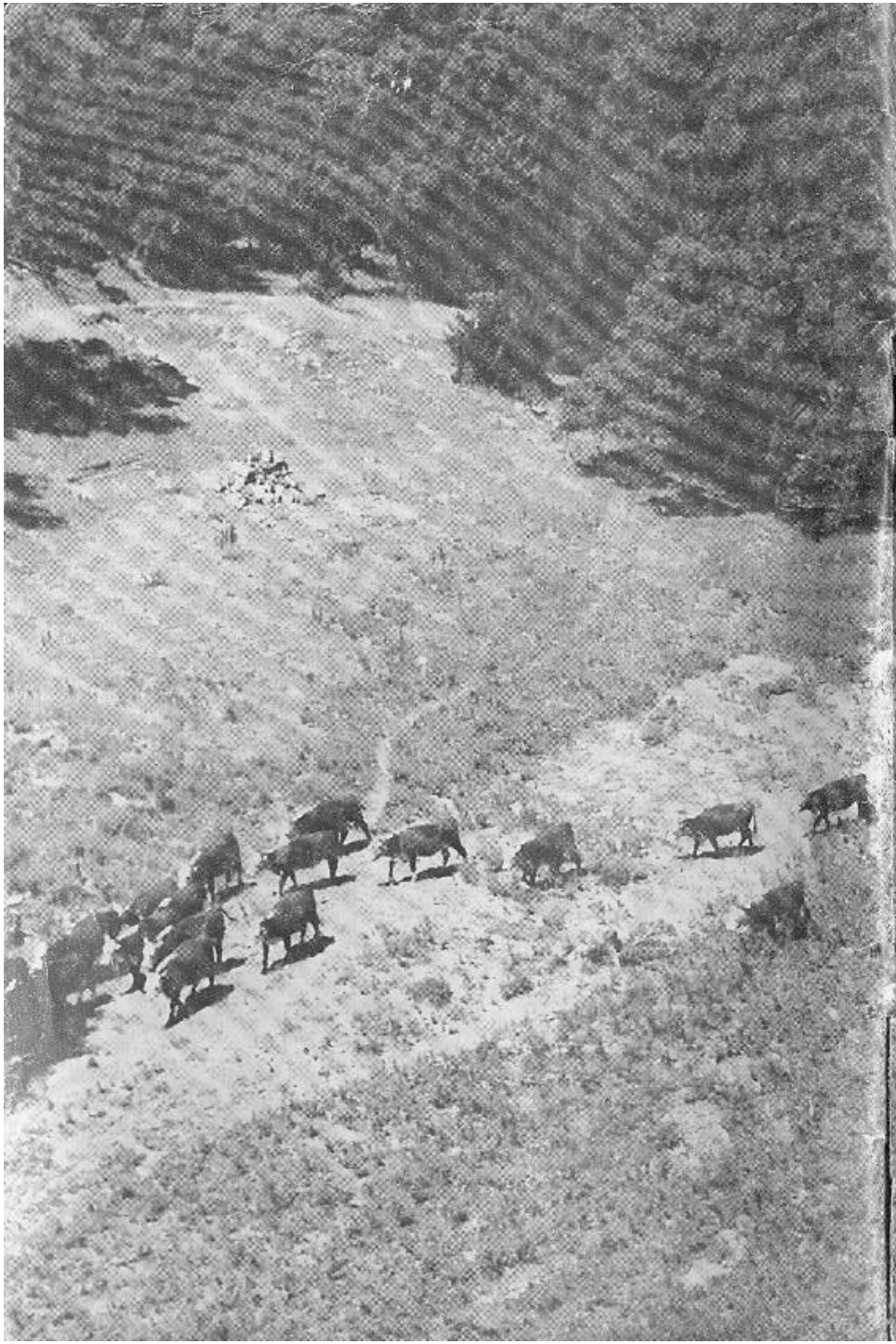
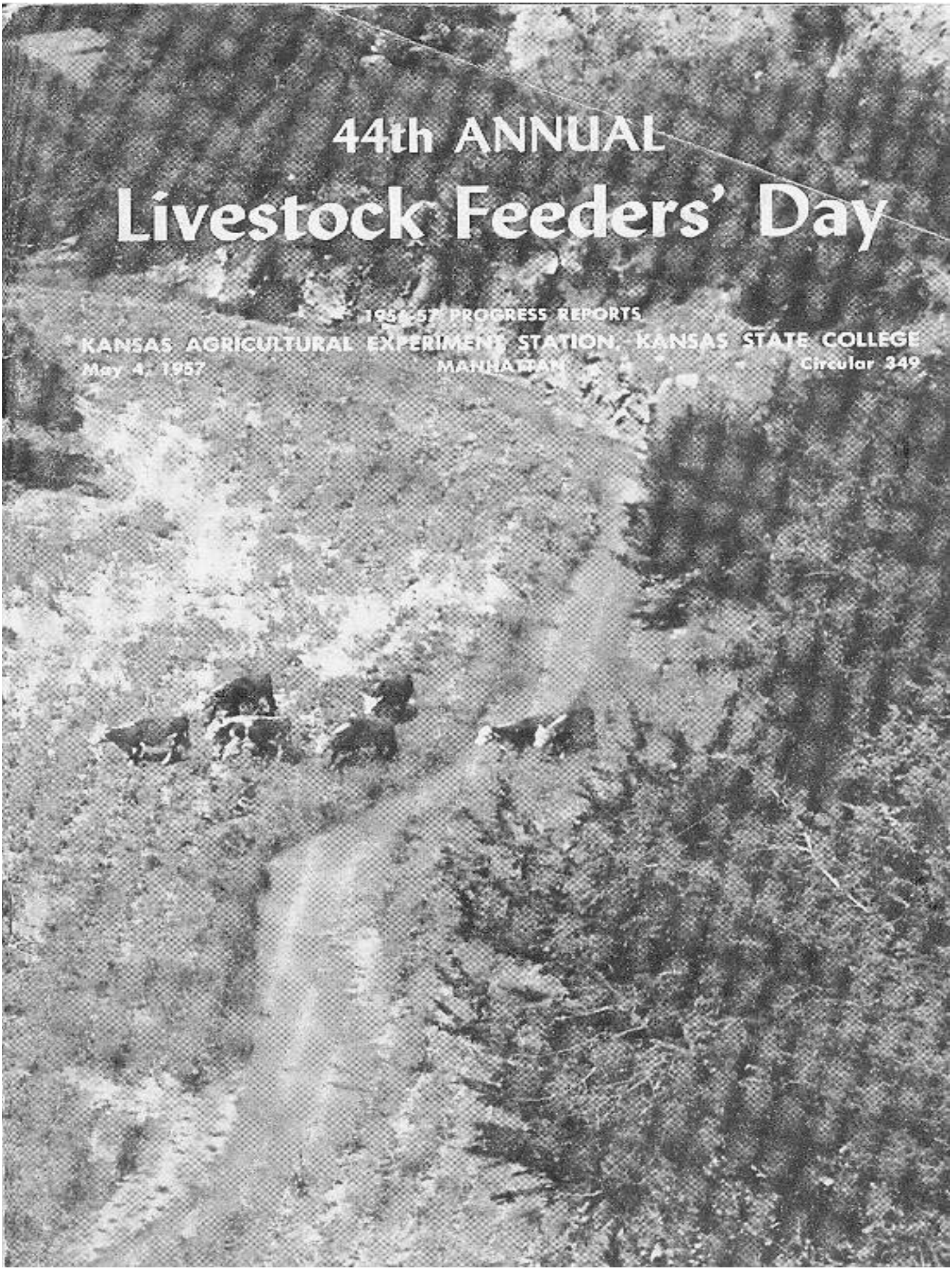


# 44th ANNUAL
# Livestock Feeders' Day

1956-57 PROGRESS REPORTS

KANSAS AGRICULTURAL EXPERIMENT STATION, KANSAS STATE COLLEGE
May 4, 1957 MANHATTAN Circular 349



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# 44th Annual Livestock Feeders' Day

## KANSAS STATE COLLEGE

### MANHATTAN, KANSAS

**SATURDAY, MAY 4, 1957**

**9:30 a.m.**—Inspection of livestock—breeding and experimental herds of cattle, sheep, swine and Quarter horses.

**11:00 a.m.**—Meeting Kansas Swine Improvement Association, Room 7, Waters Hall.

**11:30 a.m.**—Lunch—Served by Block and Bridle Club, Livestock Pavilion.

**1:30 p.m.**—Livestock Pavilion—Presiding, Richard W. Robbins, Pratt, Kansas, President, Kansas Livestock Association.

Presenting Distinguished Service Awards in Agriculture, Dean A. D. Weber.

Awards to Winners of Deferred Feeding, Feeder Calf and Creep-Feeding Performance.

Reports of Livestock Feeding, Breeding and Grazing Experiments.

Questions and Open Discussion.

**FOR THE LADIES**

**Friday, May 3, 1957**

**6:30 p.m.**—Dutch Treat Dinner, Gillett Hotel.

Kansas Cow Belles and Visiting Ladies (Make reservations in advance with Mrs. C. W. McCampbell, Manhattan, Kansas).

**Saturday, May 4, 1957**

**10:00 a.m.**—Coffee—Room 11, Umberger Hall, by Animal Husbandry Wives.

**11:30 a.m.**—Lunch (See above).

**1:30 p.m.**—Room 11—Umberger Hall.

Presiding—Mrs. Lee Perkins, Richmond, President, Kansas Cow Belles.

Introduce Yourself to Food Additives:
Miss Louella Franks
Mrs. Martine Ferguson
Mrs. Patricia Burton

**6:30 p.m.**—Block and Bridle Banquet for students, their parents and visiting stockmen and ladies.
Honoring Andrew Schuler, Sr., and M. C. Campbell.

Contribution No. 221, Department of Animal Husbandry; No. 583, Department of Agronomy; No. 555, Department of Chemistry; No. 13, Garden City Branch; No. 199, Department of Home Economics; No. 686, Department of Entomology, Kansas Agricultural Experiment Station, Manhattan.

# *Swine*

**The Comparative Value of Hand-watering Versus Self-watering Fattening Pigs on Sudangrass Pasture (Project 110, Test 1).**

**C. E. Aubel**

This experiment to compare two methods of watering pigs was conducted in the summer of 1956 with spring pigs on pasture.

Two lots of 10 pigs each were fed shelled corn and a mixed animal and plant protein supplement of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. Both lots were self-fed, free-choice, on sudangrass pasture.

The lots were on low ground; the sudangrass was of fairly good quality and sufficiently abundant for about 60 days. After that, because of the continued hot, dry weather, the pasture was scarcely more than would be ordinarily found in dry-lot feeding.

The hand-watered pigs were supplied water in a large, deep V-shaped trough. It was cleaned each day and fresh water put into it each morning, and as often through the day as was necessary to keep water before the pigs all the time. The trough had wooden strips placed over the top at about one-foot intervals to prevent the pigs from lying in the water.

The self-watered pigs got water from a well-filled barrel to which was attached a one-cup, self-watering device. Water was released into the cup by pressure of a pig's nose.

Table 2 gives the results of this experiment.

### Observations

There was little difference in the performance and behavior of the pigs watered by the two methods. The daily gains were only slightly greater in the self-watered group. The hand-watered group produced gains a little more efficiently than the self-watered pigs. The differences were small, about 3.5 percent.

It may be concluded from this experiment that if fattening pigs have free access to water, it will make little difference what method is used to supply it.

**Table 1**

**Hand-watering versus Self-watering Fattening Pigs on Sudangrass Pasture.**
June 13, 1956, to September 11, 1956—98 days.

| Ration fed | Hand-watered | Self-watered |
|---|---|---|
| Lot number | 1 | 2 |
| Number of pigs in lot | 10 | 10 |
| Av. initial wt. per pig | 56.90 | 57.40 |
| Av. final wt. per pig | 201.70 | 206.30 |
| Av. total gain per pig | 144.80 | 148.90 |
| Av. daily gain per pig | 1.47 | 1.51 |
| Av. daily gain per pig, lbs.: | | |
| Shelled corn | 4.36 | 4.60 |
| Protein supplement | .69 | .69 |
| Feed per 100 lbs. gain per pig, lbs.: | | |
| Shelled corn | 295.37 | 302.95 |
| Protein supplement | 46.96 | 45.60 |

**Free-choice Feeding of Shelled Corn and a Mixed Protein Supplement Compared with Feeding Completely Mixed Rations in Pelleted and Non-pelleted Forms to Pigs on Sudangrass Pasture (Project 110, Test 2).**

C. E. Aubel

In 1956 results of tests were presented to show what happened in winter dry-lot feeding of fattening pigs when fed free-choice and when fed a completely mixed ration. To follow this study on the best way to feed corn to growing-fattening pigs (shelled and fed free-choice with a good mixed protein supplement or fed in completely mixed rations as meal or in pellet form), three lots of pigs each were fed on sudangrass in the summer of 1956.

The lot 1 pigs were fed, free-choice, shelled corn and a mixed protein supplement of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. The supplement's crude protein percentage was 46. Lot 2 pigs were fed pellets of corn ground with the same protein supplement mixed 6 parts corn to 1 part supplement. This mixture had a protein percentage of 15 ½ percent. It was fed from 57 pounds, the pigs' starting weight, to 125 pounds. At 125 pounds the ratio of corn to protein was changed to 9 to 1, and fed pelleted to 225 pounds finish weight. The 9 to 1 pellets had a protein percentage of 14.69.

Lot 3 pigs were fed the same feeds and to the same weights as the lot 2 pigs, except that they got complete feed mixtures instead of pellets.

No antibiotic was fed in any of the lots.

Table 2 gives the results.

