility, ether extract, moisture percentage and muscle texture were only slightly related to tenderness. Thus, the prediction equation did not estimate tenderness accurately. In the earlier study of steers and heifers, a prediction equation was quite accurate for evaluating tenderness therefore it was thought that tenderness could be predicted in this study. The low relationships between the characteristics studied and tenderness can be partially explained by the fact that there was little tenderness variation in the bulls and failure of taste panel tenderness scores to correlate with Warner-Bratzler shear forces.

One very encouraging and important aspect of this study was that carcass grade could be predicted with high accuracy. A prediction equation accounted for 78% of the variation in carcass grade. The prediction equation used was: Y=11.67 + 1.32 (ether extract) + 7.19 (HEPES extractable protein fraction) + 0.15 (texture score) -0.15 (moisture percentage) + 0.67 (0.35 M KCl extractable protein fraction).

Table 9. Means of Warner-Bratzler shear force, taste panel evaluation, marbling score and U.S.D.A. grade.

	Warner-Bratzler[A] shear force (lb.)	Taste panel[B] tenderness	Taste panel[B] acceptability	Marbling score	U.S.D.A. Grade
Steaks from 21 Hereford Bulls	7.33	4.96	5.15	Slight-	Good-
Steaks from 20 Steers and Heifers	6.55	5.33	5.19	Modest	Choice

A Pounds of force required to shear through a ½ in. core of meat. A lower shear force= more tender.

B Score of 1=extremely undesirable, 2=undesirable, 3=moderately undesirable, 4=acceptable, 5=moderately desirable, 6=desirable, 7=extremely desirable.

Post-weaning Performance of Calves as Affected by Longstem Hay and Pre-weaning Creep Feeding

Gary Greathouse and E. F. Smith

Mortality in calves at weaning is one of the major problems in the beef industry. Some relief from this problem might be achieved if the calves could be changed from milk and grass to a high energy ration with little lapse in time. Many ranchers do not have adequate equipment, labor or time to do this job on the ranch where it could best be done. If a post-weaning management system could be formulated that would be acceptable to the producer of the calves and reduce death and sickness it would be of tremendous benefit. Many local feed companies are in a position to deliver complete rations to a self-feeder in the owner's lot. The management system proposed here would enable the rancher to use this service.

The objectives of this test were to: 1. Determine if there was any advantage to introducing the ration to the calves prior to weaning; 2. Determine if it is necessary to feed hay to calves with a ration of 40% ground sorghum grain and 60% dehydrated alfalfa crumbles.

Cows and their 1969 calves were sorted into two pastures. Calves in one pasture had access to 60% dehydrated alfalfa crumbles and 40% ground sorghum grain for two months before weaning. The 28 calves on the creep feed consumed 400 lbs. during the two months. All other treatments were alike for both groups.

When weaned, the calves were moved to drylot and divided into four groups. Half of those on the creep feed continued on it. The other half received the creep feed plus alfalfa hay and prairie hay free choice. Similarly, half of those not creep fed received the creep alone; the other half received it plus longstem hay free choice.

Results

Results are reported in table 10.

There appeared to be no beneficial effect on performance after weaning when the calves were creep fed in the pasture, however, the amount of creep consumed in the pasture was relatively low. There were essentially no differences in feed consumption, average daily gain, or feed required per pound of gain during the 35 days after weaning.

Longstem hay with sorghum grain and alfalfa crumbles increased total feed intake without increasing average daily gain, which decreased feed efficiency. No harmful effects nor digestive disturbances were observed when longstem hay was omitted from the ration.

None of the calves under any treatment became sick or needed medical treatment.

Table 10. Post-weaning Performance of Calves as Affected by Longstem Hay and Pre-weaning Creep Feeding

August 26 to September 30, 1969 - 35 days

	CREEP IN PASTURE		NO CREEP IN PASTURE	
	Mixture & hay	Mixture	Mixture & hay	Mixture
Number of head	14	14	23	24
Avg. feed per day, lbs.				
Mixture; self-fed:				
Grain	3.5	4.3	3.8	4.1
Alfalfa crumbles	5.2	6.4	5.7	6.1
Alfalfa hay	1.8	---	1.8	---
Prairie hay	2.1	---	1.8	---
Total, lbs.	12.6	10.7	13.1	10.2
Avg. weight at weaning, lbs.	334	328	365	349
Avg. weight 35 days after weaning, lbs.	396	393	429	415
Avg. daily gain, lbs.	1.8	1.9	1.8	1.9
Avg. feed consumed per pound of gain, lbs.	7.1	5.7	7.2	5.4

Urea and Soybean Meal Compared for Cows on Winter Bluestem Pasture 1968-1969 (Project 253)

R.W. Swanson and E.F. Smith

This test compared urea supplement (hand-fed), urea supplement (self-fed), and soybean meal (SBM) supplement (hand-fed) with cows on winter bluestem pasture. The supplements were formulated to supply the same amount of protein and total digestible nutrients. Salt was fed free choice with the hand-fed supplement.

The self-fed supplement presented many problems because limiting intake of the supplement to 3.0 lbs. per head per day required from .30 lb. to .85 lb. of salt per head per day.

Supplement compositions are shown in table 12; test results, in table 11.

The SBM supplement was superior to the urea supplements in maintaining cows' weight, percentage of calves weaned, and percentage of cows breeding back.

Self-feeding the urea supplement produced lighter calves and fewer cows breeding back than did hand-feeding the urea supplement.

Table 11. Results From Supplementing Winter Bluestem Pasture with Indicated Supplements

	Urea supplement	Urea self-fed	Soybean meal supplement
1968-Fall cows' wt., lb.	869	826	864
1969-Spring cows' wt., lb.	598	574	655
1969-Fall cows' wt., lb.	939	898	937
1969-% Calf crop weaned	87.5	87.5	91.7
1969-Adj. calf weaning wt., lb.	408	365	396
1969-% Cows bred	95.8	87.5	100

Table 12. Composition of Indicated Supplements

Urea supplement, lbs.		Urea self-fed, lbs.		Soybean meal supplement, lbs.	
Sorghum grain	940	Sorghum grain	625	Sorghum grain	655
Urea	42	Urea	28	SBM	327
Dicalcium phosphate	18	Dicalcium phosphate	12	Dicalcium phosphate	18
		Salt[1]	335		
	1000		1000		1000
Pounds of Supplement per cow daily	3.2		4.1		3.0

[1]Salt was used to limit consumption to 3 lb./head/day. Salt needed varied from .30 to .85 lb./head/day.

Protein, Salt, and Premix Aspects of All-concentrate Cattle Finishing Rations

G.M. Roth, E.F. Smith, and R.R. Schalles

This test was designed to study the following aspects of all-concentrate rations: (1) salt, (2) supplemental protein (3) self-feeding a protein and premix combination (4) a pelleted premix compared to a mash form, and (5) a repeat trial of soybean meal versus urea as a supplemental protein source.

