the silage and pellets in both the wintering and fattening phase. Results indicate that one should not expect to produce cattle grading higher than good with this type ration.

Table 26

Dehydrated grain sorghum pellets vs. grain sorghum silage in steer rations.

Wintering phase, December 2, 1958, to March 12, 1959—100 days.

Lot number	1	2
Number steers per lot	10	10
Av. initial wt., lbs.	415.5	416.0
Av. final wt., lbs.	550.5	552.0
Av. daily gain per steer, lbs.	1.35	1.36
Av. daily ration, lbs.:		
Alfalfa hay	4	4
Dehydrated grain sorghum pellets	7.65	
Grain sorghum silage		20.5
Soybean oil meal	.5	.5
Salt	.04	.02
Bonemeal-salt mixture	.09	.06
Av. feed per cwt. gain, lbs.:		
Alfalfa hay	296.3	294.1
Dehydrated grain sorghum pellets	566.7	
Grain sorghum silage		1511.0
Soybean oil meal	37.0	36.8
Salt	2.6	1.3
Bonemeal-salt mixture	6.3	4.5
Feed cost per cwt. gain	$17.59	$10.86

Fattening phase, March 13 to June 4, 1959—84 days.

Av. initial wt., lbs.	550.5	552.0
Av. final wt., lbs.	719.0	716.5
Av. daily gain per steer, lbs.	2.0	1.96
Av. daily ration, lbs.:		
Dehydrated grain sorghum pellets	17.5	
Grain sorghum silage		37.7
Soybean oil meal	1.0	1.0
Dehydrated alfalfa pellets	1.0	1.0
Salt	.07	.07
Bonemeal-salt mixture	.07	.07
Feed per cwt. gain, lbs.:		
Dehydrated grain sorghum pellets	873.6	
Grain sorghum silage		1924.0
Soybean oil meal	49.9	51.1
Dehydrated alfalfa pellets	49.9	51.1
Salt	3.4	3.8
Bonemeal-salt mixture	3.4	3.8
Feed cost per cwt. gain	$25.22	$13.09

Rolled vs. Finely Ground Pelleted Sorghum Grain in Cattle Rations. Project 567.

Progress Report

D. Richardon, E. F. Smith, B. A. Koch, F. W. Boren, and W. S. Tsien

This is a progress report of another test to further evaluate methods of sorghum grain preparation. Twenty of the heaviest steer calves purchased for experimental work were divided into two lots of 10 animals each. The daily ration is shown in Table 27. The only difference in the ration is that lot 3 received rolled sorghum grain and lot 4 finely ground pelleted sorghum grain. The gains and feed efficiency up to this time are essentially the same. The feed cost per 100 pounds gain is exactly the same. After completing the wintering phase, these animals will receive a fattening ration.

Table 27

Rolled sorghum grain vs. finely ground pelleted sorghum grain in wintering rations of steers.

December 3, 1959, to March 24, 1960—112 days.

Lot number	3	4
Number steers per lot	10	10
Av. initial wt., lbs.	560	562
Av. final wt., lbs.	762.5	768.5
Av. daily gain per animal, lbs.	1.81	1.84
Av. daily ration, lbs.:		
Atlas sorghum silage	28.5	27.5
Alfalfa hay	1.3	1.3
Soybean oil meal	1.0	1.0
Rolled sorghum grain	4.0	
Pelleted sorghum grain		4.0
Feed per cwt. gain, lbs.:		
Atlas sorghum silage	1578	1494
Alfalfa hay	73	72
Soybean oil meal	55	54
Rolled sorghum grain	221	
Pelleted sorghum grain		217
Feed cost per cwt. gain	$10.57	$10.57

Adapting Roughages Varying in Quality and Curing Processes to the Nutrition of Beef Cattle, 1959-60. Project 370.

Pelleted Alfalfa Hay and Dehydrated Pelleted Green Forage-type Sorghum in the Winter Ration of Heifer Calves

F. W. Boren, E. F. Smith, B. A. Koch, D. Richardson, and R. F. Cox

This is the second year of an experiment designed to compare the feeding value of alfalfa fed as long hay or coarsely-ground hay pellets, and forage-type sorghum fed as silage or dehydrated green forage sorghum pellets.

The hay and forage sorghum used were similar to that used in 1958-59 and described in Circular 371, page 41.

Fifty head of choice-quality heifer calves from the Jeff Ranch, Fort Davis, Texas, were used in this experiment. They were allotted, 10 head per lot, on the basis of live weight, and fed a winter ration as follows:

Lot 1. Five pounds alfalfa hay plus forage sorghum silage, free choice.