**Table 2**

**Free-choice Feeding of Shelled Corn and a Mixed Protein Supplement Compared with Feeding Completely Mixed Rations in Pelleted and Non-pelleted Forms to Pigs on Sudangrass Pasture.**

June 13, 1956, to September 19, 1956—98 days.

| Ration fed on sudangrass pasture ..... | Shelled corn, protein supplement | Pellets (complete mixture corn and protein supplements) | Nonpellets (complete mixture corn and protein supplements) |
|---|---|---|---|
| Lot number ..... | 1 | 2 | 3 |
| Number pigs in lot ..... | 10 | 10 | 10 |
| Av. initial wt. per pig, lbs. ..... | 57.40 | 57.40 | 57.30 |
| Av. final wt. per pig, lbs. ..... | 206.30 | 224.00 | 224.10 |
| Av. total gain per pig, lbs. ..... | 148.90 | 166.60 | 166.80 |
| Avv. daily gain per pig, lbs. ..... | 1.51 | 1.70 | 1.70 |
| Av. daily ration per pig, lbs.: | | | |
| Shelled corn ..... | 4.60 | ..... | ..... |
| Protein supplement ..... | .69 | ..... | ..... |
| Pellets ..... | ..... | 5.60 | 5.88 |
| Lbs. feed per 100 lbs. gain per pig: | | | |
| Shelled corn ..... | 302.95 | ..... | ..... |
| Protein supplement ..... | 45.60 | ..... | ..... |
| Complete mixture ..... | ..... | ..... | 345.68 |
| Pellets ..... | ..... | 329.53 | ..... |

**Observations**

1. The daily feed consumption of the pigs fed free-choice was .31 pound less than that of those fed pellets and .59 pound less than that of those fed the mixture.

2. The pigs fed the pellets and the complete mixture gained .19 of a pound more each day than the free-choice fed pigs.

3. The free-choice fed pigs required 19 pounds more total feed than the pigs fed pellets and 2.9 pounds more than the pigs fed the complete mixture.

4. In this experiment complete mixtures of corn and protein supplement

both pelleted and unpelleted increased the daily rate of gain and reduced the feed consumed per 100 pounds gain.

5. Grinding, mixing, and pelleting costs were not computed but should be considered when applying these results.

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**The Value of Antibiotics, Aureomycin $B_{12}$ Supplement (Aurofac 2A) and Vitamin $B_{12}$ Premix (Fortafeed 2-49-C) in the Protein Supplement for Fattening Spring Pigs in the Dry Lot in Summer (Project 110, Test 3).**

C. E. Aubel

In 1955-56 experiments were designed with swine to secure information on the maximum use of alfalfa meal in protein supplemental mixtures as a substitute for pasture in the dry lot, since pastures for swine in Kansas are often poor, inadequate, or unavailable.

The pigs in these tests received with their grain mixed protein supplements which contained varying quantities of alfalfa meal.

The mixed protein supplement that gave best results for the two years tested was one of 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

From time to time there come on the market new substances, chemical and otherwise, that added to a ration increase gains and feed efficiency.

To the efficient protein supplement of the two years preceding, antibiotics and a vitamin $B_{12}$ premix were added to see if the 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal protein mixture would then produce more efficient gains.

In this test four lots of pigs were self-fed shelled corn and a mixed protein supplement. Each lot contained 10 pigs.

Lot 1 pigs were placed on sudangrass pasture and self-fed a protein supplement made up of 4 parts tankage, 4 parts soybean meal, 1 part cottonseed meal, and 1 part alfalfa meal.

Lot 2 was fed in dry lot and received a mixed protein supplement of 4 parts tankage, 4 parts soybean meal, and 3 parts alfalfa meal.

Lot 3 was fed in dry lot and received the same protein supplement as lot 2 except that 15 pounds of Fortafeed 2-49-C, a vitamin $B_{12}$ premix, was added per ton to the protein mixture.

Lot 4 was fed in dry lot, received the same protein supplement as lot 3, with 15 pounds of Aureomycin $B_{12}$ (Aurofac 2A) added per ton of protein mixture.

Table 1 gives the results of this experiment.

**Observations**

In this experiment pigs in lots 1, 2, and 3 made almost exactly the same daily gains: 1.47, 1.48, and 1.49 pounds each, respectively. Lot 4 (receiving both vitamin $B_{12}$ premix and Aureomycin $B_{12}$) gained 1.58 pounds each daily.

Somewhat less total feed was consumed by dry lot fed pigs that got increased alfalfa meal than by pigs allowed pasture (See Table 3).

The results of this experiment confirm that increased alfalfa meal in the protein supplement increases efficiency in dry-lot feeding, and the addition of an antibiotic and vitamin $B_{12}$ increases efficiency still further.

Table 3

**The Effect of Antibiotics, Aureomycin in $B_{12}$ Supplement (Aurofac 2A) and Vitamin $B_{12}$ Premix (Fortafeed 2-49-C) in the Protein Supplement for Fattening Swine in Dry Lot in Summer and Compared with Sudangrass Pasture Feeding.**

June 13, 1956, to September 19, 1956—98 days.

| | Shelled corn, sudangrass pasture Mixed protein supplement: 4 parts tankage 4 parts soybean meal 1 part cottonseed meal 1 part alfalfa meal | Shelled corn, mixed protein supplement consisting of 4 parts tankage, 4 parts soybean meal, 3 parts alfalfa meal in dry lot | | |
|---|---|---|---|---|
| | | | 15 lbs. 2-49-C added per ton | 15 lbs. 2-49-C and 15 lbs. Aurofac 2A added per ton |
| Lot number | 1 | 2 | 3 | 4 |
| Number pigs in lot | 10 | 10 | 10 | 10 |
| Av. initial wt. per pigs, lbs. | 56.90 | 57.20 | 57.10 | 57.20 |
| Av. final wt. per pig, lbs. | 201.70 | 192.00 | 193.20 | 212.50 |
| Av. total gain per pig, lbs. | 144.80 | 145.80 | 146.10 | 155.30 |
| Av. daily gain per pig, lbs. | 1.47 | 1.48 | 1.49 | 1.58 |
| Av. daily ration per pig, lbs.: | | | | |
| Shelled corn | 4.36 | 4.21 | 4.13 | 4.62 |
| Protein supplement | .69 | .67 | .66 | .60 |
| Lbs. feed per 100 lbs. gain per pig: | | | | |
| Shelled corn | 295.37 | 283.33 | 277.27 | 292.07 |
| Protein supplement | 46.96 | 45.06 | 44.81 | 38.24 |

**The Value of Furazolidone nf-180 and Terramycin Antibiotic in the Rations of Fattening Pigs in the Dry Lot (Project 110, Test 4).**

C. E. Aubel

One of the most critical problems of the swine industry is disease. Antibiotics have been demonstrated to be effective in keeping some diseases at a low level. The nitrofurans have shown good results for certain specific diseases in poultry. Their effect in swine feeding is little known, for few experiments have been carried on feeding them to swine.

This experiment was initiated to study the effect of furazolidone nf-180 in rations for growing and fattening swine.

In this test four lots of fall pigs were self-fed free choice a basal ration of shelled corn and a mixed protein supplement in dry lot in winter. The mixed protein supplement was made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal.

Lot 1 pigs received no nitrofuran. They were self-fed the basal ration, a mixed protein supplement, and shelled corn.

Lot 2 pigs received shelled corn and a mixed protein supplement to which had been added nf-180 at the rate of 4½ pounds per ton. This supplied it to the pig at the rate of about 50 gms. per ton of total feed.

Lot 3 pigs received shelled corn and a mixed protein supplement to which had been added nf-180 at the rate of 2¼ pounds per ton. This supplied it to pigs at the rate of about 25 gms. each per total feed.

Lot 4 pigs received shelled corn and a mixed protein to which had been added Bi-Con TM-10 at the rate of 4½ pounds to a ton.

(Table 4 gives the results of this experiment.)

Acknowledgement is made to Hess & Clark, Inc., Ashland, Ohio, for supplying the furazolidone nf-180 for this experiment, and to Chas. Pfizer and Co., Terre Haute, Ind., for the Terramycin-$B_{12}$ supplement, Bi-Con TM-10.

### Observations

In this experiment the pigs that received the nf-180, furazolidone supplement made slower gains than the pigs receiving no drug or those receiving Terramycin-$B_{12}$ antibiotic. The pigs receiving the 50-gm. level in lot 2 required more corn and more protein supplement per 100 pounds gain than did the pigs in lot 1 that received no furazolidone. Those on the 25-gm. level, lot 3, required 3.09 pounds corn less per 100 pounds gain but 5.9 pounds more protein supplement than the pigs in lot 1. When the performance of the pigs in lots 2 and 3, that were fed furazolidone, were compared with the antibiotic-terramycin-fed lot, lot 4, the differences were even wider. The terramycin lot made the fastest gains and the most economical use of their feed.

In conclusion it may be said that no advantage was noted in gains or in feed consumption under the conditions of this experiment by adding nf-180 to a ration of shelled corn and a mixed protein supplement to growing pigs.

**Table 4**

**The Value of Furazolidone nf-180 and Terramycin Antibiotic in the Rations of Fattening Pigs in the Dry Lot.**

December 1, 1956, to February 27, 1957—89 days.

| Basal ration fed: Shelled corn, mixed protein supplement, in the dry lot .... | Basal | Basal + nf-180 50 gms. per ton level | Basal + nf-180 25 gms. per ton level | Basal + Bi-Con TM-10 |
|---|---|---|---|---|
| Lot number ..... | 1 | 2 | 3 | 4 |
| Number pigs in lot ..... | 10 | 10 | 10 | 10 |
| Av. initial wt. per pig, lbs. ..... | 56.70 | 56.70 | 56.50 | 56.90 |
| Av. final wt. per pig, lbs. ..... | 198.70 | 196.00 | 189.50 | 201.60 |
| Av. total gain per pig, lbs. ..... | 142.00 | 139.30 | 133.00 | 144.70 |
| Av. daily gain per pig, lbs. ..... | 1.59 | 1.56 | 1.49 | 1.62 |
| Av. daily ration per pig, lbs.: | | | | |
| Shelled corn ..... | 4.94 | 5.02 | 4.58 | 4.73 |
| Protein supplement ..... | .56 | .57 | .62 | .57 |
| Lbs. feed per 100 lbs. gain per pig: | | | | |
| Shelled corn ..... | 309.85 | 321.24 | 306.76 | 291.01 |
| Protein supplement ..... | 35.63 | 36.82 | 41.50 | 35.24 |

### The Value of Progen, Arsanilic Acid, and Terramycin Antibiotic in the Ration of Fattening Pigs in Dry Lot (Project 110, Test 5).

C. E. Aubel

The use of arsanilic acid in swine rations has been receiving experimental attention for several years. It follows the use of arsenicals that have been used in medical practice hundreds of years. Fowler's solution containing 1 percent arsenic trioxide, a cheap but toxic inorganic arsenic, was first used as a tonic to improve the appearance and well-being of animals. The toxic properties of trioxide, however, greatly limited its use except as a general tonic in veterinary practice.

At the turn of the century, arsenic in the form of arsanilic acid was found to be much less toxic than the trioxide and was effective as "magic bullets" in the health of poultry. This, with its long known tonic properties, has brought it to the attention of swine feeders and has added it to the long list of disease fighters for pigs.

Studies up to this time indicate arsanilic acid to be a useful antibacterial

Acknowledgement is made to the Abbott Laboratories, North Chicago, Ill., for supplying the Progen, Arsanilic Acid supplement for this experiment, and to Chas. Pfizer and Co., Inc., Terre Haute, Ind., for supplying the Terramycin-$B_{12}$ supplement, Bi-Con TM-10.

agent in the ration of swine of different ages. It is particularly effective in treatment of bloody dysentery or bloody scours in swine.

The Food and Drug Administration has approved arsanilic acid concentrates which are fed on a free-choice basis with grain. Few experiments have been conducted on this method of feeding the arsonic acids.

This experiment was designed to obtain information on the use of arsanilic acid in supplements fed free choice to growing fattening pigs to evaluate it in its effectiveness in the growing ration.

In this test four lots of fall pigs were self-fed shelled corn and a mixed protein supplement in dry lot in winter. The mixed protein supplement was made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, 1 part alfalfa meal.

Lot 1 pigs received no supplement, except the mixed protein supplement with the basal ration.

Lot 2 pigs received the basal ration with Bi-Con TM-10, Terramycin antibiotic $B_{12}$ supplement mixed with the protein supplement at the rate of 4½ pounds per ton.

Lot 3 pigs received arsanilic acid supplement as Progen mixed with the protein supplement at the rate of 3 pounds of Progen per ton. This supplied it to the pigs at the rate of about 90 gms. per ton of total feed.

Lot 4 pigs received arsanilic acid supplement as Progen at the rate of 3 pounds per ton and Bi-Con TM-10 Terramycin antibiotic $B_{12}$ supplement at the rate of 4½ pounds per ton, plus protein.

Table 5 gives the results of this experiment.

**Table 5**

**The Value of Progen, Arsanilic Acid, and Terramycin Antibiotic in the Rations of Fattening Pigs in Dry Lot.**

December 1, 1956, to February 27, 1957—89 days.

| Basal ration fed: Shelled corn, mixed protein supplement .... | Basal | Basal + Bi-Con TM-10 | Basal + Progen, 90 gms. to ton | Basal + Progen + Bi-Con TM-10 |
|---|---|---|---|---|
| Lot number ..... | 1 | 2 | 3 | 4 |
| Number pigs in lot ..... | 10 | 10 | 10 | 10 |
| Av. initial wt. per pig, lbs. ..... | 56.70 | 56.90 | 56.70 | 56.80 |
| Av. final wt. per pig, lbs. ..... | 198.70 | 201.60 | 196.10 | 198.50 |
| Av. total wt. per pig, lbs. ..... | 142.00 | 144.70 | 139.40 | 141.70 |
| Av. daily gain per pig, lbs. ..... | 1.59 | 1.62 | 1.44 | 1.59 |
| Av. daily ration per pig, lbs.: | | | | |
| Shelled corn ..... | 4.94 | 4.73 | 4.82 | 4.71 |
| Protein supplement ..... | .56 | .57 | .60 | .57 |
| Lbs. feed per 100 lbs. gain per pig: | | | | |
| Shelled corn ..... | 309.85 | 291.01 | 308.32 | 296.25 |
| Protein supplement ..... | 35.63 | 35.24 | 38.59 | 36.20 |

**Observations**

In this experiment pigs that received the arsanilic acid alone made the poorest gains of all the lots, only 1.44 pounds per head per day. The pigs receiving no arsanilic acid gained 1.59 pounds, those that received Terramycin gained 1.62 pounds, and those that received Terramycin and arsanilic acid gained 1.59 pounds.