Crossbred calves from Hereford dams and Angus sires, raised at the Grass Utilization Unit were used. Birth dates were known for all calves. They were brought up to an all-concentrate ration by self-feeding a mixture of 70 percent dehydrated alfalfa crumbles and 30 percent dry rolled sorghum grain. The sorghum grain was increased 10 percent every other day until (after about two weeks) the calves were on a diet of dry rolled, sorghum grain.

Four straightbred Angus, one bull, one steer weighing 980 pounds, and one heifer weighing 548 pounds, were removed from the original 79 head, leaving 72 test animals.

The cattle were lotted (by randomized stratification) into two trials of six treatments each. Each treatment contained six animals averaging 697 pounds and 525 days of age at the time the test was begun. The cattle were weighed every 28 days, always at the same time and in the same order.

A heifer in treatment 1 died of viral pneumonia shortly after the test was begun. The feed she had consumed was subtracted and her data removed from the test.

The ration compositions and performance data are shown in Tables 13, 14 and 15. Data from trials 1 and 2 were summarized together as there were no significant differences between trials in any of the data.

Discussion

Based on the data collected, the only difference between treatments of statistical significance involved the pelleted premix treatment. The rate of gain for it was significantly lower than any other treatment. Decreased rate of gain resulted from decreased feed consumption rather than from inefficient feed utilization.

Salt is necessary in the animal diet primarily as a source of sodium. When the diet is deficient in sodium, the level of sodium excretion drops because the kidneys can do an excellent job of conserving it. When the animal has a normal body level of sodium, it may take several months to show a deficiency. Animals receiving no salt performed normally on this 84-day trial.

The protein requirement of cattle of this size and age is usually estimated to be about 10 percent of the total ration; enough to insure good performance allowing for variation in feed ingredients. Sorghum grain used in this experiment was 9.7 percent protein on a 90-percent dry matter basis. Cattle receiving no supplemental protein performed normally.

In regard to the treatment with the various ration components separately self-fed, it was originally intended to separately self-feed sorghum grain and a mixture containing the salt, premix, and protein supplement. The ratio of soybean meal to urea in the protein supplement portion of this mixture was designed to be the factor used to control intake. It was found that when the mixture was formulated to contain 0.5 percent salt of the total ration. The salt exerted a limiting influence on consumption of the mixture. It soon became necessary to take the salt out of the mixture and to feed it free choice in a separate feeder. The cattle consumed .23 percent of their total diet as salt when it was fed free choice. After removing the salt, it was relatively easy to stabilize intake by using only a mixture of soybean meal and premix. The premix seemed to be unpalatable enough to limit consumption. A mixture of 72 percent soybean meal and 28 percent premix was soon found to give the desired intake of both ingredients so this mixture was used throughout the remainder of the test, with little day-to-day variation in intake. Cattle on that ration and those on the control ration performed almost identically.

The feed cost was high for both groups, reflecting the price differential between soybean meal and urea as a source of supplemental protein.

The comparison of soybean meal and urea as supplemental protein sources showed no significant differences. This was in agreement with previous work.

Table 13. Protein, Salt, and Premix Aspects of All-concentrate Cattle Finishing Rations Ration Composition

Ingredient, lbs.	1	2	3	4	5	6
Dry, rolled sorghum grain	1920	1930	1920	1940	1812	Free choice
45% nitrogen urea	20	20	20			
Salt	10		10	10	10	"
Mash form premix	50	50		50	50	
Pelleted form premix			50			
44% C.P. soybean meal					128	
Mixture of 71.7% soybean meal & 28.3% premix mash*						"
TOTAL, lbs.	2000	2000	2000	2000	2000	

*This is the mixture at which the intake of premix was nearly equal to that of animals in the control group, treatment 5.

Premix, lbs.

20.0	Ground limestone
1.0	Trace mineral premix
0.5	Stilbestrol premix, 2 gm/lb
0.3	Vitamin A premix, 10,000 I.U./gm
0.8	Aureomycin premix, 10 gm/lb
27.4	Finely-rolled sorghum grain
50.0	

Table 14 Protein, Salt, and Premix Aspects of All-concentrate Cattle Finishing Rations

Performance Data
2-9-69 to 10-1-69, 84 Days

Treatment Description	1 Urea control	2 No salt	3 Pelleted premix	4 No-protein supplement	5 Soybean control	6 Free choice
No. of steers	7	7	7	7	7	7
No. of heifers	4	5	5	5	5	5
Av. initial wt., lbs.	717	690	689	686	704	698
Av. final wt., lbs.	955	956	916[1]	958	970	970
Wt. gain, lbs.	238	266	227	272	266	272
Av. daily gain, lbs.	2.8	3.2	2.7	3.2	3.2	3.2
Av. feed/head/day, lbs.	24.2	22.2	20.8	22.8	22.9	23.2
Feed/cwt gain, lbs.	855	702	771	706	739	715
Av. carcass grade[2]	19.6	19.9	20.2	20.1	20.0	19.8
Av. yield grade[3]	2.9	2.9	2.8	3.1	3.1	3.0
Av. rib-eye area, sq. in.	12.58	12.29	11.51	12.29	12.25	11.95
Av. fat thickness, in.	1.07	0.74	0.83	0.99	0.92	0.96
NE /100 lbs. feed, megcal	84.7	85.2	84.7	85.6	83.8	85.8
NE /100 lbs. feed, megcal	56.5	56.8	56.5	57.1	55.9	57.2
Feed to meet maintenance, lbs.	7.92	7.88	7.92	7.84	8.02	7.82
Feed for production	16.31	14.36	12.93	15.01	14.91	15.33
Total NE , megcal	9.21	8.15	7.30	8.57	8.33	8.77
Expected ADG, lbs/day	3.64	3.31	3.01	3.46	3.37	3.53
Actual ADG / Expected ADG %	78	96	90	94	94	92

[1]Significantly less than all others at the .05 level.

[2]21 = Choice +, 20 = Choice, 19 = Choice -.

[3]Yield grades are 1-5 with 1 being the most desirable.

Table 15 Protein, Salt, and Premix Aspects of All-concentrate Cattle Finishing Rations

Economic Data

Treatment Description	1 Urea control	2 No salt	3 Pelleted premix	4 No-protein supplement	5 Soybean control	6 Free choice
Feed cost/ton[1],$	45.26	45.36	45.44	44.65	47.78	48.71
Feed cost/cwt gain,$	19.35	15.92	17.52	15.75	17.65	17.41
Yardage cost/cwt gain[2],$	1.76	1.58	1.85	1.54	1.58	1.54
Total cost/cwt gain,$	21.11	17.50	19.37	17.29	19.23	18.95
Animal cost/head[3],$	224.31	214.99	214.84	213.86	219.68	217.48
Feed cost/head,$	46.15	42.37	39.79	42.85	46.02	47.38
Yardage cost/head[2],$	4.20	4.20	4.20	4.20	4.20	4.20
Total cost/head,$	274.66	261.56	258.83	260.91	269.90	269.06
Return/head[4],$	276.88	260.96	250.54	258.88	268.89	264.24
Profit or loss/head,$	2.22	-.60	-8.29	-2.03	-1.01	-4.82

[1] Price includes $5/ton for processing; pelleting was an additional $5/ton.