Lot 2. Five pounds alfalfa hay pellets plus forage sorghum silage, free choice.

Lot 3. Five pounds alfalfa hay plus dehydrated green forage sorghum pellets, free choice.

Lot 4. Five pounds alfalfa hay pellets plus dehydrated green forage sorghum pellets, free choice.

Lot 5. Five pounds dehydrated alfalfa pellets plus dehydrated green forage sorghum pellets, free choice.

Results and Observations

The results of this experiment are reported in Table 28. This table reveals the following:

1. Using lot 1, which received alfalfa hay and silage, as a control, the increase in average daily gain made by the heifers in lots 3, 4, and 5 was highly significant.

2. The percentage increase in average daily gain made by the heifers in lots 2, 3, 4, and 5 over lot 1 was 21, 32, 38, and 45, respectively.

3. Under the system of limiting alfalfa hay pellets to 5 pounds per head per day and feeding dehydrated pelleted green forage sorghum free choice, pelleted alfalfa hay affected the variability of gains between lots 24 percent, whereas the pelleted forage sorghum effect was 58 percent. Therefore, it was more advantageous to pellet the forage sorghum than the alfalfa hay under this feeding regime.

4. There was no significant difference between the gains made by the heifers in lots 4 and 5. This indicates that pelleted, sun-cured alfalfa hay and dehydrated alfalfa pellets will produce similar results under this type of feeding system.

5. There were no adverse effects of an all-pellet forage ration on heifers in lots 4 and 5.

6. The dry matter consumption was sharply increased when dehydrated pelleted green forage sorghum was fed.

7. There was no great difference in the dry matter required to produce 100 pounds of gain in lots 1, 4, and 5. Lots 2 and 3 required more dry matter to produce 100 pounds of gain than the other lots.

8. The average feed cost per cwt. gain increased as the dry matter consumption increased.

Table 28

The effect of pelleted alfalfa hay and dehydrated pelleted green forage-type sorghum[1] on the winter performance of weaning heifer calves.

Wintering—November 24, 1959, to March 15, 1960, incl.—112 days.

Lot number	1	2	3	4	5
Number heifers per lot	10	10	10	10	10
Av. initial wt. per heifer, lbs.	455	451	450	451	452
Av. final wt. per heifer, lbs.	592	592	603	612	618
Av. gain per heifer, lbs.	117	141	153	161	169
Av. daily gain per heifer, lbs.	1.04	1.26	1.37[2]	1.44[2]	1.51[2]
Percentage increase in av. daily gain		21	32	38	45
Av. daily ration per heifer, lbs.:					
Alfalfa hay	5.0		5.0		
Ground alfalfa hay pellets		5.0		5.0	
Sorghum silage[2]	21.8	26.8			
Dehydrated pelleted sorghum[3]			12.4	11.6	11.7
Dehydrated alfalfa pellets					5.0
Av. dry matter consumed per head per day	11.18	12.68	16.45	15.84	15.75
Percentage increase in dry matter consumption		1	47	43	42
Lbs. feed per cwt. gain:					
Alfalfa hay	479		366		
Ground alfalfa hay pellets		397		348	331
Sorghum silage	2085	2128			
Dehydrated pelleted sorghum					778
Dehydrated alfalfa pellets			904	808	
Av. dry matter required per cwt. gain	1074	1235	1204	1096	1051
Av. feed cost per cwt. gain[1]	$ 9.04	$10.88	$16.15	$14.97	$19.49

1. Feed prices may be found inside back cover.
2. Significantly ($p<.01$) greater than the gains made in lot 1.

Studies on Shipping Fever and Shipping Shrink in Cattle.

F. W. Boren, H. D. Anthony, D. C. Kelley, D. L. Nelson, E. F. Smith, and S. Wearden

This is a joint project between the Departments of Veterinary Medicine and Animal Husbandry financed in part by Smith, Kline, and French Laboratories, Philadelphia, designed to determine some basic facts related to shipping fever and shipping shrink in cattle and, in particular, weaned stocker calves.

Experimental Procedure

The calves used in this study were from Jeff Ranch, Fort Davis, Texas. They were gathered early October 21, 1959, weaned from the cows, loaded into trucks, and transported about 50 miles to loading pens in Alpine, Texas. They were group-weighed to determine a pay weight.