The feed consumption was lowest in the lots receiving the antibiotic, lots 2 and 4, and the highest in lot 3 that received the arsanilic acid.

When arsanilic acid and terramycin were both added to the ration, a good response was achieved but not so good as when terramycin was added alone.

**Producing Parakeratosis in Growing Fattening Swine (Project 110, Test 6).**

C. E. Aubel

Parakeratosis has been a problem in farm swine herds for several years. It is a severe dermatitislike condition which may resemble mange. Pigs may show encrustations on the skin, particularly over the rear limbs and abdomen. The skin frequently cracks in advanced cases. The mortality rate is low, unless the condition occurs in very young pigs. The greatest loss to swine producers is increased feed cost and time required to get the pigs to market. In some cases there are dressing carcass losses.

Exact cause of the condition has not been understood. Rations containing excessive levels of calcium have been reported to be conducive to the condition, and a small quantity of zinc is reported to prevent as well as cure the condition.

Occasional instances of parakeratosis have occurred in the experimental herd at the college.

This test was conducted to obtain information on inducing the condition.

In the winter of 1956-57, 18 fall pigs including Poland Chinas and Durocs were divided into two lots. The pigs were allowed to run on limestone soil; rations were self-fed.

The basal mixture was ground corn 8 parts, mixed with 1 part of a mixed protein supplement made up of 4 parts tankage, 4 parts soybean meal, 1 part linseed meal, and 1 part alfalfa meal. This mixture contained approximately 15 percent protein. This feed plus 2 percent ground limestone for each pound of corn was mixed and pelleted and self-fed to the lot 2 pigs. The lot 1 pigs were self-fed free choice on shelled corn and the same mixed protein supplement as lot 2 pigs.

The first lesions of parakeratosis began appearing in 28 days after the experiment started. By 40 days, seven of the eight pigs in lot 2 receiving the added calcium developed parakeratosis. The experiment was continued 89 days and no attempt to correct the condition was made. Feed consumption, daily gains, and feed efficiency are shown in Table 6.

**Table 6**

**Feeding Fattening Pigs to Produce Parakeratosis.**

December 1, 1956, to February 27, 1957—89 days.

| Ration fed | Shelled corn, mixed protein supplement self-fed free choice | Parakeratosis lot, ground corn, mixed protein supplt. 8 to 1 in pellet self-fed |
|---|---|---|
| Lot number | 1 | 2 |
| Number pigs in lot | 10 | 8 |
| Av. initial wt. per pig, lbs. | 56.70 | 58.62 |
| Av. final wt. per pig, lbs. | 198.70 | 138.00 |
| Av. total gain per pig, lbs. | 142.00 | 81.30 |
| Av. daily gain per pig, lbs. | 1.59 | .91 |
| Av. daily ration per pig, lbs.: | | |
| Corn and protein supplement | 5.50 | 4.43 |
| Lbs. feed per 100 lbs. gain per pig: | | |
| Corn and protein supplement | 345.49 | 387.45 |

**Observations**

In this experiment it will be noted the parakeratosis lot made very slow gains, only .91 pound daily compared with 1.59 pounds for the lot receiving a balanced calcium level. One pig in lot 2 did not exhibit any lesions of the disease, had nice smooth hair, and seemed to gain normally throughout the experiment. She was a Poland China gilt that weighed 211.5 pounds at the end of the experiment. She seemed normal in every way.

### Summary and Recommendations

Parakeratosis was produced in pigs by feeding a high-calcium ration (1.3% ca.). Seven of eight pigs showed lesions within seven weeks from the time of feeding. One pig exhibited it as early as four weeks. Three of the pigs showed severe lesions.

From this experiment it is recommended that high levels of calcium in the rations of growing pigs be avoided. The National Research Council recommendation for calcium levels in the ration should be followed.

Although zinc was not added to the ration as a corrective measure in this experiment, it is reported that adding 1 pound of a high zinc trace mineral premix to a ton of feed alleviates the condition.

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**Metabolism of Carotenoid Pigments and Vitamin A by Swine (Project 311, Test 7).**

**Provitamin A from Alfalfa and Yellow Corn and Gelatin-stabilized Vitamin A as Sources of Vitamin A for Weanling Pigs.**

**D. B. Parrish and C. E. Aubel**

There is relatively little information on the utilization of vitamin A of different sources by weanling pigs. In this test, three sources of vitamin A were used: (1) a gelatin-stabilized vitamin A product, (2) carotene as supplied by high-quality alfalfa meal, and (3) carotene and cryptoxanthin as supplied by yellow corn. Alfalfa and yellow corn were analyzed for carotene and crude cryptoxanthin and units of vitamin A calculated by multiplying micrograms of these carotenoid pigments by 1.6 and 0.8, respectively. From previous work it was estimated that 400 units of vitamin A per pound of feed would provide for satisfactory growth and health throughout the test, if the source of vitamin A were used efficiently. Twenty-seven weanling pigs were distributed among three groups of three lots each so that lots among the groups were balanced on the basis of litter, sex, and weaning weight. These pigs were from gilts fed a vitamin A-restricted diet during the gestation and nursing period. Although they were in apparent satisfactory condition, their vitamin A reserves were low.

The basal feed was composed of white corn 76 percent, soybean meal 17 percent, nonfat milk solids 2.5 percent, brewer's yeast 1.5 percent, salt, limestone, and bonemeal mix 1 percent, plus vitamins and trace minerals. To each feed one of the vitamin A sources was added at 400 units per pound. When yellow corn or alfalfa was used, it was substituted in the formula for an equivalent weight of white corn. The experiment lasted two months. The pigs were fed three per lot. Each day they were offered only a small excess of feed over what they would clean up. For the first five days they received basal feed only containing no vitamin A source.

Data from the study are presented in Table 7.

#### Observations

1. Pigs receiving 400 units of gelatin-stabilized vitamin A per pound of feed gained more weight, converted their feed more efficiently, and had larger concentrations of vitamin A in their blood serum than those getting the same unitage of vitamin A from alfalfa meal or yellow corn.

2. In this test alfalfa meal and yellow corn were of approximately the same value for supplying provitamin A for pigs.

3. Unit for unit, pigs utilized vitamin A from alfalfa and yellow corn less efficiently than that from stabilized vitamin A.

## Table 7

### Average Body Weights, Feed Efficiencies, and Blood Serum Vitamin A Contents of Pigs.

| Diet | Lot[1] | Average wt., lbs. 5/24/56 | Average wt., lbs. 7/24/56 | Average gain, lbs. By lot | Average gain, lbs. By diet | Feed efficiency By lot | Feed efficiency By diet | Vitamin A, mcg./100 ml. serum[2] By lot | Vitamin A, mcg./100 ml. serum[2] By diet |
|---|---|---|---|---|---|---|---|---|---|
| Vitamin A[3] | 1[4] | 23 | 92 | 69 | | 2.7 | | 21.6 | |
| | 2 | 25 | 95 | 70 | | 2.6 | | 22.2 | |
| | 3 | 25 | 87 | 62 | | 2.9 | | 17.9 | |
| | | | | | 67 | | 2.7 | | 20.6 |
| Dehydrated alfalfa | 1a | 23 | 76 | 53 | | 2.9 | | 4.3 | |
| | 2a | 25 | 87 | 62 | | 2.8 | | 3.1 | |
| | 3a | 25 | 65 | 40 | | 3.6 | | 1.4 | |
| | | | | | 52 | | 3.1 | | 3.1 |
| Yellow corn | 1b | 23 | 81 | 58 | | 2.8 | | 1.4 | |
| | 2b | 25 | 89 | 64 | | 2.9 | | 1.3 | |
| | 3b | 25 | 59 | 34 | | 3.6 | | 1.3 | |
| | | | | | 52 | | 3.1 | | 1.3 |

1. Three pigs per lot.
2. At termination of experiment.
3. Gelatin-stabilized vitamin A used was Pfizer A-16-P.
4. 1, 1a, 1b, etc., are groups balanced by litter, sex, and weight.

## Table 8

### Chemical Analysis of Feeds Used in Swine Feeding Trials, Summer, 1956.

| | Protein, % | Ether extract, % | Crude fiber, % | Moisture, % | Ash, % | N-Free extract, % | Carbohydrates, % |
|---|---|---|---|---|---|---|---|
| Protein supplement, 4-4-1-1 | 45.88 | 4.04 | 6.33 | 7.84 | 11.34 | 24.57 | 30.90 |
| Protein supplement 4-4-3 | 34.81 | 4.07 | 12.62 | 7.83 | 11.09 | 29.58 | 42.20 |
| Whole corn, yellow | 10.25 | 3.88 | 1.92 | 10.59 | 1.35 | 72.01 | 73.93 |
| Hog pellets, 6 to 1 | 15.50 | 4.52 | 3.30 | 9.66 | 3.17 | 63.85 | 67.15 |
| Hog pellets, 9 to 1 | 14.69 | 4.30 | 2.95 | 10.16 | 7.97 | 60.03 | 62.98 |

### Chemical Analysis of Feeds Used in Swine Feeding Trials, Winter, 1956-1957.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Protein supplement, 4-4-1-1 | 47.38 | 3.99 | 6.32 | 6.65 | 12.49 | 23.17 | 29.49 |
| Corn, yellow | 10.28 | 3.80 | 2.70 | 10.63 | 1.41 | 71.71 | 73.78 |
| Hog feed, lot 1, test 6 | 14.44 | 3.76 | 2.80 | 10.06 | 2.81 | 66.13 | 68.93 |
| Hog feed, 8-1, lot 2, test 6 | 15.31 | 3.22 | 2.80 | 9.58 | 4.00 | 65.09 | 67.89 |

# *Sheep*

## Lamb Feeding Experiments, 1956-57

**Feed Lot and Pasture Fattening Tests with Feeder Lambs. Studies Carried on by the Department of Animal Husbandry and the Garden City Branch Experiment Station, Project 111-GC.**

**Carl Menzies, T. Donald Bell, and A. B. Erhart**

Tests this year include the following roughage comparisons for fattening lambs in dry lot: (1) Axtell stover, (2) Axtell stover and alfalfa hay, (3) Axtell silage and alfalfa hay, (4) wheat silage and alfalfa hay, and (5) Axtell fodder and alfalfa hay.

The use of hormones in fattening lamb rations was again studied, using the standard sorghum stover, milo grain, cottonseed meal, salt, and limestone ration. This study consisted of the following four treatments: (1) controls, (2) 6 mgs. stilbestrol implants, (3) 2 mgs. of stilbestrol per lamb daily mixed with the ration, and (4) Synovex implants consisting of 200 mgs. progesterone and 2.5 mgs. of estradiol.

One lot of 50 lambs was pastured on irrigated wheat from November 2 to January 28, or 87 days. Twenty-five head were implanted with 6 mgs. of stilbestrol at the beginning of the grazing period. After the grazing period, the lambs were put in dry lot and fed the standard stover, milo cottonseed meal, salt, and limestone ration.

Two lots containing 50 lambs each were fed aureomycin in the form of Aurofac 2A along with the standard ration. Each lamb in both lots received approximately 14.4 mgs. aureomycin per head per day. In addition the lambs in one lot were implanted with 6 mgs. of stilbestrol.

All the lambs were shorn during the period February 18 to 20 and continued on feed except 10 each from lots 1, 2, 3, and 4. This group was taken to Manhattan for further study.

### Lambs

The lambs for this year's tests were primarily whiteface finewools with a few blackface crossbreds from near Bernalillo, N.M. They were approximately one half ewe and one half wether lambs. They averaged 65.4 pounds at the loading point and 62 pounds off the cars in Garden City October 24, 1956. They were started on test November 2.

Feed prices: Milo grain, $2.25 per cwt.; alfalfa hay, $30 per ton; Axtell stover, $10 per ton; Axtell fodder, $12 per ton; Axtell silage, $8 per ton; wheat silage, $8 per ton; cottonseed meal, $70 per ton; salt, $1 per cwt.; limestone, $1 per cwt.; and wheat pasture, $0.50 per head per month.

### Table 9

**Results from Adding Hormones to Lamb-Fattening Rations, Garden City, Kansas, 1956-57.**

| | No hormone | Stilbestrol implants (6 mgs.) | Stilbestrol in feed (2 mgs. daily) | Synovex implants[1] |
|---|---|---|---|---|
| Ration fed | Whole milo, Axtell stover, C.S. meal, salt, limestone | Whole milo, Axtell stover, C.S. meal, salt, limestone | Whole milo, Axtell stover, C.S. meal, salt, limestone | Whole milo, Axtell stover, C.S. meal, salt, limestone |
| Lot number | 1 | 2 | 3 | 4 |
| Number lambs per lot | 50 | 50 | 50 | 50 |
| Days on feed | 101 | 101 | 101 | 101 |
| Initial wt. per lamb, lbs. | 72.1 | 71.5 | 71.3 | 71.6 |
| Final wt. per lamb, lbs. | 95.5 | 99.0 | 99.5 | 100.9 |
| Total gain per lamb, lbs. | 23.4 | 27.5 | 28.2 | 29.3 |
| Daily gain per lamb, lb. | .23 | .27 | .28 | .29 |

Table 9 (Continued).

| | | | | |
|---|---|---|---|---|
| Lbs. feed per lamb daily: | | | | |
| Milo grain | 1.13 | 1.13 | 1.14 | 1.13 |
| Axtell stover | 2.16 | 2.10 | 2.12 | 2.41 |
| Cottonseed meal | .20 | .20 | .20 | .20 |
| Salt | .017 | .025 | .022 | .027 |
| Limestone | .015 | .015 | .015 | .015 |
| Lbs. feed per cwt. gain: | | | | |
| Milo grain | 487.09 | 421.18 | 408.05 | 389.32 |
| Axtell stover | 909.90 | 782.61 | 758.80 | 832.65 |
| Cottonseed meal | 86.01 | 74.60 | 72.18 | 68.56 |
| Salt | 7.41 | 9.31 | 7.81 | 9.15 |
| Limestone | 6.39 | 5.54 | 5.36 | 5.12 |
| Feed cost per cwt. gain | $18.62 | $16.15 | $15.63 | $15.48 |
| Hormone cost per lamb | | .02 | .10 | .50 |
| Feed cost per lamb | 4 37 | 4.37 | 4.42 | 4.53 |
| Initial cost per lamb | 13.48 | 13.36 | 13.33 | 13.38 |
| Number of lambs lost | | | 1 | |
| Cost of lamb loss[2] | | | .35 | |
| Total cost per lamb | 17.85 | 17.75 | 18.20[3] | 18.41 |
| Final cost per cwt. | 18.69 | 17.93 | 18.29[3] | 18.25 |
| Av. wt. of shorn fleece, lbs. | 6.79 | 6.14 | 6.11 | 6.02 |

1. Each lamb received 200 mgs. of progesterone and 2.5 mgs. estradiol.
2. Initial cost of lamb plus cost of feed consumed divided by number of lambs remaining on test in lot 3.
3. Including cost of one lost.