[2] Yardage was 5¢/head/day.

[3] Based on Kansas City quotations July 9, 1969.

[4] Based on actual return; cattle sold on grade and yield basis.

Effects of Winter Nutrition Levels on Cow and Calf Performance

R.R. Schalles, Guy Kiracofe, C.L. Drake and C.N. Reves

Cow and calf performance under four winter-nutrition levels was compared using 34 cows the first year and 87 cows the second year. Cows were maintained on the same nutrition treatment both years with additional cows added the second year, Cows ranged from less than 2 to 11 years of age. Average calving date was early April. A total of 95 calves were included during the two years. Calves were weighed within 24 hours after birth and at monthly intervals from June to November. Cows were weighed each month. All cows were graded and calves were weaned and graded at the November weighing.

Winter rations consisted of: (Group 1) 3 lbs. alfalfa hay, 3 lbs, cracked sorghum grain, 1 1/2 lb. soybean meal; (Group 2) 3 lbs. alfalfa hay, 3 lbs. cracked sorghum grain; (Group 3) 3 lbs. alfalfa hay, 1 1/2 lb. soybean meal; (Group 4) 3 lbs. alfalfa hay, Each group of cows was wintered and summered in approximately 300 acres of native pasture.

Results and Discussion

Average November weight of cows 2 years old or less was 802 lbs.; 3-year-olds, 938 lbs.; and over 3-year-olds, 1046 lbs. Weights of 2-year-old cows varied little until after the cows calved. Heifers receiving only 3 lbs. of alfalfa hay weighed 83 lbs. less than those receiving 3 lbs. of alfalfa, 3 lbs. sorghum grain, and 1 1/2 lbs. soybean meal; and about 45 lbs. less than the other two groups. The difference was maintained throughout the remainder of the year. The same difference was seen in the 3-year-olds from November until the following summer when all groups reached quite similar weights. There was no significant difference in weights of cows over 3 years old, regardless of nutrition level.

Weight of calves differed most between those with 2- or 3-year-old mothers. Two-year-old cows on the highest level of nutrition (Group 1) produced the heaviest calves. Cows 3 years old wintered on 3 lbs. alfalfa hay and 1 1/2 lbs. soybean meal produced lighter calves than 3-year-old cows on the other nutrition levels.

Cows receiving only 3 lbs. alfalfa hay raised fewer calves, and required more services to conceive. Two-year-old cows had lower percentage calf crops than other age groups, with cows over 3 years having highest percentage calf crops.

Adding 3 lbs. of sorghum grain to the ration was superior to adding 1 1/2 lbs. soybean meal, basdd on calf weights and number of calves raised. That indicates that energy level was more critical than protein. Although performance of 3-year-old cows was similar on all rations, those receiving only 3 lbs. alfalfa gave poorest results.

Table 16. Average Cow and Calf Performance, Two-year-old Cows[a]

Group	1	2	3	4
Ration:				
Alfalfa	3 lbs.	3 lbs.	3 lbs.	3 lbs.
Milo	3 lbs.	3 lbs.		
SBM	1 1/2 lbs.		1 1/2 lbs.	

Time Data	Cow	Calf	Cow	Calf	Cow	Calf	Cow	Calf
Starting grade	11.5		11.7		12.0		12.0	
Starting wt.	850		780		783		796	
December wt.	845		769		795		783	
January wt.	892		815		835		818	
February wt.	848		756		770		761	
March wt.	850		761		768		754	
April wt.	843	68[b]	743	67[b]	763	59[b]	731	64[b]
May wt.	790		755		752		707	
June wt.	823	160	774	129	793	114	724	119
July wt.	888	207	833	173	847	158	782	177
August wt.	920	286	875	232	871	226	815	231
September wt.	950	326	899	274	900	265	864	290
October wt.	948	368	913	304	895	295	862	321
November wt.	960	383	912	315	911	308	872	350
November grade	8	4	9	4	9	5		5
Number head	11.4	11.5	11.0	9.8	11.1	10.6		10.2

[a]All weights are in lbs. Grades 10 = average good, 11 = high good, 12 = low choice

[b]Birth weights

Table 17. Average Cow and Calf Performance of Three-year-old Cows[a]

Group	1		2		3		4	
Ration:								
Alfalfa	3 lbs.		3 lbs.		3 lbs.		3 lbs.	
Milo	3 lbs.		3 lbs.					
SBM	1 1/2 lbs.				1 1/2 lbs.			
Data	Cow	Calf	Cow	Calf	Cow	Calf	Cow	Calf
Starting grade	11.2		11.5		11.7		10.5	
Starting wt.	946		967		937		902	
December wt.	966		985		961		913	
January wt.	1023		1032		1005		950	
February wt.	972		965		946		888	
March wt.	987		956		919		891	
April wt.	971	72[b]	937	75[b]	931	68[b]	891	77[b]
May wt.	892		904		876		839	
June wt.	946	158	910	165	918	132	880	154
July wt.	1016	214	991	220	984	179	958	212
August wt.	968	292	1019	296	1038	253	1014	284
September wt.	1059	333	1038	332	1062	292	1049	335
October wt.	1053	375	1033	374	1074	328	1062	387
November wt.	1046	385	1025	396	1066	336	1048	398
November grade	11.2	11.7	11.6	11.6	11.4	11.1	11.6	12.0
No. head	9	8	13	13	10	8	9	6

[a] All weights are in lbs. Grades 10 = average good, 11 = high good, 12 = low choice

[b] Birth weights

Table 18. Average Cow and Calf Performance of Cows Over Three Years Old[a]

Group	1		2		3		4	
Ration:								
Alfalfa	3 lbs.		3 lbs.		3 lbs.		3 lbs.	
Milo	3 lbs.		3 lbs.					
SBM	1 1/2 lbs.				1 1/2 lbs.			
Data	Cow	Calf	Cow	Calf	Cow	Calf	Cow	Calf
Starting grade	12.2		11.6		11.9		12.2	
Starting wt.[b]	1084		978		1072		1049	
December wt.	1103		996		1064		1036	
January wt.	1154		1046		1099		1041	
February wt.	1076		980		1031		1003	
March wt.	1066		984		1009		1014	
April wt.	1066	76[b]	983	75[b]	1021	76[b]	983	75[b]
May wt.	1001		884		966		936	
June wt.	1033	169	932	163	989	168	1003	164
July wt.	1083	222	978	225	1061	225	1073	218
August wt.	1063	280	979	285	1071	291	1075	285
September wt.	1084	327	1010	334	1107	334	1117	347
October wt.	1075	361	1016	369	1088	369	1103	367
November wt.	1048	378	994	394	1085	374	1114	383
November grade	12.1	11.3	10.4	11.2	11.9	11.5	12.3	11.8
No. head	14	13	8	8	15	14	9	7