At this time, 50 head of heifer calves were randomly selected from the 175 heifers. The 50 heifers were then randomly assigned to two groups. Treatments for each group follow: (1) Control-calves injected intramuscularly with sterile saline; (2) calves injected with 25 mgs. per 100 pounds body weight of SKF 5354-A (Trifluomeprazine). The calves were individually identified with metal number tags. The following specimens were obtained in Alpine, Texas, from each calf: (1) Two nasal swabs; (2) body temperatures; (3) a blood sample. Citrated blood samples were examined at the hospital in Alpine to determine the leukocyte count and packed-cell volume. Blood was returned to Manhattan, Kan., for examinations.

The two groups of calves were then individually weighed, combined, loaded into one cattle car and shipped to Manhattan October 21. They were enroute 114 hours, being unloaded for hay and water at Gainesville, Texas, and Kansas City, Kan., before arriving in Manhattan (October 26), where they were group-weighed, hauled by truck to the Beef Cattle Experimental unit at Kansas State University, individually weighed, body temperatures taken, blood samples collected, and two nasal swabs obtained from each animal.

The heifers then were separated into two groups, irrespective of treatment, and placed in two lots. Subsequently, seven additional examinations, including temperatures, two nasal swabs, blood samples, and body weights, were made for each animal. The seven examinations were on days 1, 3, 5, 8, 11, 15 and 25 after the calves arrived in Manhattan. All calves were observed daily for symptoms of shipping fever.

The nasal swabs that were collected from the experimental calves were plated on tryptone blood agar plates. Special emphasis was placed on the isolation of Pasteurella organisms. Fermentation reactions were used to identify both Pasteurella multocodia and Pasteurella hemolytica bacteria.

Packed-cell volumes were determined for both the erythrocyte evaluations and the occurrence of hemoconcentration. White blood cells were enumerated. Blood films were prepared for differential leukocyte counts.

Serum samples were collected, identified and stored. These samples will be used for further comparative studies with serum samples that will be collected from a calf studied under identical environmental conditions.

Results and Observations

1. Shipping fever did not occur in any of the calves during the experimental period.
2. Pasteurella organisms were isolated from 33 of the 50 calves studied.
3. Number of leukocytes decreased in both the control and tranquilized groups of cattle between the 8th and 16th days.
4. The packed-cell volume of the control group remained significantly higher than the packed-cell volume of the tranquilized group during the test period.
5. Tranquilizer used in this study did not significantly decrease shrink. Average shrink of the treated group was more than the control group (9% vs. 8%), not statistically significant. The average shrink of the 299 head of calves, which were mates to the test group, was 9.32%. This was very close to the shrink encountered in the group of calves on the experiment. Physical treatment the calves on experiment were subjected to in the collection of data apparently did not affect total shrink.

6. It required 7 to 9 days for the control group to regain original average weight, whereas, the tranquilized group required 12 to 15 days to return to original weight.

The Effects of Shade and Hormone Implant on Fattening Yearling Heifers, 1959; and a Three-year Summary, 1957-1958-1959.

F. W. Boren, E. F. Smith, B. A. Koch, D. Richardson, and S. Wearden

This is the third year of an experiment designed to study the value of shade for beef cattle under Kansas conditions. The experiment was designed also to study the effects of Synovex heifer implant (20 mgs. estradiol benzoate and 100 mgs. of testosterone) on the performance of heifers in drylot with and without shade. One lot of heifers having no shade was implanted with Rapigain Implant Paste (20 mgs. estradiol, 60 mgs. testosterone, and 60 mgs. progesterone). Synovex and Rapigain implants were furnished by Squibb and Sons. Two previous tests are reported in Circulars 358 and 371.

Experimental Procedure

Fifty head of Hereford heifers averaging 607 pounds per head were used in 1959. They were placed in five lots, 10 head per lot, on the basis of live weight and previous treatment.

The heifers were on test from May 14, 1959, to October 1, 1959 (140 days). At the beginning of the experiment the heifers were consuming 8 pounds of sorghum grain, 1 pound of soybean meal, and 5 pounds of alfalfa per head daily. They were rapidly brought to a daily ration composed of all the sorghum grain they would consume, 1 pound of soybean meal, and 5 pounds of alfalfa hay. At the termination of the test, the heifers were sold on the central market at St. Joseph, Mo.

The shade structures used were the same as described in Circular 371, page 36.

One lot of heifers having access to shade, and one lot of heifers having no shade, were implanted at the beginning of the feeding trial with one Synovex hormone implant as described above. One lot having no shade was implanted at the beginning of the experiment with Rapigain Paste implant.