Table 10

**A Comparison of Various Locally Grown Roughages in Lamb-Fattening Rations.**

| Treatment | Axtell stover, alfalfa hay, whole milo grain, salt | Sorghum silage, alfalfa hay, whole milo grain, salt | Axtell fodder, alfalfa hay, whole milo grain, salt | Wheat silage, alfalfa hay, whole milo grain, salt |
|---|---|---|---|---|
| Lot number | 7 | 8 | 9 | 10 |
| Number lambs per lot | 50 | 50 | 50 | 50 |
| Days on feed | 101 | 101 | 101 | 101 |
| Initial wt. per lamb, lbs. | 71.1 | 71.2 | 70.4 | 71.5 |
| Final wt. per lamb, lbs. | 96.3 | 97.7 | 96.7 | 93.9 |
| Total gain per lamb, lbs. | 25.2 | 26.5 | 26.3 | 22.4 |
| Av. daily gain per lamb, lbs. | .25 | .26 | .26 | .22 |
| Lbs. feed per lamb daily: | | | | |
| Milo grain | 1.13 | 1.13 | 1.05 | 1.13 |
| Axtell stover | 1.68 | | | |
| Sorghum silage | | 2.89 | | |
| Axtell fodder | | | 1.47 | |
| Wheat silage | | | | 3.74 |
| Alfalfa hay | .72 | .72 | .72 | .72 |
| Salt | .0135 | .0147 | .0182 | .0251 |
| Lbs. feed per cwt. gain: | | | | |
| Milo grain | 453.15 | 429.89 | 403.34 | 509.06 |
| Axtell stover | 667.96 | | | |
| Sorghum silage | | 1100.35 | | |
| Axtell fodder | | | 565.58 | |
| Wheat silage | | | | 1686.01 |
| Alfalfa hay | 288.96 | 274.13 | 276.78 | 324.61 |
| Salt | 5.40 | 5.58 | 7.0 | 11.34 |
| Feed cost per cwt. gain | $17.92 | $18.18 | $16.69 | $23.18 |
| Feed cost per lamb | 4.51 | 4.82 | 4.39 | 5.19 |
| Initial cost per lamb | 13.29 | 13.31 | 13.16 | 13.36 |
| Number of lambs lost | 0 | 0 | 0 | 0 |
| Total cost per lamb | 17.80 | 18.13 | 17.55 | 18.55 |
| Total cost per cwt. of lamb | 18.48 | 18.56 | 18.15 | 19.76 |
| Av. wt. of shorn fleece, lbs. | 6.45 | 6.68 | 6.95 | 6.57 |

## Table 11

**Results of Wheat Pasture Studies and Feeding Aureomycin in Lamb-Fattening Rations, with and without Hormones.**

| Ration fed | Axtell stover, whole milo grain, cottonseed meal, salt, limestone, aureomycin[1] | Axtell stover, whole milo grain, cottonseed meal, salt, limestone, aureomycin, plus 6 mgs. stilbestrol implant | —Irrigated wheat pasture— No stilbestrol | —Irrigated wheat pasture— 6 mgs. implant stilbestrol |
|---|---|---|---|---|
| Lot | 5 | 6 | 11 | |
| Number lambs per lot | 50 | 50 | 25 | 25 |
| Days on feed | 101 | 101 | 87 | 87 |
| Initial wt. per lamb, lbs. | 70.2 | 70.3 | 71.5 | 70.6 |
| Final wt. per lamb, lbs. | 93.3 | 96.8 | 101.1 | 110.4 |
| Total gain per lamb, lbs. | 23.1 | 26.5 | 29.6 | 39.8 |
| Av. daily gain per lamb, lb. | .23 | .26 | .34 | .46 |
| Lbs. feed per lamb daily: | | | | |
| Milo grain | 1.14 | 1.14 | | |
| Axtell stover | 2.03 | 1.91 | | |
| Cottonseed meal | .20 | .20 | | |
| Alfalfa hay | | | .13 | .13 |
| Limestone | .015 | .015 | | |
| Salt | .017 | .019 | .006 | .006 |
| Lbs. feed per cwt. gain: | | | | |
| Milo grain | 493.89 | 430.00 | | |
| Axtell stover | 885.23 | 723.98 | | |
| Cottonseed meal | 87.48 | 76.16 | | |
| Alfalfa hay | | | 38 | 28 |
| Limestone | 6.5 | 5.66 | | |
| Salt | 7.54 | 7.32 | 1.89 | 1.41 |
| Feed cost per cwt. gain | $18.74 | $16.09 | $5.49 | $4.09 |
| Feed cost per lamb | 4.33 | 4.27 | 1.63 | 1.63 |
| Hormone cost per lamb | | .02 | | .02 |
| Aureomycin cost per lamb[2] | .16 | .16 | | |
| Initial cost per lamb | 13.12 | 13.14 | 13.36 | 13.20 |
| Number of lambs lost | 0 | 0 | 0 | 0 |
| Total cost per lamb | 17.61 | 17.59 | 14.99 | 14.85 |
| Total cost per cwt. of lamb | 18.87 | 18.17 | 14.83 | 13.45 |
| Av. wt. of shorn fleece, lbs. | 5.95 | 6.03 | 8.91 | 8.69 |

1. Each lamb received 14.4 mgs. aureomycin per day.
2. Figured at $0.40 per pound for Aurofac 2A.

### Observations

As in past tests, lambs that received hormones gained faster on less feed than did the control lots. In this year's test lambs in lot 2 that received a 6-mg. stilbestrol implant gained 17 percent faster than the controls; lambs in lot 3 that were fed 2 mgs. stilbestrol daily gained 22 percent faster, and the lambs in lot 4 that were implanted with 200 mgs. progesterone and 2.5 mgs. estradiol gained 26 percent faster than the controls.

In last year's trials, lambs fed or implanted with these hormones gained about 20 percent more than the control lambs. The hormone lots also required from 13 to 16 percent less feed per cwt. of gain than the controls. In previous tests lambs fed stilbestrol or implanted with stilbestrol or stilbestrol and progesterone combinations have graded lower and yielded less than lambs receiving no hormone.

Lambs on the standard ration of ground Axtell stover, milo grain, cottonseed meal, limestone, and salt gained only 0.23 pound per lamb per

day. Replacing the cottonseed meal with 0.72 pound of alfalfa hay cheapened the feed cost per cwt. gain by about 70 cents but increased the daily rate of gain by only 0.02 pound.

Gains made by lambs fed alfalfa hay, milo grain, and salt along with ground Axtell stover, sorghum silage, or Axtell fodder as roughages were approximately the same in all cases. However, use of Axtell fodder cheapened the feed cost considerably at the prices charged for the different roughages. In last year's test, lambs fed sorghum silage plus alfalfa hay as roughage gained faster than lambs receiving either sorghum stover or stover plus alfalfa hay as the roughage part of their ration. However, the lambs this year consumed about 1 pound less silage per day than the lambs did last year.

Rather disappointing results were obtained with wheat silage and alfalfa hay as the roughage. This lot had the lowest gain of any in the test and also a much higher feed cost. These lambs gained well the first part of the test but dropped to only 0.07 pound per day for the last 25 days of the experiment.

The feeding of 14.4 mgs. of aureomycin per lamb per day failed to increase the rate of gain or feed efficiency under conditions of this test. The feeding of aureomycin to lambs implanted with 6 mgs. of stilbestrol did not have any additive effect. These lambs gained about the same as those in lot 2 that were implanted with stilbestrol and fed a similar ration without aureomycin.

The largest and cheapest gains were made by the lambs on wheat pasture. The lambs in this lot that were implanted with 6 mgs. of stilbestrol at the beginning of the test gained about 35 percent faster than those that were not implanted. Results were almost identical with those obtained in last year's test. The increased rate of gain made by the implanted lambs resulted in $1.38 difference in the final cost per cwt. of lamb.

Only one lamb was lost during this 101-day test. This lamb was from lot number 3 and died from urinary calculi. One lamb died before the experiment started.

Appreciation is expressed to the Eli Lilly Company at Indianapolis, Ind., which furnished the stilbestrol premix fed to the lambs; to the Syntex Animal Products Division of Foundation Laboratories, Inc., of New York, N.Y., for the estradiol-progesterone (Synovex) pellets; and to the Norden Laboratories of Lincoln, Nebr., for the stilbestrol pellets.

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## The Relationship of Physical Balance in the Utilization of Pelleted and Nonpelleted Rations for Lambs—Metabolism Studies (Project 236).

D. Richardson, T. D. Bell, R. F. Cox, and W. D. Striegel

Studies at this station and others have shown the importance of ratio of roughage to concentrate in lamb-fattening rations. In recent years, there has been considerable interest in feeding completely pelleted rations. Tests were designed to study the effect of pelleting upon digestibility and percentage of nitrogen retained by lambs fed different ratios of roughage to concentrate, pelleted and nonpelleted. A previous test indicated lowered digestion of fiber in pelleted rations but an increase in digestibility of other nutrients to such an extent that the total digestible nutrient values were essentially the same. Nitrogen retention was greater with the pelleted rations.

### Experimental Procedure

Eight crossbred lambs averaging 85 pounds each were used during the winter of 1955-56 to study rations consisting of 60 percent roughage and 40 percent concentrate as pellets, and 50-50 pellets with enough hay to make the ratio 55 percent roughage and 45 percent concentrate.

Also, in the winter of 1956-57 eight crossbred lambs averaging about 90 pounds each were used to study rations containing 65 and 55 percent roughage and 35 and 45 percent concentrate, respectively. Alfalfa and

corn were used as the roughage and concentrate. Where pellets were used, they were made to contain a ratio of roughage to concentrate of 60-40 and 50-50. Enough chopped hay was fed with the pellets to make ratios of 65-35 and 55-45 in the total ration. Each animal served as his own control for the various rations.

### Results and Discussion

More work needs to be done to make definite comparisons. The results of these two tests are presented in Tables 12 and 13. They indicate greater digestibility of all nutrients, especially crude fiber, and an increase in nitrogen retention when enough chopped hay was added to 60-40 pellets to make a 65-35 roughage-to-concentrate ratio.

In general, nitrogen retention seems to be greater with pelleted rations; however, quantity of total feed consumption has a great influence on this factor. Rations containing a greater percentage of concentrate seem to be utilized more efficiently. Pelleted rations made from sun-cured alfalfa tended to be more efficient than pelleted rations from dehydrated alfalfa.

**Table 12**

**Results of Digestion and Nitrogen Balance Studies with Lambs Using Varying Ratios of Roughage to Concentrate in Pelleted and Nonpelleted Rations, November, 1955, to January, 1956.**

| No. of lambs | Ration | % apparent digestibility of protein | % apparent digestibility of ether extract | % apparent digestibility of crude fiber | % apparent digestibility of nitrogen-free extract | % total digestible nutrients | % nitrogen retained |
|---|---|---|---|---|---|---|---|
| 8 | 60-40 SP[1] | 59.46 | 64.62 | 20.64 | 77.58 | 58.37 | 7.53 |
| 8 | 60-40 DP[2] | 51.55 | 69.26 | 21.56 | 72.72 | 53.32 | 9.75 |
| 7 | 60-40 HC[3] | 54.87 | 57.69 | 27.11 | 75.16 | 55.08 | —15.25[4] |
| 7 | 50-50 SP[5] | 69.32 | 69.42 | 33.59 | 83.51 | 65.85 | 21.79 |
| 7 | 50-50 DP[5] | 65.92 | 75.52 | 35.63 | 82.59 | 66.03 | 16.96 |

1. 60% sun-cured alfalfa and 40% corn in pellet.
2. 60% dehydrated alfalfa and 40% corn in pellet.
3. 60% chopped alfalfa hay and 40% ground corn nonpelleted.
4. Lambs ate less than one half of normal quantity of feed.
5. Pellets contained 50% sun-cured alfalfa hay and dehydrated alfalfa, respectively, and 50% corn. Enough chopped hay was added to make a 55-45 ratio.

**Table 13**

**Results of Digestion and Nitrogen Balance Studies with Lambs Using Varying Ratios of Roughage to Concentrate in Pelleted and Nonpelleted Rations, November, 1956, to February, 1957.**

| No. of lambs | Ration | % apparent digestibility of protein | % apparent digestibility of ether extract | % apparent digestibility of crude fiber | % apparent digestibility of nitrogen-free extract | % total digestible nutrients | % nitrogen retained |
|---|---|---|---|---|---|---|---|
| 8 | 60-40 SP[1] | 72.98 | 61.90 | 38.31 | 82.31 | 63.79 | 14.18 |
| 7 | 60-40 DP[1] | 66.70 | 67.76 | 36.81 | 78.93 | 59.71 | 12.20 |
| 8 | 65-35 HC[2] | 69.24 | 63.75 | 44.62 | 79.81 | 61.98 | 5.71 |
| 8 | 50-50 SP[1] | 72.12 | 72.91 | 36.34 | 84.02 | 67.16 | 19.87 |
| 8 | 50-50 DP[1] | 65.32 | 81.78 | 36.60 | 80.77 | 64.67 | 17.39 |
| 8 | 55-45 HC[2] | 72.65 | 70.84 | 44.76 | 83.07 | 66.73 | 18.13 |

1. Sun-cured (SP) and dehydrated (DP) alfalfa was used to make pellets consisting of 60-40 and 50-50, respectively, of roughage and corn. Enough chopped hay was added to make the ratio of roughage to concentrate 65-35 and 55-45.
2. Ration made up of chopped hay and ground corn.