[a]All weights are in lbs. Grades 10 = average good, 11 = high good, 12 = low choice

[b]Birth weights

Using Simmental Bulls on Hereford Cows

Miles McKee, Robert R. Schalles and Keith O. Zoellner

Fourteen registered Hereford cows in the Kansas State University purebred teaching herd were mated artificially to the Simmental bull Capitaine #1236 in November and December, 1968. The 23 ampules of semen available were used on the first 23 Hereford cows to show estrus following November 20, 1968. Of cows inseminated, six calved as two-year olds, two as three-year olds, one at four years, two at five years, one at eight, and two at ten years of age. The two that calved at five years of age were sold prior to calving. Both calved unassisted but one calf was dead at birth. Only three of the remaining 12 cows calved unassisted. Some of those assisted might have calved unassisted. Early results indicated assistance was good management, as soon as it appeared to be needed.

Nine of the fourteen calves dropped would be considered representative of a normal range in Hereford color patterns and shade of red except for considerable white on the legs. Two would be considered red necks. Five had extra patches of white on their bodies.

Five of the fourteen calves were born dead or died shortly after birth. Three had fetal heart beats at birth and one breathed for about 15 minutes. One cow became partially paralyzed during calving. Another cow developed peritonitis and died 36 hours after delivering a dead calf.

Eight of the Simmental calves, five heifers and three bulls, have been grown at the University. Their mothers were wintered on dry bluestem pasture with supplemental protein cubes and alfalfa hay. The calves have not received creep feed. They were weighed March 7, 1970, after being held all day off feed and water.

The calves will be weaned about May 15. The heifers will be grown and developed with the purebred heifers at the University. Performance data, yearling weights, and 18-month weights will be collected. The heifers will be bred and kept in the University herd for further studies. The bulls will go on a 140-day post-weaning gain test for performance data. We plan to use the bulls in a breeding experiment to study use of crossbred bulls.

Information on the twelve cows that calved at the University is summarized in table 19.

All calves were sired by one bull. The two year old heifers inseminated were small, not well grown. Reports from other Simmental x Hereford crossbreeding programs indicate that sire and size of dam influence ease of calving.

Table 19. Data for twelve Simmental-Hereford cross calves dropped at Kansas State University, fall, 1969

Cow age (years)	Length of gestation (days)	Calving date	Sex of calf	Birth weight (lbs.)	Weight 3-7-70 (lbs.)	Wt./day of age	Color pattern	Remarks
2	286	9/3	F	72	---	----	Normal Hereford	Pulled, dead at birth
2	284	9/8	F	70	180	1.083	Normal Hereford	Pulled, difficult
2	288	9/9	M	86	---	----	White stripe down left heart girth	Pulled, heart beat, never breathed
2	292	9/10	M	88	---	----	Normal Hereford	Pulled, lived 15 minutes
10	290	9/11	F	78	335	1.893	Normal Hereford	Born unassisted
4	286	9/12	M	70	380	2.159	Body spotted with white	Pulled, easy
3	291	9/12	M	90	315	1.790	White stripe down body	Pulled, difficult
3	287	9/13	M	84	295	1.686	White stripe down body	Pulled
2	295	9/15	M	83	---	----	Normal Hereford	Pulled, difficult heart beat, no breath
8	282	9/15	F	73	300	1.734	Normal Hereford	Born unassisted
2	290	9/16	F	85	250	1.453	Normal Hereford	Born unassisted
10	284	9/21	F	87	390	2.335	Normal Hereford	Pulled
Average (all)	287.9			80.5	305.625	1.767		
Average (females)	286.0			77.5	291.0	1.700		
Average (males)	289.8			83.5	330.0	1.878		

Relationships Among Carcass Characteristics of Cattle Exhibited at Shows in the Midwest

Miles McKee, Robert R. Schalles, Mack Harris,
Keith O. Zoellner, Herman W. Westmeyer

Carcass data were collected from 24 carcass shows held throughout the Midwest, including eight county shows in Kansas and one county show in Nebraska, seven years' results from the Kansas National Junior Livestock Show in Wichita, two years' results from the Midwest Steer and Carcass Show at Austin, Minn., two years' results from the St. Joseph Live Steer and Carcass Show, St. Joseph, Mo., and one-year results from AK-SAR-BEN, Omaha, Nebr.; Waterloo Carcass Show, Waterloo, Iowa; Hoosier Beef Show, Indianapolis, Ind.; and the 4-H Beef Carcass Summary, Nebraska State Fair, Lincoln, Nebr.

The shows were from 1962 through 1969. Gross data collected included live weight, carcass weight, USDA carcass grade, USDA carcass conformation score, dressing percentage, rib-eye area, rib-eye area/carcass hundredweight, fat cover at the 12th rib, fat cover/carcass hundredweight, percentage of kidney fat, percentage of lean cuts, marbling, maturity, carcass index, quality grade, and daily gain. Each show collected its data so data collected were not the same for each show. Table 21 shows the number of measurements taken, the average for each measure, and the standard error for each.

Carcass grade correlated highly (.886) with marbling, as is true with carcasses normally found in coolers. Squaring the simple correlation gives us a measure of the variation percentage in carcass grade due to marbling. Marbling accounted for 78% of the variation in carcass grade at the 24 shows studied.

The relationship between fat cover and carcass grade has been discussed in many ways at recent livestock shows. Here simple correlations involved were .272 for fat cover and carcass grade and .343 for fat cover and marbling, indicating that fat cover accounts for 14% of the variation in carcass grade and 12% of the variation in marbling. So 86% and 88%, respectively, of the variation in carcass grade and marbling are accounted for by factors other than fat cover.

Rib-eye area was negatively correlated with both fat cover and marbling. As fat cover increases, muscling, as related to rib-eye area, tends to decrease. Basically, the correlation between rib-eye area and carcass grade is zero. So, muscling can be increased in cattle without jepordizing carcass grade. The correlations between carcass conformation and rib-eye area and between carcass conformation and fat thickness are .202 and .347, respectively. Our present system of assigning carcass conformation scores, therefore, emphasizes fat more than muscling.

Fat cover accounted for only 14% of the variation in dressing percentage and rib-eye area, as an indicator of muscling, accounted for only 1% of the variation in dressing percentage. In nonshow cattle fat and muscle account for more variation, so dressing percentage in show cattle is a poor measure of net merit. The highest correlation between daily gain and any other measure was the correlation between daily gain and rib-eye area (.116). Observations reported here indicate that the steers exhibited by juniors or adults at carcass contests are not representative of normal steer populations. Measures are needed to help eliminate show animals that do not represent a normal population.