Results and Observations

Table 29 shows the results of this experiment.

1. Shade improved the average daily gain of nonimplanted heifers 0.23 pound more per head daily than those without shade; however, shade improved the average daily gain of implanted heifers only 0.04 pound per head daily. This is the reverse of 1958 when greatest response to shade (0.12 pound per day) was with the implanted heifers.
2. Synovex heifer implant increased average daily gain of the heifers without shade 0.15 pound per head daily; however, there was no increase in average daily gain of implanted heifers with shade.
3. The combined effects of shade and Synovex heifer implant resulted in a 0.19-pound increase in average daily gain.
4. Heifers with shade and not implanted were the most efficient in feed utilization. They required about 100 pounds less total feed per cwt. gain than the nonimplanted heifers without shade.
5. Synovex heifer implant improved feed efficiency in the no-shade lot, but the reverse occurred in the shaded, implanted lot, the shaded nonimplanted heifers requiring less feed per cwt. gain.
6. Shade did not increase the feed efficiency of implanted heifers.
7. The feed cost per cwt. gain followed the same trend as the feed required per cwt. gain. The shaded, nonimplanted heifers made least cost per cwt. gain. Shade and implant heifers produced 100 pounds of gain for about $1 per cwt. less than the nonimplanted heifers without shade.
8. The selling price per cwt. was the same for all lots.
9. The heifers in lot 3 had an average carcass grade of low good; whereas, average carcass grade of the other lots was average good. The increase in carcass grade of lot 4 over 3 indicates that shade compensated for the decrease in grade due to the implant.

10. In lots 3, 4, and 5 the average square inches of ribeye was greater, apparently because these heifers were implanted and also were heavier at market time.
11. There was no difference in average fat thickness at the 12th rib among various lots.

Three-year Summary, 1957-1959

Table 30 presents a three-year summary of the effects of shade and hormone implant on fattening yearling heifers. In each of the three years the test was conducted 140 days during June, July, August, September, and October.

Results and Discussion

1. Shade, irrespective of implant, produced an increase in average daily gain that was significant ($p<0.05$).
2. The increased total gain per head due to shade was 17.4 pounds.
3. Implant, irrespective of shade, produced a significant ($p<0.05$) increase in average daily gain. This increased average daily gain resulted in the implanted heifers being 25.5 pounds heavier at market time.
4. Both shade and implant were responsible for more efficiency of production, requiring less feed per cwt. gain.
5. Carcass grades of implanted heifers were significantly lower ($p<0.05$) than nonimplanted heifers; however, not enough to cause a price difference, since the carcass grade difference was between average and high good (within grade) and not between high good and low choice (between grade).
6. Shade had no influence on carcass grade.
7. Implant and/or shade had no influence on the average fat thickness at the 12th rib.
8. Shade did not significantly affect size of ribeye; however, implant heifers had a highly significant ($p<0.01$) greater area of ribeye muscle at the 12th rib.
9. If cattle of the grade produced in this study sell for $25 per cwt., the shade would result in a $4.35 per head increase in returns over nonshaded cattle. Using this same liveweight price, $25 per cwt., the implant would result in a $6.37 per head increase in returns over nonimplanted cattle. The combined increase in returns due to shade and implant would be $10.72 per head.
10. The between-year difference in average daily gains of the shaded and/or implanted heifers was highly significant. It is difficult to explain why there was a year-to-year difference in the implanted cattle. The difference in average daily gain between years due to shade was apparently due to the great difference in the severity of the summer heat during the test period. If heat is severe, there could be a marked advantage in providing shade for feedlot cattle; however, if the summer is mild, the advantage of shade would be slight.

Table 29

The effect of shade and hormone implant[1] on fattening yearling heifers. May 14, 1959, to October 1, 1959—140 days.

Lot number	1	2	3	4	5
Number heifers per lot	10	10	10	10	10
Management	No shade	Shade	No shade implant[1]	Shade implant[1]	No shade implant[2]
Av. initial wt. per heifer, lbs.	606	608	605	607	608
Av. final wt. per heifer, lbs.	863	898	883	891	867
Av. gain per heifer, lbs.	257	290	278	284	259

1. Synovex heifer implant—20 mgs. estradiol benzoate and 100 mgs. testosterone. Squibb & Sons.
2. Rapigain Implant Paste—20 mgs. estradiol, 60 mgs. testosterone, and 60 mgs. progesterone. Squibb & Sons.