### The Relationship of Physical Balance to the Utilization of Pelleted and Nonpelleted Rations for Lambs (Project 236).

C. Menzies, T. D. Bell, D. Richardson, R. F. Cox, and W. D. Striegel

Physical balance of lamb-fattening rations has been studied in this project for several years. This is the fourth year that this project has

been set up to study the effect of pelleting rations of varying proportions of roughages and concentrates upon feed-lot performance and feed efficiency compared with similar unpelleted rations. For the past two years both dehydrated and field-cured alfalfa hay have been used as roughages.

### Experimental Procedure

The lambs used in this test were purchased on the Kansas City market October 10, 1956. They were primarily white-faced fine-wool wether and ewe lambs with a few black-faced crossbreds. November 6 the lambs were started on test, weighing approximately 75.5 pounds.

Six lots of 21 lambs each were fed as follows:

Lot 1—Pelleted ration, 60 percent field-cured alfalfa hay and 40 percent corn. In addition .4 pound of chopped alfalfa hay was fed per lamb per day. Total ration was approximately 65 percent alfalfa hay and 35 percent corn.

Lot 2—Pelleted ration, 50 percent field-cured alfalfa hay and 50 percent corn. In addition each lamb received .4 pound of chopped alfalfa hay per day. Total ration was approximately 55 percent alfalfa hay and 45 percent corn.

Lot 3—Nonpelleted ration, 65 percent chopped alfalfa hay and 35 percent ground corn.

Lot 4—Nonpelleted ration, 55 percent chopped alfalfa hay and 45 percent ground corn.

Lot 5—Pelleted ration, 60 percent dehydrated alfalfa hay and 40 percent corn. In addition each lamb received .4 pound of chopped alfalfa hay per day. This ration was made up of approximately 65 percent dehydrated alfalfa hay and 35 percent corn.

Lot 6—Pelleted ration, 50 percent dehydrated alfalfa hay and 50 percent corn. In addition .4 pound of chopped alfalfa hay was fed per lamb per day. Total ration was approximately 55 percent dehydrated alfalfa hay and 45 percent corn.

The alfalfa hay and dehydrated alfalfa hay used in this test both came from the same college field. A portion was dehydrated at the time of cutting and was later used with ground corn to make the pellets for lots 5 and 6. The remainder of the hay was baled and stored in the barn until part of it was ground and used with ground corn to make the pellets fed to lots 1 and 2. The chopped hay used in all lots came from the baled-hay supply. This hay was chopped with an ensilage cutter. All the corn used in this test was purchased in a bulk lot from a Manhattan mill.

The rations were fed twice a day; in addition, all the lambs had access to water and salt at all times. Individual weights were taken at the beginning of the trial and every two weeks thereafter. Carcass grades were obtained on the lambs when slaughtered.

The feed prices and processing charges used in determining the feed cost were as follows: chopped alfalfa hay, $28 per ton ($25 per ton baled plus $3 per ton for chopping); ground corn, $1.50 per bushel; dehydrated alfalfa hay, $37 per ton ($12 per ton for hay in the field plus $25 per ton for cutting, hauling, and dehydrating); grinding hay for pellets cost $5 per ton and mixing and pelleting cost $5 per ton. With these figures, the 60-percent field-cured hay-40-percent corn pellets cost $44.44 per ton, the 50-percent field-cured hay-50-percent corn pellets cost $46.80 per ton, the 60-percent dehydrated hay-40-percent corn pellets cost $48.62 per ton, and the 50-percent dehydrated hay-50-percent corn pellets cost $50.28 per ton.

### Results and Discussion

The average daily gain, feed intake, feed consumed per cwt. pounds of gain, feed cost per cwt. gain, feed cost per lamb and carcass grades are shown in Table 13. Chemical analyses of feeds used are shown in Table 19. Results of digestion trials using the rations fed in this test are reported on pages 14 and 15.

The lambs fed the field-cured alfalfa hay and corn pellets gained faster

and more efficiently than did the lambs fed the unpelleted rations or those fed the dehydrated alfalfa hay and corn pellets.

In contrast to last year's results, lambs fed dehydrated alfalfa hay and corn pellets did not gain significantly faster than lambs fed similar unpelleted rations.

The lambs in lots 1 and 2, that were fed the field-cured pellets, consumed about .3 to .5 pound more total feed per lamb per day than did the lambs fed either the pellets containing dehydrated hay or the unpelleted rations containing the same proportions of roughages to concentrates.

In agreement with last year's results, slightly larger gains were produced by the pellets containing the higher proportion of roughage. However, the lambs fed these pellets were no more efficient than lambs fed pellets containing the lower proportion of roughage.

In previous years the ration of 55-percent roughage and 45-percent concentrates has been the most efficient and economical when nonpelleted rations were fed. The best results in this year's test, however, were obtained with the 65-percent roughage and 35-percent concentrate unpelleted ration.

The 65-percent roughage and 35-percent concentrate unpelleted ration produced the cheapest gains of any lots in this year's test. Due to the increased rate of gain and efficiency the two lots fed field-cured alfalfa hay and corn pellets produced gains just about as economically as the unpelleted rations. The gains made by the lambs fed dehydrated alfalfa hay and corn pellets cost considerably more than those made when other rations were fed.

There was little difference in the carcass grades of the lambs fed the different rations; however, lot 2 produced the highest grading carcasses. All lambs sold for the same price.

Table 14

Feed-Lot Performance of Lambs Fed Pelleted and Nonpelleted Rations of Varying Concentrations.

| Lot number | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Ration fed | 60% field-cured alfalfa hay, 40% corn pelleted* | 50% field-cured alfalfa hay, 50% corn pelleted* | 65% chopped alfalfa hay, 35% cracked corn unpelleted | 55% chopped alfalfa hay, 45% cracked corn unpelleted | 60% dehydrated alfalfa hay, 40% corn pelleted* | 50% dehydrated alfalfa hay, 50% corn pelleted* |
| Number lambs per lot | 21 | 21 | 21 | 20 | 21 | 21 |
| Days on feed | 88 | 88 | 88 | 88 | 88 | 88 |
| Initial wt. per lamb, lbs. | 77 | 75.4 | 75.3 | 75.3 | 75.5 | 75.1 |
| Final wt. per lamb, lbs. | 117.5 | 115.0 | 108.8 | 106.1 | 110.6 | 106.2 |
| Total gain per lamb, lbs. | 40.5 | 39.6 | 33.4 | 31.0 | 35.1 | 31.1 |
| Av. daily gain per lamb, lb. | .459 | .450 | .380 | .352 | .399 | .353 |
| Lbs. feed per lamb daily: | | | | | | |
| Pellet | 3.15 | 2.92 | | | 2.94 | 2.62 |
| Cracked corn | | | 1.16 | 1.33 | | |
| Chopped hay | .418 | .408 | 2.20 | 1.76 | .408 | .408 |
| Lbs. feed per cwt. gain: | | | | | | |
| Pellet | 684.7 | 647.9 | | | 735.5 | 740.7 |
| Cracked corn | | | 304.6 | 377.7 | | |
| Chopped hay | 87.6 | 90.6 | 577.9 | 483.7 | 102.1 | 115.4 |
| Feed cost per cwt. gain, $ | 16.44 | 16.43 | 16.25 | 16.89 | 19.31 | 20.24 |
| Feed cost per lamb, $ | 6.66 | 6.51 | 5.43 | 5.24 | 6.78 | 6.29 |
| Number lambs died | | | | 1 | | |
| Carcass grades: | | | | | | |
| Prime | | | | 2 | 1 | |
| Choice | 10 | 17 | 12 | 9 | 10 | 11 |
| Good | 11 | 4 | 9 | 9 | 10 | 10 |
| Av. daily gain per lamb fed similar rations in '55-56, lb. | .416 | .398 | .336 | .355 | .381 | .377 |

* Each lamb received, in addition, .4 lb. chopped alfalfa hay daily.

## Table 15

### Lamb Production by Ewes of Different Types from Sires of Different Breeds in 1956.

| Breed or breed-type | No. ewes bred | No. ewes lambing before Dec. 20 | No. ewes lambing after Dec. 20 | No. lambs weaned | % lambs weaned | Lamb weight at 100 days of age | Average weaning weight, lbs. | Lbs. of lamb weaned per ewe bred |
|---|---|---|---|---|---|---|---|---|
| Ewe types:[1] | | | | | | | | |
| Finewools | 47 | 43 | 2 | 54 | 114.9 | 72.7 | 100.2 | 100.2 |
| Northwest Whiteface | 40 | 23 | 12 | 40 | 100 | 75.4 | 96.6 | 96.5 |
| Northwest Blackface | 49 | 35 | 8 | 48 | 95.9 | 76.0 | 103.3 | 103.3 |
| Total[1] | 136 | 101 | 22 | 42 | 103.6 | 74.6 | 99.5 | 99.5 |
| Sire groups:[2] | | | | | | | | |
| Hampshire | 34 | 26 | | 30 | 107.1 | 75.1 | 100.5 | 88.7 |
| Suffolk | 34 | 27 | | 32 | 100 | 76.7 | 101.9 | 95.9 |
| Southdown | 33 | 25 | | 29 | 87.8 | 72.0 | 97.8 | 85.9 |
| Shropshire | 35 | 23 | | 24 | 68.7 | 74.8 | 101.2 | 69.4 |

1. Results include 22 ewes that lambed after December 20. These ewes were bred after July 25, 1955, when the three ewe groups were run together and rams of all four breeds were placed with them.

2. Ewes that lambed after December 20 are figured as dry ewes.

## Table 16

### 1957 Lambing Data and Lamb Production from Ewes of Different Types and from Sires of Different Breeds.

| | No. ewes bred | No. ewes lambing | Average lambing date | Av. birth wt., lbs. — Singles | Twins | % lambs born | No. lambs alive Mar. 29 | Av. wt. of lambs Mar. 29 |
|---|---|---|---|---|---|---|---|---|
| Ewe groups: | | | | | | | | |
| Finewools | 48 | 43 | Nov. 17 | 11.2 | 10.2 | 135.4 | 58 | 84.6 |
| Northwest Whiteface | 39 | 31 | Dec. 15 | 12.3 | 8.8 | 117.9 | 44 | 72.3 |
| Northwest Blackface | 47 | 40 | Dec. 10 | 13.6 | 9.2 | 127.6 | 57 | 75.1 |
| Sire groups: | | | | | | | | |
| Hampshire | 33 | 28 | Nov. 28 | 10.5 | 9.0 | 127.2 | 35 | 85.4 |
| Suffolk | 33 | 33 | Dec. 6 | 12.7 | 9.2 | 145.4 | 46 | 84.0 |
| Southdown | 31 | 21 | Dec. 6 | 10.7 | 8.2 | 97.0 | 33 | 70.8 |
| Shropshire | 34 | 29 | Dec. 2 | 10.6 | 9.2 | 141.1 | 46 | 70.9 |

## The Effect of Stilbestrol on Digestion and Nitrogen Balance in Lamb Rations (Project 370).

D. Richardson, T. D. Bell, and R. F. Cox

The feeding of stilbestrol to ruminants has, in general, increased rate of liveweight gain and decreased the quantity of feed required per unit of gain. This test was conducted to determine the effect of stilbestrol upon digestibility of nutrients and nitrogen retention when used in a lamb's ration.

### Experimental Procedure

Fifteen crossbred lambs weighing about 90 pounds each were used in this test. The ration, composed of 65 percent alfalfa and 35 percent corn, was fed as a pellet. The lambs had been on this ration for a previous test and were accustomed to it. Collections of feces and urine were made over seven-day periods. After the first collection period, 2 mgs. of stilbestrol was added to the ration of each lamb. After a 10-day adjustment period, feces and urine were again collected for seven days. In this way, each animal served as his own control. The total quantity of feces and urine was measured each day and a sample obtained for chemical analysis.

### Results and Observations

The results of this test are presented in Table 17. There were small but nonsignificant differences in the digestibility of protein, crude fiber, nitrogen-free extract, and total digestible nutrients. There was a significant decrease in digestibility of ether extract. Nitrogen retention increased but the amount was not significant. These results indicate that stilbestrol has very little or no effect upon the utilization of the nutrients studied.