Simple correlations for indicated measurements are presented in table 20.

Table 20. Simple Correlations for Carcasses from 24 Midwest Shows

	Live weight	Carcass grade	Carcass conformation	Rib-eye area	Fat cover
Carcass grade	.026				
Carcass conformation	.154	.399			
Rib-eye area	.430	-.090	.202		
Fat cover	.162	.372	.347	-.249	
Marbling	-.009	.886	.330	-.130	.343

Table 21. Numbers, Means, and Standard Errors for Traits Measured on Carcass at 24 Midwest Carcass Shows, 1962-69.

Trait measured	Number of measures	Mean* (Average)
Live weight	1216	965±2.6 lb.
Carcass weight	1269	610±1.8 lb.
Carcass grade[a]	1192	10.6±.04
Carcass conformation[a]	592	11.5±.05
Dressing %	757	62.6±.1
Rib-eye area	1297	11.46±.04 sq. in.
REA/cwt. carcass	543	1.88±.01 sq. in.
Fat cover	1297	.60±.006 in.
Fat cover/cwt. carcass	543	.096±.001 in.
% kidney fat	676	2.9±.002
% lean cuts	758	49.7±.07
Marbling[b]	628	16.5±.18
Maturity[c]	345	1.8±.05
Carcass index	667	
Quality grade[a]	185	10.28±.12
Daily gain	80	1.96±.08 lb.

a 10 = low choice
11 = average choice
12 = high choice

b 16 = low modest
17 = average modest
18 = high modest

c 1 = A^-
2 = A^o
3 = A^+

* ± indicates standard error

Research in Progress:

Air Structure for Feedlot Cattle

David Ames and Calvin Drake

Climatic variables have a drastic impact on the performance of beef cattle. Maximum efficiency can be expected at a thermoneutral effective temperature[1]. When ambient temperature falls far below the thermoneutral zone for a beef steer, large quantities of energy are required to maintain body temperature. This of course, lowers efficiency by lowering net energy available for production. When the ambient temperature rises above the thermoneutral, feed intake drops, energy is used in panting and sweating and again net energy for production is reduced. The thermoneutral zone for cattle is approximately 50°F and varies somewhat with external insulation (hair coat). Small deviations in effective temperature (± 20°F) have little effect on energy needed to maintain body temperature. However, effective temperatures far below or far above the thermoneutral zone significantly lower animal efficiency. Obviously, beef cattle would benefit from temperatures maintained within 20°F of the thermoneutral zone. With this in mind, a confinement system using an air structure to buffer the ambient environment was initiated.

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1 Effective temperature is defined as the combination of dry bulb temperature, humidity, and air velocity expressed as equivalent still air temperature.

Comparison of Biuret and Soybean Meal for Wintering Cows on Bluestem Pasture (Project 253)

H.A. Thyfault, E.F. Smith and L.H. Harbers

Biuret, a non protein nitrogen compound, has shown promise as a protein substitute for ruminants fed poor quality roughages. Urea, by comparison, cannot be used without an adequate supply of energy in the form of either grain or molasses. Biuret is not broken down to ammonia so rapidly as urea is. Biuret, therefore, is less toxic than urea.

Studies were initiated in December, 1969, with cows grazing dry bluestem pasture to compare soybean and biuret as protein sources for wintering pregnant cows.

Methods

Experiment I. Forty-eight 5 year-old cows were initially divided into two groups of 20 and 28 animals to uniformly stock two pastures. Each group was further divided for hand feeding of (1) a soybean-sorghum grain mix and a (2) biuret-sorghum grain mix (table 22). The rations were isonitrogenous and isocaloric. The cows were hand fed in lots each morning. Animals had access to water, salt mixture (table 23), and pasture the remainder of the day. Data on monthly cow weights, birth date and weight of calf, weaning weight, and conception rates are being recorded. The experiment will continue through the spring and summer.

Experiment II. Twenty cows were randomly divided into two equal pastures and supplemented with 3.3 lbs. sorghum grain per day plus vitamins (table 1). Biuret [1] was added in a separate salt mixture (table 2). Data collected are the same as those in Experiment I. In addition, mineral mix consumption was determined and expressed per head per day.

Results

Monthly weights of cows are given in figure 1. The complete supplements were designed to meet present NRC recommendations. As expected, cows fed the soybean-sorghum grain mixture gained approximately 0.3 lbs./head/day. Cows fed the biuret-sorghum grain mix lost approximately 0.2 lb./head/day.

The two groups fed biuret in the mineral mix (Experiment II) are not directly comparable because of the initially low mineral-biuret mixture intake; however, they received the same level of energy as those on the complete supplement (Experiment I). The first part of the experiment shows that additional protein was necessary as weight loss was greatest when mineral consumption was low.

Other researchers found that cows would consume the biuret-mineral mixture at 0.1-0.16 lb./head/day. Our data verify their conclusion (figure 2). By adding various amounts of ground sorghum grain, we increased consumption of biuret-mineral to 1.0 lb/head/day. After accepting the mix, the animals restricted their intake to 0.7 lb./day with no additional grain added to the mix. At that level, the animals were consuming 0.35 lb. biuret/head/day. That should supply the protein requirement if the NPN compound is synthesized to protein. The average salt intake was 51.5 grams per day; 45 grams is thought to be adequate.

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1 Kedlor - trade name for biuret -- supplied by Dow Chemical Company, Midland, Michigan.

Table 22. Composition of Complete Supplements Used in Experiment I

Component	Soybean	Biuret
Soybean meal, lb.	37.8	------
Biuret, lb.	------	8.1
Sorghum grain, lb.	62.2	91.9
Vitamin A, I.U.	6.70×10^5	6.62×10^5
Vitamin E, I.U.	670	662
Daily consumption, lb.	3.0	3.3

Table 23. Composition of Mineral Mixtures

Mineral	Experiment I	Experiment II
Biuret	00.0	50.0
Bone meal	65.3	32.4
Salt	33.3	16.2
Trace minerals	1.2	1.2
Sulfur	0.2	0.2

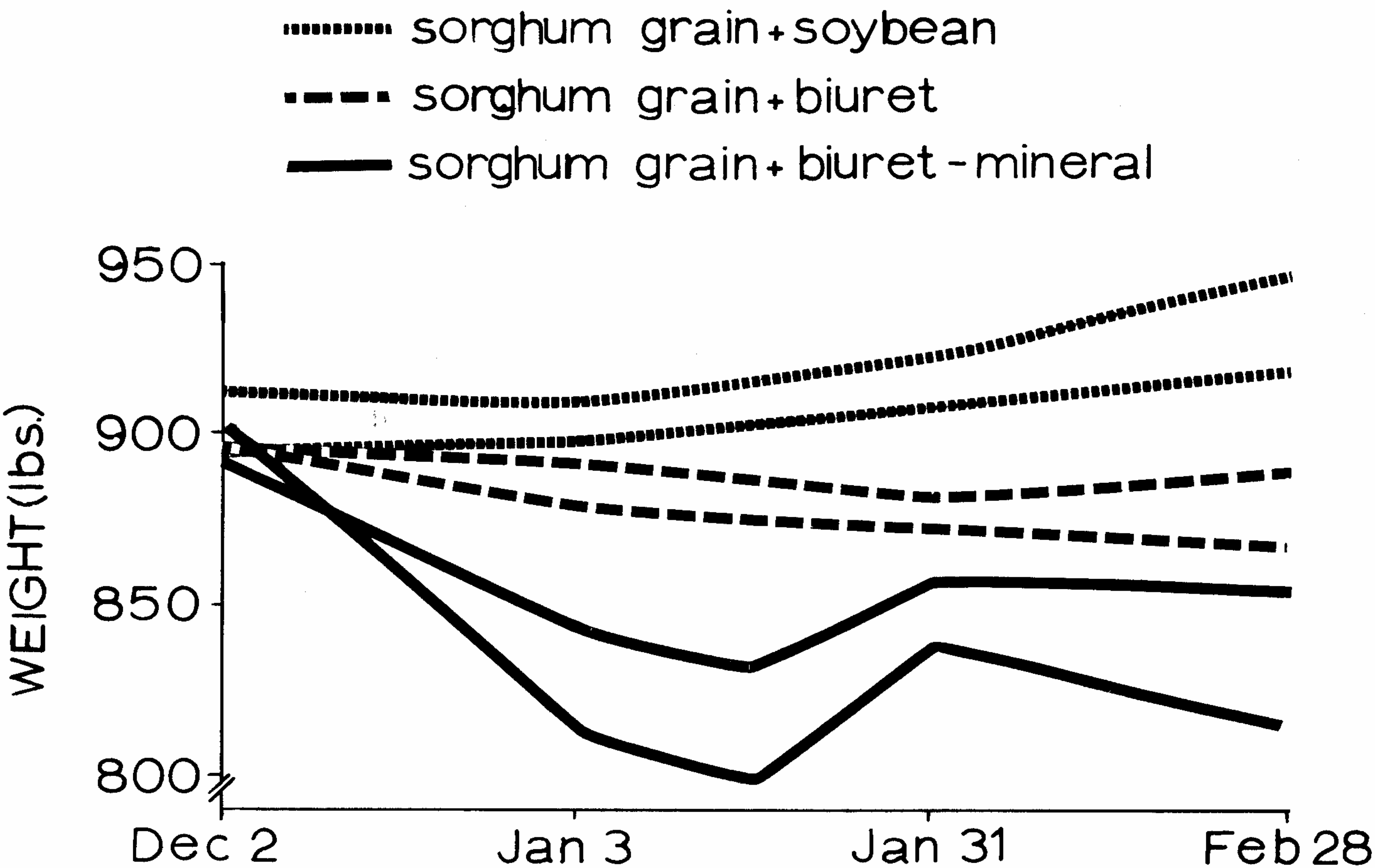
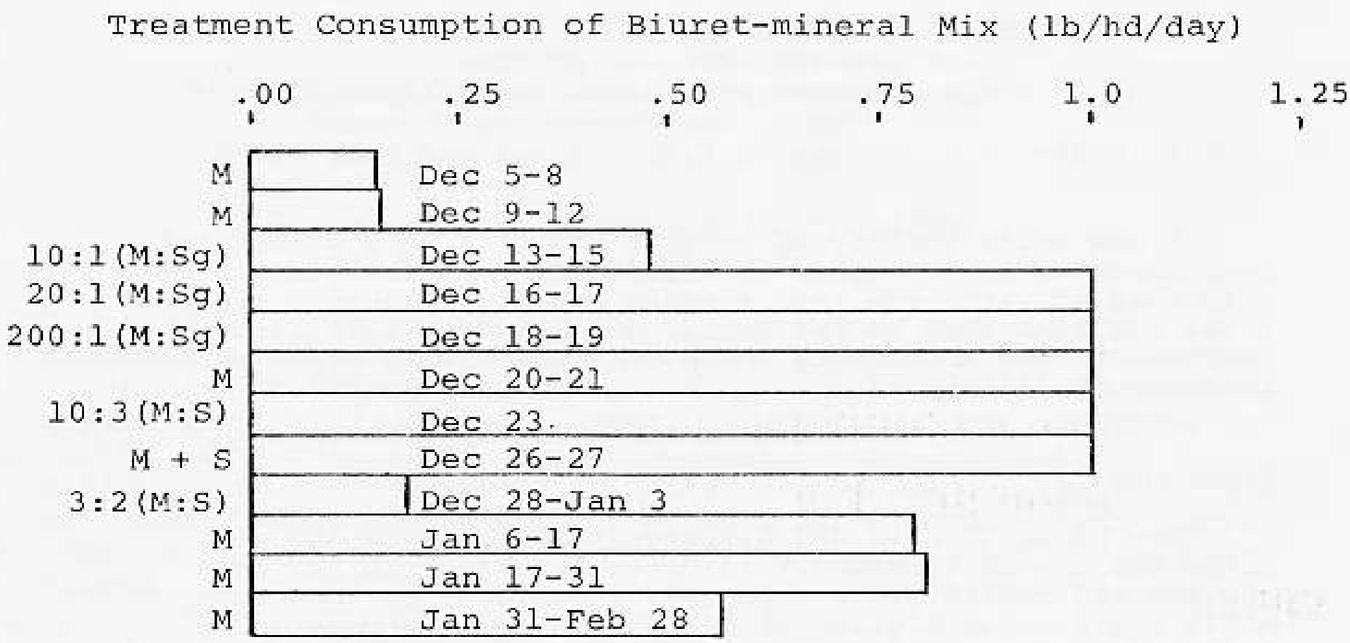
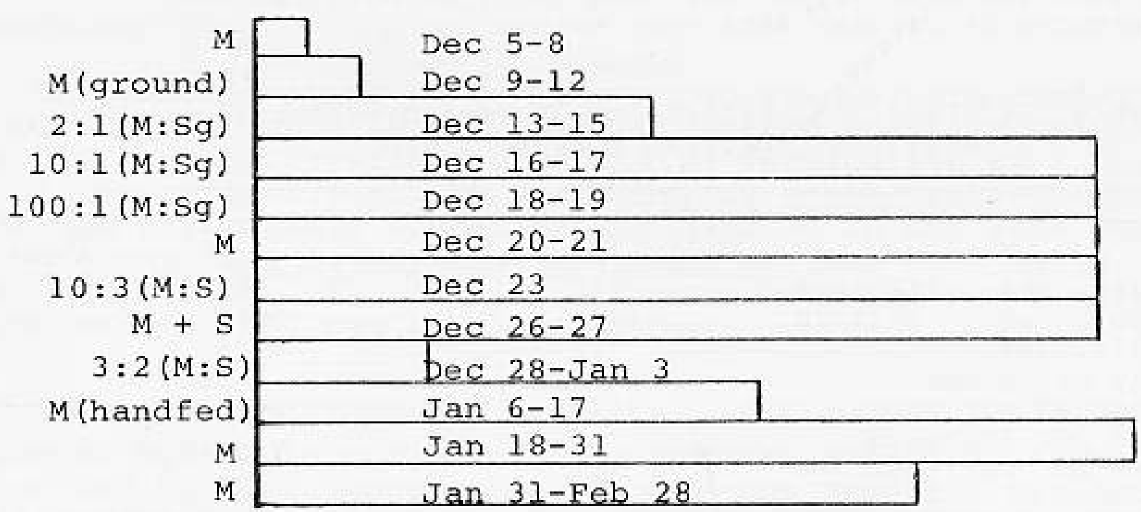