**Table 17**

**Average Digestion and Nitrogen Balance Results with 15 Lambs on a Ration with and without Stilbestrol.**

| Ration | % apparent digestibility of | | | | | % |
|---|---|---|---|---|---|---|
| | crude protein | ether extract | crude fiber | N-free extract | TDN | nitrogen retained |
| Control | 68.06 | 64.99 | 35.68 | 84.84 | 64.40 | 14.74 |
| Control plus 2 mgs. stilbestrol daily per animal | 67.53 | 60.10 | 33.50 | 84.86 | 63.59 | 15.11 |

## Table 18

### Chemical Analyses of Feeds Used in Garden City Lamb-Feeding Trials, 1956-57.

| Description | Protein (N×6.25), % | Ether extract, % | Crude fiber, % | Moisture, % | Ash, % | N-free extract, % | Carbohydrates, % |
|---|---|---|---|---|---|---|---|
| **As received** | | | | | | | |
| Wheat silage | 5.92 | 0.89 | 13.37 | 55.26 | 6.43 | 18.13 | 31.50 |
| Wheat pasture | 7.50 | 1.09 | 4.51 | 69.23 | 4.44 | 13.23 | 17.74 |
| Sorghum silage | 2.49 | 0.89 | 10.87 | 53.85 | 3.82 | 28.08 | 38.95 |
| Sorghum fodder | 3.63 | 2.01 | 20.66 | 9.91 | 10.11 | 53.68 | 74.34 |
| Sorghum stover | 2.94 | 1.27 | 20.08 | 16.88 | 7.52 | 51.31 | 71.39 |
| Alfalfa hay | 14.38 | 1.80 | 31.33 | 5.89 | 9.24 | 37.36 | 68.69 |
| **Dry basis** | | | | | | | |
| Wheat silage | 13.21 | 1.99 | 29.90 | | 14.34 | 40.53 | 70.43 |
| Wheat pasture | 24.40 | 3.55 | 14.65 | | 14.44 | 42.96 | 57.61 |
| Sorghum silage | 5.39 | 1.93 | 23.54 | | 8.28 | 60.86 | 84.40 |
| Sorghum fodder | 4.03 | 2.23 | 22.93 | | 11.22 | 59.59 | 82.52 |
| Sorghum stover | 3.54 | 1.53 | 24.16 | | 9.05 | 60.72 | 84.88 |
| Alfalfa hay | 15.28 | 1.91 | 33.29 | | 9.82 | 39.70 | 72.99 |

## Table 19

### Chemical Analyses of Feeds Fed in This Test and in the Digestion Trial Reported on Pages 14 and 15.

| | Protein (N×6.25), % | Ether extract, % | Crude fiber, % | Moisture, % | Ash, % | N-free extract, % | Carbohydrates, % |
|---|---|---|---|---|---|---|---|
| Ground corn | 11.31 | 3.86 | 2.14 | 8.55 | 1.83 | 72.31 | 74.45 |
| 60-40 field-cured pellets | 15.38 | 2.81 | 15.15 | 6.58 | 6.43 | 53.65 | 68.80 |
| 60-40 dehydrated pellets | 15.38 | 3.63 | 18.12 | 6.03 | 8.55 | 48.29 | 66.41 |
| 50-50 field-cured pellets | 14.13 | 3.07 | 13.10 | 6.85 | 5.48 | 57.37 | 70.47 |
| 50-50 dehydrated pellets | 13.56 | 4.39 | 15.51 | 6.47 | 6.65 | 53.42 | 68.93 |
| Chopped alfalfa hay* | 15.50 | 1.66 | 29.30 | 5.94 | 9.28 | 38.32 | 67.62 |
| Chopped alfalfa hay* | 18.00 | 1.78 | 25.59 | 5.77 | 10.02 | 38.84 | 64.43 |

* These two samples were both obtained from the same lot of chopped field-cured hay.

**The Use of Management Techniques and Hormones to Control the Time, Rate, and Regularity of Lambing (Project BJ-441).**

**E. Nelson, W. Smith, J. Wheat, T. D. Bell, and C. S. Menzies**

Large, uniform lambs of high quality on the market at the right time provide the sheep man with his margin of profit. Because this is true, there has been considerable concern among producers of fall lambs concerning the control of the time, rate, and regularity of fall lambing. Many producers have found that their ewes will not breed regularly during the summer months and the lambing interval tends to be extended with lapses occurring occasionally.

To attack this problem, it is necessary to have basic information concerning the influence of each sex in the production of fall lambs.

The animals used in connection with this study were a flock of approximately 136 head of western ewes of three predominant types (Texas or finewools, Northwest Blackface Crossbreds, and Northwest Whiteface Crossbreds), and four breeds of rams (Hampshire, Suffolk, Shropshire, and Southdown). Observations on these sheep at this station during the past four summers indicate that the ewes may be sexually active during the summer months, at least above marginal levels, and failure to settle may be due to poor semen-quality production by the rams used. Factors affecting semen quality are being observed at Kansas State College.

Some seasonal variation in semen quality has been observed at this station. However, the data now being collected are still incomplete, and no definite conclusions can be drawn from them. It is evident that individual rams tend to vary considerably more in regard to semen quality than do the breeds being observed. During the summer of 1956, four of the eight rams used on the experimental ewes exhibited some sterility for varying periods during the active breeding season (June 1 to September 7). One ram of each breed was so affected.

This preliminary observation indicates that a smaller ratio of ewes per ram be allowed during the summer than for normal fall breeding, and that even small groups of ewes should have at least two rams available. Other management techniques that tend to show promise are the feeding of high roughage rations, providing as cool a place as possible for the rams during the day, and shearing the rams at the beginning of the breeding season or shortly thereafter.

The scope of the entire project has not been fully investigated. Hormones have not been used in this study to attempt to change reproductive efficiency, because of their inconsistent results in previous studies (reported in Circulars 283, 1952; and 308, 1954). Their use, however, is still considered to be a possible method of control for fall lambing.

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**Adaptability of Breeds of Rams and Breed-Types of Range Ewes to Market Lamb Production in Kansas (Project 347).**

**Carl Menzies, T. D. Bell, L. A. Holland, and Edward Nelson**

Western ewes of the three predominant types (Texas ewes or finewools, Northwest Blackface Crossbreds, and Northwest Whiteface Crossbreds) commonly found in Kansas were obtained as ewe lambs in the fall of 1951 and bred to Hampshire, Suffolk, Shropshire, and Southdown rams for five seasons. A different set of rams has been used each year, and the ewes have been rotated so that they were bred to a different breed of ram each year. Lamb and wool production records have been kept on the different types of ewes, and lamb production figures have been obtained for the four sire groups.

**Results**

Lamb production figures for the 1955-56 lamb crop are presented in Table 15 and the preliminary lambing data and lamb production for 1956-57 are shown in Table 16.

January 30, all lambs were separated into sire groups except 12 late lambs that were added to their respective groups February 26. Each group

of lambs was creep-fed, twice a day, a concentrate mixture consisting of 6 parts by weight of milo; 1 part whole oats; 1 part wheat bran; 1 part cracked corn; 1 part dehydrated alfalfa meal, molasses, and corn pellets. Approximately 2 percent salt was added to this mixture. Lambs were also fed good, leafy alfalfa hay in the creep. The ewes in the different lots were fed similar rations consisting of 1 pound grain, 2 pounds alfalfa hay, and 6 pounds sorghum silage per ewe per day. Records were kept on the feed consumption of the different groups of lambs and ewes.

Table 20 gives the gains and feed consumption of the different groups of lambs.

### Discussion and Observations

As in the past four years, the Texas finewool ewes bred and lambed earlier this year than the other two types of ewes. The finewool ewes lambed 23 days (average) earlier than the Northwest Blackface ewes and 28 days before the Northwest Whiteface ewes. Because of the earlier lambing date, lambs from the Texas finewool ewes usually reach market weights earlier than lambs from the other groups. The lambs from the other groups, however, usually gain slightly faster than the finewool lambs and are heavier at 100 days of age. So far in this year's test the lambs from the finewool ewes have gained about .05 pound less per day than lambs from the other ewe groups.

The Whiteface crossbred ewes generally have produced the heaviest fleeces, followed by the finewools. There have been no consistent differences among the three types of ewes in lambing and weaning percentages. There has been no consistent difference in carcass grade of lambs from different ewe groups; however, lambs from the Blackface Crossbreds have in some years graded slightly higher.

Lambing and weaning data from the lambs sired by Hampshire, Suffolk, Southdown, and Shropshire rams have not been consistent. The average birth weights of lambs sired by Hampshire, Suffolk, and Shropshire rams have varied from year to year but have been about equal. The lambs sired by Southdown rams usually averaged lighter at birth than lambs sired by the other breeds.

The Hampshire- and Suffolk-sired lambs so far have gained faster in this year's test than Southdown- or Shropshire-sired lambs; however, they were no more efficient in converting feed into gain. In past years Hampshire- and Suffolk-sired lambs have usually gained slightly faster and have been heavier at weaning than the Southdown- and Shropshire-sired lambs. However, this trend has not been consistent. In 1954-55 the Southdown- and Shropshire-sired lambs gained equally as fast as the lambs sired by the other two breeds. The Southdown-sired lambs have shown a slight advantage in carcass grade in some years but this superior quality has not been demonstrated consistently.

**Table 20**

**Feed Consumption and Lamb Production from Four Different Breeds of Rams and Three Types of Ewes.**

| | No. of lambs | Daily concentrate consumption in creep per lamb | Av. daily gain in lbs. per lamb | Gain per lb. of creep feed consumed |
|---|---|---|---|---|
| Sire groups: | | | | |
| Hampshire | 35 | 1.46 | .600 | .41 |
| Suffolk | 46 | 1.45 | .644 | .44 |
| Southdown | 32 | 1.16 | .559 | .48 |
| Shropshire | 46 | 1.32 | .541 | .41 |
| Ewe groups: | | | | |
| Finewools | 58 | | .552 | |
| Northwest Whiteface | 44 | | .615 | |
| Northwest Blackface | 57 | | .604 | |

# *Beef Cattle*

**Three-Year Summary-Level of Winter Supplementation for Steer Calves Both Winter and Summer Grazed on Bluestem Pastures, 1952-53, 1954-55, 1955-56 (Project 253-1).**

E. F. Smith, R. F. Cox, B. A. Koch, and F. H. Baker

The primary object of this test was to find the most desirable level of protein supplementation for wintering steer calves on dry bluestem pasture that are to be sold off summer grass as stocker or feeder yearlings.

### Experimental Procedure

Three 10-head lots of good-quality Hereford steer calves were used in this study each year. The animals remained on bluestem pasture both winter and summer.

Respective lots were fed the below indicated supplements during the winter:

Lot 1—1 pound of soybean pellets per head daily.
Lot 2—2 pounds of soybean pellets per head daily.
Lot 3—1 pound of soybean pellets and 1 pound of ground corn per head daily.

Salt was available to the steers at all times. A bonemeal and salt mixture was offered free choice during the winter for the first two trials. In the third test, six of the steers in each lot were implanted with 36 mgs. of stilbestrol. The stilbestrol phase of the study is reported elsewhere.

### Observations

Some additional gain was obtained by increasing the supplemental feed level from 1 to 2 pounds per head daily. For the combined winter and summer periods an additional 128 pounds of soybean pellets fed per animal to lot 2 produced 28 pounds of gain per steer compared with lot 1. In lot 3, 128 pounds of corn produced 20 pounds more gain per animal compared with lot 1 where only 1 pound of soybean pellets was fed per head daily.

Although the differences were not large, there appears to be some advantage to increasing the supplemental level from 1 to 2 pounds per head daily. One pound of soybean pellets and 1 pound of corn produced about the same gain as 2 pounds of soybean pellets per head daily in this summary. This is the case in two of the three years tested. Apparently 1 pound of soybean pellets per head daily comes close to meeting the calves' protein needs when combined with an energy feed such as corn.

### Table 21

**Three-Year Summary—Level of Winter Supplementation for Steer Calves Both Winter and Summer Grazed on Bluestem Pastures, 1952-53, 1954-55, 1955-56.**

Phase 1—Wintering—125.7 days.

| | | | |
|---|---|---|---|
| Lot number | 1 | 2 | 3 |
| Number of steers | 10 | 10 | 10 |
| Initial wt. per steer, lbs. | 505 | 508 | 507 |
| Final wt. per steer, lbs. | 551 | 584 | 572 |
| Gain per steer, lbs. | 46 | 76 | 65 |
| Daily gain per steer | .37 | .52 | .60 |
| Daily ration per steer, lbs.: | | | |
| Soybean pellets | 1.00 | 2.00 | 1.00 |
| Ground corn | | | 1.00 |
| Prairie and alfalfa hay[1] | 1.47 | 1.44 | 1.44 |
| Dry bluestem pasture | Free choice | | Free choice |
| Salt | Free choice | | Free choice |
| Feed cost per steer[2] | $10.25 | $14.63 | $13.91 |

Table 21 (Continued).

| | | | |
|---|---|---|---|
| Phase 2—Grazing, April to August—109.3 days. | | | |
| Initial wt. per steer, lbs. | 551 | 584 | 572 |
| Final wt. per steer, lbs. | 757 | 788 | 779 |
| Gain per steer, lbs. | 206 | 204 | 207 |
| Daily gain per steer, lbs. | 1.88 | 1.87 | 1.89 |
| Feed cost per steer[2] | $16.00 | $16.00 | $16.00 |
| Summary of Phases 1 and 2—235 days. | | | |
| Initial wt. per steer, lbs. | 505 | 508 | 507 |
| Final wt. per steer, lbs. | 757 | 788 | 779 |
| Gain per steer, lbs. | 252 | 280 | 272 |
| Daily gain per steer, lbs. | 1.07 | 1.19 | 1.16 |
| Feed cost per steer | $25.25 | $30.63 | $29.19 |
| Feed cost per 100 lbs. gain[2] | $10.02 | $10.94 | $11.00 |

1. Hay was fed only when snow covered the grass.
2. The feed prices used are those inside the back cover; $1 per steer was charged for salt and mineral.

**Self-Feeding Urea Molasses and the Feeding of Aureomycin to Steer Calves Wintered on Bluestem Pasture, 1956-57 (Project 253-1).**

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

In this study a self-fed, urea-molasses mixture is being compared to molasses self-fed plus 1.3 pounds of soybean meal in an effort to determine if a urea-molasses mixture self-fed on dry grass will serve as an adequate source of protein and energy.

Another phase of the experiment is to determine if aureomycin will improve the performance of calves wintered outside exposed to the hazards of winter weather.

### Experimental Procedure

The steer calves used in the study originated in the vicinity of Santa Rosa and Melrose, N.M. They were allotted to their treatments on the basis of weight. The calves in lots 12 and 12A were wintered together in a 190-acre bluestem pasture and separated each morning to be fed. The calves in lot 7 were in a 60-acre pasture, as were those in lot 15.

Lot 12 should be compared with lot 12A, which received aureomycin in the form of Aurofac 2A. The Aurofac 2A was mixed with the soybean meal so as to furnish 45 mgs. of aureomycin per calf daily.

Lot 7 should be compared with lot 15. The molasses in lots 7 and 15 was self-fed with no attempt to regulate consumption. The urea-molasses mixture fed to lot 15 contained 77 percent molasses, 3 percent phosphoric acid, and a 20 percent urea solution which was one half urea and one half water. The molasses fed to lot 7 contained 3 percent phosphoric acid.