Figure 1

Weight Change of Cows Fed Soybean or Biuret



M---biuret mineral mix alone free choice
M:Sg---ratio of biuret mineral mix to fine ground sorghum grain
M:S---ratio of biuret mineral mix to salt
M+S---biuret mineral mix alone with salt offered separately



Group II (10 head)

Figure 2. Consumption of Biuret-mineral Mixture by Cows on Various Treatments

White Sorghum Grain (Funk's G766W) and Elevator-Run Red Sorghum Grain Compared For Fattening Cattle

C.L. Drake, V.P. Carlson[1], P.H. Wilson[2] and D.M. Allen

A new white variety of sorghum grain (Funk's G766W) has been reported to be higher in digestible dry matter and protein than elevator-run, red sorghum grain. A 120-day field trial was conducted on the George and Vernon Miller farm near Great Bend to compare the two sorghum grain types under feed-lot conditions.

Procedure:

One hundred Angus and Black-whiteface steers and six Angus heifers were randomly allotted by weight to two pens, and fed dry rolled grain from self-feeders.[3] Cottonseed hulls and sun-cured ground alfalfa were used to provide bulk and were removed gradually in 14 days. Ruff-tabs were then fed to provide the only source of roughage the remainder of the trial.

Results:

Feed-lot performance is reported in table 24. The only difference was in feed efficiency. Steers receiving white sorghum grain required .79 lb. less feed per pound of gain. Feedlot gain was over 3 lbs. per head daily on both rations. No differences in carcass data were noted.

Table 24. Feed-lot performance of fattening cattle receiving indicated sorghum grain

	White sorghum grain (Funk's G766W)	Elevator-run red sorghum grain
Av. weight, lbs., 11-24-69	648	650
Av. weight, lbs., 3-24-70	1020	1019
Total gain, lbs.	372	369
Av. daily gain, lbs.	3.10	3.07
Feed consumed per animal, lbs.	2528	2800
Lbs. feed per lb. gain	6.80	7.59
Feed cost per cwt. gain[a],$	$17.27	19.28

[a]Feed Cost of $2.54 per cwt.

[1]County Extension Agricultural Agent, Ellsworth county.
[2]County Extension Agricultural Agent, Barton county.
[3]Rations prepared and delivered by Great Bend Co-op.

Preliminary Investigations with Adapted Rumen Microorganisms[1] (ARM) for Fattening Beef Cattle

C.L. Drake, D.L. Good, R.R. Schalles
P.A. Hahn[2], O.D. Myrick, Jr.[2]

The use of rumen microorganisms is not new but neither is it a common practice. We used a product developed by W.R. Grace and Company in an attempt to reduce the "adaptation period" of cattle placed on a finishing ration. The adaptation response is believed to correlate with changes in microbial populations in the cattles rumen. Microbes that efficiently metabolize one type of diet, like forage, do not survive on a high grain diet. However, the multitude of microbes in the rumen includes types that help digest grain. When they increase until they dominate the rumen population, the adaptation period is complete.

Using artificial rumens and live animals, nutritionists have predicted changes that occur in the rumen during dietary shifts. So it is theoretically possible to preadapt rumen microbes in the laboratory to any combination of dietary factors. Thus, placing cattle on a high concentrate ration and simultaneously inoculating them with rumen microbes pre-adapted in the laboratory to high concentrations of grain should reduce the adaptation period. Treated animal's feedlot performance should exceed the performance of untreated animals.

Procedure:

One hundred straight and crossbred steers were randomly allotted to 20 pens of 5 head each. Adapted rumen microorganisms (ARM) were fed to each treatment group using vermiculite as a carrier and different levels of ARM with varying concentrate-to-roughage ratios were studied. Controls were handled in the same manner but were not inoculated with ARM. ARM was fed once daily for 3 days at the start of the trial. Steers used had previously been on pasture and had not received grain.

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1 Adapted Rumen Microorganisms and partial financial support were provided by W.R. Grace & Co., Washington Research Division, Clarksville, Md.

2 W.R. Grace & Co., Washington Research Center, Clarksville, Md.

The design of the 111-day trial follows:

Lot no.		Lot no.	
55-56	Control for lots 19-24	19-20	13% Silage, 87% concentrate 0.1 Normal level ARM
53-54	Control for lots 25-26	21-22	13% Silage, 87% concentrate Normal level ARM
51-52	Control for lots 27-28	23-24	13% Silage, 87% concentrate 3 x Normal ARM
49-50	Control for lots 29-30	25-26	25% Silage, 75% concentrate Normal level ARM
		27-28	35% Silage, 65% concentrate Normal level ARM
		29-30	45% Silage, 55% concentrate Normal level ARM

In all lots concentrate levels below 87% were increased every five days in this manner: 55-65-75-87%

Results:

At the end of the trial all but one lot of steers receiving ARM gained 3 to 7.8% more and were 0.1 to 5.9% more efficient in feed conversion than controls ($P<.05$). Little variation was observed in carcass data and founder did not differ among lots.

Discussion:

Inoculation with ARM was effective in this trial and another trial is in progress to study different methods of administrating ARM. It appears the greatest response will be in the slower gaining animals with less response in healthy fast gaining animals.

The Nutritive Value of Four Varieties of Sorghum Grain

(Project 567)

R.L. McCollough, C.L. Drake and K.F. Harrison

Introduction

In 1969, Kansas harvested 182,896,000 bushels from 3,266,000 acres of grain sorghum for a 56-bushel-per-acre average. Much of it is fed to beef cattle; therefore, it would be an economic advantage for both grain producers and cattle feeders to have a sorghum grain of superior feeding quality.

Work in Texas[1] has suggested that a new, white sorghum grain may be superior to red sorghum grain in nutritive value. We compared four varieties of sorghum grain for digestibility. Feedlot performance of cattle fed the four varieties is underway.

Materials and Methods

Three popular red varieties grown in Kansas were comparied with the new white grain. The varieties used were: Funk's G-766W[2], white; ACCO R-109[3], red over yellow endosperm; DeKalb E-57[4], red; Northrup King 222A[5], red.

Sorghum grain used to conduct a digestion trial in 1968 was purchased from local farmers. Four Hereford steers, weighing approximately 820 lbs. each, were used in a four-by-four latin square design to obtain digestion coefficients reported in table 25. They were fed an all-concentrate ration shown in table 26.

In 1969, a second digestion trial was conducted and an effort was made to reduce variety variation. June 9, 1969, approximately 7 acres each of four varieties were planted in the same field, at 7 pounds per acre in 36-inch rows. No consideration was given to individual company specifications for seeding rate. Weeds were controlled by rotary hoeing, field cultivating and spraying with 2, 4-D July 15. The field was hilled for irrigation and irrigated August 15. One hundred fifty lbs. N/A were applied preplant as anhydrous ammonia with 9 lbs. N, 22 lbs. P_2O_5, 16 lbs. K_2O, and 5 lbs. Zn supplied per acre as a starter fertilizer.

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1 Nishimuta, J.F., L.B. Sherrod and R.D. Furr. 1969. Digestibility of Regular, Waxy, and White Sorghum Grain Rations by Sheep. Proceeding, Western Section, American Society of Animal Science 20:259.

2 Supplied by: Funk Bros., Lubbock, Texas

3 Supplied by: Anderson, Clayton & Co., Belmond, Iowa

4 Supplied by: Dekalb Seed Co., Lubbock, Texas

5 Supplied by: Northrup, King & Co., Lubbock, Texas

All varieties were harvested November 16-19, 1969. Yield data are in table 27. The field loss was caculated by difference between actual grain harvested by combine and yield calculated by hand harvesting heads from 6 plots, per variety.

Results and Discussion

There were no significant differences in yield among the four varieties of sorghum grain. We did notice the Funk's G-766W was 3 to 4 inches taller, and lodged more at harvest time than the red varieties. Proximate analysis of the four sorghum varieties are presented in table 28.

Digestion coefficients did not differ significantly. When the cattle first started on feed, a difference in palatibility of varieties was noticed in both the feedlot and digestion trials. Less ACCO R-109 was consumed the first few days but after 7 days consumption was the same for all varieties.

Table 25. Digestibility Coefficients of Sorghum Grain

	Rations			
	Funk's 766W	ACCO R-109	Dekalb E-57	Northrup King 222A
Daily DM intake lbs.	10.91	9.94	10.03	10.49
Digestibility, DM basis%				
Protein	62.84	62.95	66.89	60.20
Crude Fiber	51.11	49.80	48.16	46.89
Ether Extract	58.18	52.80	60.26	61.31
Nitrogen Free Extract	78.90	80.52	79.89	79.21
TDN	75.66	76.51	76.86	75.73
Dry Matter	74.85	76.05	76.44	75.00
Gross Energy	73.25	73.75	69.75	71.75
Nitrogen Retention	.15	.05	.21	.12
Gross Energy Kcal/kg	4,541.00	4,520.00	4,511.00	4,541.00
Digestible Energy Kcal/gm	3,326.00	3,333.00	3.147.00	3,258.00

Note: No significant difference among any of digestion coefficients

Table 26. Ingredients in Pounds Per Ton of Ration

Ground limestone (38%)	8.42	
Vitamin A premix (10,000 IU per gm)	.33	(150 gm)
Chlorotetracyctine premix (10 gm/lb)	.71	(322.8 gm)
Trace mineral premix[1]	1.00	
Salt	20.00	
Sorghum grain[2]	19.54	
Total premix	50.00	
Rolled sorghum grain	1,950.00	
Total ration	2,000.00	

1 Percentages of indicated elements in trace mineral premix: Maganese 4.4%; iron 6.6%; copper 1.32%; cobalt .23%; iodine .30%; zinc 5%; magnesium 20%; sulfur 2.70%.

2 Grain varied with urea added to make rations isonitrogenous to 12% protein (dry matter basis)
Urea added, as percent of ration:
Funk's G-766W, .57%; ACCO R-109, .62%
Dekalb, E-57, .70%; Northrup King, 222A, .23%.

Table 27. Actual and Expected Yields of Sorghum Grains (Summer 1969)

Sorghum Grain Varieties	Funk's G-766W	ACCO R-109	DeKalb E-57	Northrup King 222A
Acre/field	6.2	7.8	9.3	6.3
Lbs./field	33,030.0	51,520.0	57,490.0	38,630.0
Moisture %	15.0	15.2	15.0	15.0
Test wt. (lbs./bu)	59.5	59.5	60.5	59.5
Bu/field (56/lbs./bu)	589.8	920.0	1,026.6	689.8
Bu/acre (as is)	95.1 (80.9)[1]	117.0 (99.2)	109.7 (93.2)	109.5 (92.5)
Expected yield (as is)[2]	114.7 (99.9)	132.7 (114.8)	118.6 (102.9)	111.1 (96.2)
Field loss bu/acre	19.6 (19.1)	15.6 (15.6)	8.9 (9.6)	1.5 (3.6)
Field loss %	17.1 (19.1)	11.8 (13.6)	7.6 (9.4)	1.4 (3.8)
Av. leaves/plant	8 to 9	8 to 9	9 to 11	7 to 8
Mature plant height in.	54-58	52-53	52-55	49-52

1 Parenthesis indicates 100% DM basis

2 Expected yield = grain harvested by hand from 20 ft. of a 36 inch row.
Calculation of expected yield:
43,560 sq. ft./acre, 60 sq. ft. or .00138 of an acre
1 ÷ .00138 = 726.005
726.005 ÷ 56 lbs./bu = 12.964
12,964X lbs. of grain/20 ft. = expected bu./acre

Table 28. Proximate Analysis of Varieties of Sorghum Grain

	Varieties							
	Funk's G-766W		ACCO R-109		Dekalb E-57		Northrup King 222A	
Dry Matter %	84.20		84.84		84.49		84.11	
Moisture %	15.98		15.16		15.51		15.89	
Protein (6.25) %	8.95	(10.58)[1]	8.90	(10.49)	8.59	(10.17)	9.95	(11.82)
Ether extract %	2.74	(3.26)	2.70	(3.18)	2.47	(2.92)	2.69	(3.20)
ASH %	1.29	(1.54)	1.43	(1.69)	1.33	(1.57)	1.33	(1.58)
Crude fiber %	1.55	(1.85)	1.80	(2.12)	1.58	(1.87)	1.57	(1.87)
Nitrogen free extract %	69.49	(82.77)	70.01	(82.52)	70.52	(83.43)	68.57	(81.52)
Starch %	64.97	(77.33)	67.06	(79.04)	66.13	(78.27)	64.73	(76.96)

1 Parenthesis 100% dry matter basis

The annual K.S.U. Swine Industry Day will be Thursday, October 1, 1970 at Weber Hall. Visitors are welcome at the swine research farm at any time. Groups will learn more by making arrangements in advance.