### Observations

Aureomycin added to the ration of lot 12A increased the gain slightly as compared with lot 12.

Molasses fed to lot 7 was more palatable than the urea molasses fed to lot 15. The soybean meal and extra molasses consumed by lot 7 increased the gain of that lot by 87 pounds per head over lot 15 self-fed a urea-molasses mixture.

The protein or protein equivalent consumed in the supplemental feed by the two lots was about the same for each lot.

Apparently some additional source of protein other than that found in dry bluestem pasture and urea is necessary for calves.

**Table 22**

**Self-Feeding Urea Molasses and the Feeding of Aureomycin to Steer Calves Wintered on Bluestem Pasture. Compare Lot 12 with 12A and Lot 7 with 15.**

December 11, 1956, to March 30, 1957—109 days.

| Lot number | 12 | 12A | 7 | 15 |
|---|---|---|---|---|
| Treatment | No aureomycin | Aureomycin | Molasses and soybean meal | Urea molasses |
| Number steers per lot | 10 | 10 | 10 | 10 |
| Initial wt. per steer, lbs. | 433 | 432 | 435 | 435 |
| Final wt. per steer, lbs. | 514 | 526 | 534 | 447 |
| Gain per steer, lbs. | 81 | 94 | 99 | 12 |
| Daily gain per steer, lbs. | .74 | .86 | .91 | .11 |
| Daily ration per steer, lbs.: | | | | |
| Soybean meal | 1.0 | 1.0 | 1.3 | |
| Ground milo grain | 4.6 | 4.6 | | |
| Aureomycin, mgs. | | 45 mgs. | | |
| Molasses, self-fed | | | 4.0 | |
| 10% urea molasses, self-fed | | | | 2.6 |
| Dry bluestem pasture | Free choice | | Free choice | |
| Salt | Free choice | | Free choice | |
| Feed cost per steer* | $19.35 | $20.03 | $22.05 | $14.93 |

* Feed prices for 1956-57 are inside back cover of this circular. $1 per steer was charged for salt; $0.50 per pound for Aurofac 2A; and $85 per ton for the urea-molasses mixture.

**Level of Winter Protein Supplementation for Steer Calves Both Wintered and Summer Grazed on Bluestem Pasture, 1955-56 (Project 253).**

**E. F. Smith, B. A. Koch, R. F. Cox, and G. L. Walker**

This is the third trial of this experiment. In addition to this year's test, a three-year summary is included in this circular. The test is designed to study the level of protein supplementation most desirable for wintering steer calves on dry bluestem pasture that are to be sold off summer grass as stocker or feeder yearlings. Results of this test are measured primarily by the combined winter and summer performance of the steers.

**Experimental Procedure**

Thirty good-quality Hereford steer calves purchased from the Williams Ranches near Lovington, N.M., were used in the test. They were the heaviest steer calves of 256 purchased. They were divided on the basis of weight into three lots of 10 calves each and grazed together on a 190-acre bluestem pasture during the winter. Each morning they were gathered and divided into three feeding pens to receive their supplements. The treatment assigned to each lot was as follows:

Lot 12A—1 pound of soybean pellets per head daily.
Lot 12B—2 pounds of soybean pellets per head daily.
Lot 12C—1 pound of soybean pellets and 1 pound of corn per head daily.

All of the steers were grazed together during the summer on bluestem pasture.

Six of the steers in each lot were implanted at the start of the test with 36 mgs. of stilbestrol. The results of this treatment are included in another report found in this publication.

**Observations**

On the basis of gain, apparently 1 pound of soybean pellets does not furnish sufficient protein for steer calves wintered on dry bluestem pasture. The steers in lot 12B gained slightly more in the winter and 29 pounds more year-long when fed 2 pounds of soybean pellets as compared

112 days

with lot 12A where only 1 pound of soybean pellets was fed. However, the cost of producing the gain was about the same in both lots.

The steers in lot 12C fed 1 pound of soybean pellets and 1 pound of corn per head daily gained about the same amount as those fed only 1 pound of soybean pellets. Since no increase in gain was obtained with the corn, cost of producing a 100-pound gain with corn was increased slightly.

**Table 23**

**Level of Protein Supplementation for Steer Calves Both Winter and Summer Grazed on Bluestem Pasture.**

Phase 1—Wintering, January 4, 1956, to April 7, 1956—93 days.

| Lot number | 12A | 12B | 12C |
|---|---|---|---|
| Number of steers | 10 | 10 | 10 |
| Initial wt. per steer, lbs. | 581 | 590 | 585 |
| Final wt. per steer, lbs. | 604 | 647 | 620 |
| Gain per steer, lbs. | 23 | 57 | 35 |
| Daily gain per steer, lb. | .25 | .61 | .37 |
| Daily ration per steer, lbs.: | | | |
| Soybean pellets | 1 | 2 | 1 |
| Ground corn | | | 1 |
| Prairie and alfalfa hay[1] | 1 | 1 | 1 |
| Dry bluestem pasture | Free choice all lots | | |
| Salt | Free choice all lots | | |
| Feed cost per steer[2] | $6.26 | $9.52 | $8.96 |
| Phase 2—Grazing, April 7, 1956, to August 7, 1956—123 days. | | | |
| Initial wt. per steer, lbs. | 604 | 647 | 620 |
| Final wt. per steer, lbs. | 803 | 841 | 807 |
| Gain per steer, lbs. | 199 | 194 | 187 |
| Daily gain per steer, lbs. | 1.62 | 1.58 | 1.52 |
| Feed cost per steer[2] | $17.00 | $17.00 | $17.00 |
| Summary of Phases 1 and 2—January 4, 1956, to August 7, 1956—216 days. | | | |
| Initial wt. per steer, lbs. | 581 | 590 | 585 |
| Final wt. per steer, lbs. | 803 | 841 | 807 |
| Gain per steer, lbs. | 222 | 251 | 222 |
| Daily gain per steer, lbs. | 1.03 | 1.16 | 1.03 |
| Feed cost per 100 lbs. gain[2] | $10.47 | $10.56 | $11.69 |
| Feed cost per steer[2] | $23.26 | $26.52 | $25.96 |
| Av. feeder grade August 4[3] | High good | High good | High good |
| Av. condition score August 4[4] | 3.5 | 3.4 | 3.1 |

1. Fed only when snow covered the grass.

2. Feed prices may be found inside back cover; a charge of $1 per head was made for salt.

3. Animals were scored individually by a committee of three animal husbandmen.

4. Condition scores ranged from 1 to 6, the higher number indicating more condition.

**Supplements for Yearling Steers on Bluestem Pastures During the Latter Part of the Grazing Season, 1956, and a Three-Year Summary, 1953-55-56 (Project 253-1).**

**E. F. Smith, R. F. Cox, B. A. Koch, and G. L. Walker**

The nutritive value of bluestem pasture usually declines rapidly after midsummer. This is the third trial in this experiment in an attempt to find a method to economically increase the rate of gain after midsummer with small quantities of concentrate feed.

**Experimental Procedure**

Twenty-seven head of good-quality yearling Hereford steers were used in this test. They had been grazed together on bluestem pasture pre-

vious to the test. The steers were divided into three lots of nine steers each in a manner to equalize any differences due to previous winter treatments. They were grazed on bluestem pasture and received the following treatment from August 7, 1956, to October 2, 1956:

Lot 1—No supplement.
Lot 2—2 pounds of soybean pellets per head daily.
Lot 3—2 pounds of ground corn per head daily.

Six of the steers in each lot were implanted with 36 mgs. stilbestrol implants the previous fall. Results of this phase of the test are reported elsewhere in this circular.

### Observations

1. The gain was increased by feeding either soybean pellets or corn. By feeding 114 pounds of soybean pellets per steer, the gain was increased 31 pounds. At present costs, this would probably be profitable, especially if it would improve the appearance of the steers.

Only 12 pounds of gain was produced from 114 pounds of corn. This small gain increase would not pay for the corn at present prices, unless it raised the feeder grade or enabled the producer to sell the steers at a higher price. The results of this test indicate protein and not energy feeds are needed for late summer feeding on grass where only small quantities of feed are to be fed.

2. It rained 5.07 inches in July and 3.61 inches in August. September was dry with a total of only .12 inch for the month.

### Three-Year Summary, 1953-55-56

For the three-year summary (Table 25), 141 pounds of soybean pellets produced 28 pounds of additional gain. At present prices the additional gain would more than pay for the soybean pellets. This was true for each year except 1953. Most of the increase in gain each year came during September except in 1953.

Gain increases were also made in October. However, the feeding trial was discontinued in mid-October or earlier each year.

The feeding of ground shelled corn to lot 3 also increased the gain. 141 pounds of corn for 15 pounds of gain. Under present prices this small gain would not justify feeding corn.

Apparently in some years there is a need for additional protein for yearling steers during late summer, especially September and October. It is possible that smaller quantities than 2 pounds per head daily would suffice when protein is needed.

### Table 24

**Effect of Feeding Supplements During the Latter Part of the Grazing Season to Yearling Steers on Bluestem Pasture.**

August 7, 1956, to October 2, 1956—57 days.

| Lot number | 1 | 2 | 3 |
|---|---|---|---|
| Number of steers per lot | 9 | 9 | 9 |
| Management | No supplement | 2 lbs. soybean pellets | 2 lbs. corn |
| Initial wt. per steer, lbs. | 817 | 818 | 818 |
| Final wt. per steer, lbs. | 902 | 933 | 914 |
| Gain per steer, lbs. | 85 | 115 | 96 |
| Daily gain per steer, lbs. | 1.52 | 2.05 | 1.71 |
| Gain in lbs. contributed to feeding soybean pellets or ground corn | 0 | 31 | 12 |
| Total soybean pellets or corn fed per steer, lbs.: | | | |
| Soybean pellets | 0 | 114 | |
| Ground corn | 0 | | 114 |
| Gain per steer by periods: | | | |
| August 7 to September 1 | 56 | 54 | 56 |
| September 1 to October 2 | 29 | 61 | 40 |
| Total gain August 7 to October 2 | 85 | 115 | 96 |

Table 25

**Summary—Supplements for Yearling Steers on Bluestem Pastures During the Latter Part of the Grazing Season, 1953, 1955, 1956.**

August to October—70.3 days.

| Lot number | 1 | 2 | 3 |
|---|---|---|---|
| Number of steers | 33 | 33 | 33 |
| Management | No supplement | 2 lbs. soybean pellets | 2 lbs. corn ground |
| Initial wt. per steer, lbs. | 774 | 776 | 777 |
| Final wt. per steer, lbs. | 864 | 894 | 882 |
| Gain per steer, lbs. | 90 | 118 | 105 |
| Daily gain per steer, lbs. | 1.28 | 1.67 | 1.49 |
| Gain in lbs. contributed to feeding soybean pellets or corn | | 28 | 15 |
| Total soybean pellets or corn fed per steer, lbs.: | | | |
| Soybean pellets | | 141 | |
| Ground shelled corn | | | 141 |
| Gain per steer by periods, lbs.: | | | |
| August | 52 | 47 | 48 |
| September | 21 | 49 | 36 |
| October* | 21 | 33 | 32 |

* October gain is average of 1953 and 1955. In 1956 the trial was over October 2.

## The Value of Stilbestrol Implants for Beef Cattle (Project 253-1).

Garth L. Walker, Ed F. Smith, B. A. Koch, and R. F. Cox

This test was conducted to study the effect of stilbestrol implants on steer calves fed various levels of supplements and wintered on dry bluestem pasture.

### Experimental Procedure

Thirty choice-quality Hereford steer calves from the Williams Ranches near Lovington, N.M., were used in this test. These animals grazed together on dry bluestem pasture. They were separated for a brief period each morning into three groups and fed their different supplements. The supplements fed per head daily were: Lot 1, 1 pound of soybean oil meal pellets; lot 2, 2 pounds of soybean oil meal pellets; and lot 3, 1 pound of soybean oil meal pellets plus 1 pound of ground corn. Six animals in each of the three lots were implanted with 48 mgs. of stilbestrol.

**Wintering phase.** Gains between implants and controls were comparable in lot 1; however, in lots 2 and 3 those implanted gained 0.36 pound and 0.35 pound more per day than did the controls. There were some treated animals that exhibited abnormal secondary sex characteristics and uneven toplines.

**Grazing phase.** All animals were grazed in the same pasture during the summer. Gains between controls and implants were quite similar in all lots. Undesirable appearance due to implanting was still apparent in a few animals.

### Summary

Numbers used in this test were limited but results indicate that the quantity of protein, or protein and energy, supplied may affect rate of gain due to stilbestrol.

Control and implanted calves that received 1 pound of soybean oil meal pellets during the winter and were summer grazed made similar weight gains for the two periods.

The implanted steers in lot 2, which had been wintered on 2 pounds of soybean oil meal pellets, gained 47 pounds more for the 216-day period.

Implanted calves wintered on 1 pound of soybean oil meal pellets plus 1 pound of ground corn gained 50 pounds more than did the controls.

## Table 26

**Effect of Stilbestrol on Steer Calves Wintering on Dry Bluestem Pasture Fed Various Levels of Supplement and Grazed on Bluestem Pasture the Following Summer.**

Wintering phase—January 4 to May 3, 1956—120 days.

| Lot number | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|
| Number of steers | 10 | | 10 | | 10 | |
| Ration | Dry bluestem pasture, 1 lb. 80% pellets per head daily | | Dry bluestem pasture, 2 lbs. 80% pellets per head daily | | Dry bluestem pasture, 1 lb. 80% pellets and 1 lb. corn per head daily | |
| Treatment | Controls | Implants | Controls | Implants | Controls | Implants |
| Number of steers per treatment | 4 | 6 | 4 | 6 | 3[1] | 6 |
| Initial wt. per steer, lbs. | 598 | 570 | 605 | 582 | 586 | 583 |
| Final wt. per steer, lbs. | 673 | 652 | 681 | 701 | 639 | 678 |
| Total gain per steer, lbs. | 75 | 82 | 76 | 119 | 53 | 95 |
| Daily gain per steer, lb. | .62 | .68 | .63 | .99 | .44 | .79 |
| Summer grazing phase—May 4 to August 7, 1956—96 days. | | | | | | |
| Initial wt. per steer, lbs. | 673 | 652 | 681 | 701 | 639 | 678 |
| Final wt. per steer, lbs. | 814 | 796 | 826 | 850 | 779 | 826 |
| Total gain per steer, lbs. | 141 | 144 | 145 | 149 | 140 | 148 |
| Daily gain per steer, lbs. | 1.46 | 1.50 | 1.51 | 1.55 | 1.45 | 1.54 |
| Complete trial—January 4 to August 7, 1956—216 days. | | | | | | |
| Initial wt. per steer, lbs. | 598 | 570 | 605 | 582 | 586 | 583 |
| Final wt. per steer, lbs. | 814 | 796 | 826 | 850 | 779 | 826 |
| Total gain per steer, lbs. | 216 | 226 | 221 | 268 | 193 | 243 |
| Daily gain per steer, lbs. | 1.0 | 1.04 | 1.02 | 1.24 | .89 | 1.12 |

1. Removed from test because of sore foot.

## Project 253-2.

Object of this test was to obtain information in regard to stilbestrol implants for heifer calves wintered on dry bluestem pasture or in dry lot and grazed during the summer on bluestem pasture.

### Experimental Procedure

Thirty head of good to choice heifer calves from near Lovington, N.M., were allotted as equally as possible into three lots of 10 animals each. Four animals in each lot were implanted with 36 mgs. of stilbestrol at the beginning of the trial. All lots were grazed together on bluestem pasture from May 3 to August 3, 1956.

The heifers in lot 4 were wintered in dry lot and received per head daily 3 pounds of alfalfa hay, 1.5 pounds of corn, and 28 pounds of sorghum silage.

Animals in pasture 7 received 3 pounds of alfalfa hay and 1.5 pounds of corn per head daily.

Heifers in pasture 8 received 6 pounds of alfalfa per head daily. All animals received free choice salt and a bonemeal and salt mixture.

### Observations

**Wintering phase.** The treated animals in lot 4 seemed to exhibit symptoms of hormonal disturbances such as nervousness, depressed loin, and sexual organ development sooner and to a great extent than treated animals in pastures 7 and 8. One heifer in lot 4 and one heifer in pasture 7 developed a vaginal prolapse. The heifer in lot 7 failed to respond to treatment and was slaughtered.

The implanted heifers in lot 4 gained 0.35 pound more per head daily than the nonimplanted heifers of that lot. The implanted heifers on grass tended to gain slightly more than the controls.

**Grazing phase.** All heifers were grazed together during the summer. The nonimplanted heifers in pasture 7 gained 0.24 pound more per head daily than the implants. Gains in the other two lots were about the same for controls and implants.

### Summary

Numbers in this test were small. The wintering and grazing phases combined lasted 262 days. Stilbestrol implants gained 58 pounds more per head in lot 4, wintered in dry lot; 22 pounds more per head for those in pasture 8; and no increase for pasture 7.

The general appearance of the implanted heifers was extremely impaired by depressed loin and excessive development of secondary sex characteristics. In addition, one implanted heifer was slaughtered because of vaginal prolapse. After the test terminated, another heifer was slaughtered for the same reason.

The level of stilbestrol, 36 mgs. per heifer, apparently was too high with the type of high-roughage ration fed. Under the conditions of this study, stilbestrol implants proved undesirable at the level used for heifers on high-roughage rations due to the undesirable appearance of the heifers and the difficulty encountered with vaginal prolapse.

## Table 27

### Influence of Stilbestrol Implants on Heifer Calves, Winter and Summer Treatment.

November 15, 1955, to May 3, 1956—170 days.

| Lot number | 4 | | Pasture 7 | | Pasture 8 | |
|---|---|---|---|---|---|---|
| | Sorghum silage, 25 lbs. Alfalfa hay, 3 lbs. Corn, 1.40 lbs. | | Alfalfa hay, 3 lbs. Corn, 1.5 lbs. Dry bluestem pasture | | Alfalfa hay, 6 lbs. Dry bluestem pasture | |
| Treatment | Nonimplants | Implants 36 mgs. | Nonimplants | Implants 36 mgs. | Nonimplants | Implants 36 mgs. |
| Number heifers per lot | 6 | 4 | 6 | 3[1] | 6[2] | 4 |
| Initial wt. per heifer, lbs. | 473 | 473 | 471 | 482 | 474 | 480 |
| Final wt. per heifer, lbs. | 661 | 720 | 550 | 585 | 542 | 564 |
| Total gain per heifer, lbs. | 188 | 247 | 79 | 103 | 68 | 84 |
| Daily gain per heifer, lbs. | 1.10 | 1.45 | .46 | .60 | .40 | .49 |
| Summer grazing phase—May 4, 1956, to August 3, 1956—91 days. | | | | | | |
| Initial wt. per heifer, lbs. | 661 | 720 | 550 | 585 | 542 | 564 |
| Final wt. per heifer, lbs. | 738 | 796 | 734 | 747 | 715 | 743 |
| Total gain per heifer, lbs. | 77 | 76 | 184 | 162 | 173 | 179 |
| Daily gain per heifer, lbs. | .85 | .84 | 2.02 | 1.78 | 1.90 | 1.97 |
| Complete trial—November 15, 1955, to August 3, 1956—261 days. | | | | | | |
| Initial wt. per heifer, lbs. | 473 | 473 | 471 | 482 | 474 | 480 |
| Final wt. per heifer, lbs. | 738 | 796 | 734 | 747 | 715 | 743 |
| Total gain per heifer, lbs. | 265 | 323 | 263 | 265 | 241 | 263 |
| Daily gain per heifer, lbs. | 1.02 | 1.24 | 1.01 | 1.02 | .92 | 1.01 |

1. Removed from test because of vaginal prolapse March 10, 1956.
2. Pregnant—removed from test during grazing phase June 7, 1956.

## Project 253-3-5

For experimental procedure used in this test refer to Project 253-3-5 of this circular.

Object of this test was to determine the value of stilbestrol implants for yearling steers grazed on bluestem pastures.

Treated animals used in this study were implanted with stilbestrol at two levels, 24 mgs. and 36 mgs. A few steers exhibited raised tailheads and depressed or weak loins; this seemed to be more noticeable in the steers implanted at the 36-mg. level.

Considering animals in all pastures, the 24-mg. level of stilbestrol increased total weight gained 37 pounds per animal and the 36-mg. level increased total weight gained per animal 33 pounds over the controls.

### Table 28

**Effect of Stilbestrol Implants on Steers Pastured on Bluestem Pasture.**
April 29 to October 1, 1956—155 days.
Pasture Management Study.

| Pasture number | Pasture treatment | Number of steers | Av. daily gain | Total gain | Treatment |
|---|---|---|---|---|---|
| 1 | Normal stocked | 9 | .99 | 154 | Controls |
| 1 | Normal stocked | 4 | 1.26 | 195 | 24 mgs. |
| 1 | Normal stocked | 4 | 1.33 | 206 | 36 mgs. |
| 2 | Overstocked | 11 | 1.06 | 165 | Controls |
| 2 | Overstocked | 5 | 1.38 | 214 | 24 mgs. |
| 2 | Overstocked | 5 | 1.25 | 193 | 36 mgs. |
| 3 | Understocked | 6 | 1.05 | 163 | Controls |
| 3 | Understocked | 3 | 1.16 | 180 | 24 mgs. |
| 3 | Understocked | 3 | 1.06 | 165 | 36 mgs. |
| 4 | Deferred and rotated | 26 | .90 | 140 | Controls |
| 4 | Deferred and rotated | 13 | 1.08 | 168 | 24 mgs. |
| 4 | Deferred and rotated | 12 | 1.08 | 168 | 36 mgs. |
| 9 | Early spring burned | 6 | 1.27 | 197 | Controls |
| 9 | Early spring burned | 4 | 1.41 | 218 | 24 mgs. |
| 9 | Early spring burned | 3 | 1.54 | 239 | 36 mgs. |
| 10 | Mid-spring burned | 7 | 1.33 | 206 | Controls |
| 10 | Mid-spring burned | 3 | 1.74 | 270 | 24 mgs. |
| 10 | Mid-spring burned | 3 | 1.66 | 257 | 36 mgs. |
| 11 | Late spring burned | 7 | 1.30 | 202 | Controls |
| 11 | Late spring burned | 3 | 1.52 | 236 | 24 mgs. |
| 11 | Late spring burned | 3 | 1.46 | 227 | 36 mgs. |

## Project 253-4

For experimental procedure of this test, refer to Project 253-4 in this circular.

The purpose of this test was to study the effect of stilbestrol implants for yearling steers on a wintering, grazing, and fattening program.

Five steers in pasture 12 and in lot 11 were implanted with 84 mgs. of stilbestrol at the beginning of the test.

During the wintering and grazing phases some of the implanted steers displayed an uneven topline, presumably due to treatment. However, it appeared that during the fattening phase the noticeable effect from treatment was reduced.

Implants made greater gains than controls in the wintering and fattening phases, but the opposite was true during summer grazing.

## Table 29

**Yearling steers—Wintering, Grazing, Fattening Yearling Steers—169 Days.**

Wintering phase—November 16, 1955, to May 3, 1956.

| | | | | |
|---|---|---|---|---|
| Lot number | 11 | | 12 | |
| Daily ration per steer, lbs.: | | | | |
| Soybean oil meal pellets | 1 | | 1 | |
| Sorghum silage | 65.8 | | | |
| Prairie hay | 1.6 | | | |
| Dry bluestem pasture | | | Free choice | |
| Treatment | Controls | Implants 84 mgs. | Controls | Implants 84 mgs. |
| Number of steers per treatment | 5 | 5 | 5 | 5 |
| Initial wt. per steer | 880 | 881 | 883 | 868 |
| Final wt. per steer | 1123 | 1167 | 907 | 932 |
| Total gain for period | 243 | 286 | 24 | 64 |
| Daily gain for period | 1.43 | 1.69 | .14 | .37 |
| Summer phase—May 4 to July 9, 1956—67 days. | | | | |
| Initial wt. per steer, lbs. | 1123 | 1167 | 907 | 932 |
| Final wt. per steer, lbs. | 1149 | 1185 | 1068 | 1088 |
| Total gain for period, lbs. | 26 | 18 | 161 | 156 |
| Daily gain for period, lbs. | .39 | .27 | 2.40 | 2.33 |
| Full feed—July 10, 1956, to September 15, 1956—68 days. | | | | |
| Initial wt. per steer, lbs. | 1149 | 1185 | 1068 | 1088 |
| Final wt. per steer, lbs. | 1269 | 1331 | 1210 | 1247 |
| Total gain for period, lbs. | 120 | 146 | 142 | 159 |
| Daily gain for period, lbs. | 1.76 | 2.14 | 2.08 | 2.33 |
| Complete—November 16, 1955, to September 15, 1956—304 days. | | | | |
| Initial wt. per steer, lbs. | 880 | 881 | 883 | 868 |
| Final wt. per steer, lbs. | 1269 | 1331 | 1210 | 1247 |
| Total gain for period, lbs. | 389 | 450 | 327 | 379 |
| Daily gain for period, lbs. | 1.27 | 1.47 | 1.07 | 1.24 |

### Project 253-6

This test was designed to determine the effect of stilbestrol implants on steer calves wintered on dry bluestem pasture or in dry lot, and stilbestrol's subsequent effect on these animals summer grazed and full-fed during the fall.

#### Experimental Procedure

The calves were allotted to their winter-feeding treatment according to weight.

Lot 18—Eighteen steer calves, eight of which were implanted with 36 mgs. of stilbestrol in November, 1955, were wintered in dry lot. They were fed 30 pounds sorghum silage, 3.9 pounds ground milo grain, and 1 pound soybean oil meal per head daily. They were grazed together on bluestem pasture from May 3 to August 3. On August 3, the eighteen steers were divided into two equal lots—five controls and four implants—were self-fed ground milo grain and prairie hay with 2 pounds soybean meal per head daily in dry lot. The other nine—five controls and four implants—were full-fed in an identical manner on bluestem pasture, except grass replaced prairie hay.

Pasture 15—Eight steer calves (four implants and four controls) were wintered on dry bluestem pasture and fed 3.6 pounds of ground milo grain and 1 pound of soybean pellets per head daily; grazed on bluestem pasture until August 3; self-fed grain in dry lot starting August 3.

#### Observations

**Wintering phase.** Implanted animals did not appear to have any serious side effects from stilbestrol treatment. However, there were some treated animals that could be detected by observation. The gain of the calves on dry bluestem implanted with stilbestrol was about the same as

## Table 30

### The Influence of Stilbestrol Implants on Steer Calves, Wintering, Grazing, Fattening.

Wintering phase—November 30, 1955, to May 3, 1956—155 days.

| Lot number | 18 | | 15 | |
|---|---|---|---|---|
| Daily ration, lbs.: | | | | |
| Sorghum silage | 29.7 | | Dry bluestem pasture | |
| Ground milo grain | 3.9 | | 3.6 | |
| Soybean oil meal | 1.0 | | 1.0 | |
| Treatment | Controls | Implants 36 mgs. | Controls | Implants 36 mgs. |
| Number steers per treatment | 10 | 8 | 4 | 4 |
| Initial wt. per steer, lbs. | 392 | 390 | 380 | 386 |
| Final wt. per steer, lbs. | 639 | 704 | 543 | 556 |
| Total gain per steer, lbs. | 247 | 314 | 163 | 170 |
| Daily gain per steer, lbs. | 1.59 | 2.02 | 1.06 | 1.09 |

Summer grazing phase—May 4, 1956, to August 3, 1956—91 days.

| | | | | |
|---|---|---|---|---|
| Initial wt. per steer, lbs. | 639 | 704 | 543 | 556 |
| Final wt. per steer, lbs. | 731 | 793 | 729 | 731 |
| Av. total gain per steer, lbs. | 92 | 89 | 186 | 175 |
| Av. daily gain per steer, lbs. | 1.0 | .98 | 2.63 | 1.92 |

Full-feeding phase—August 4, 1956, to November 10, 1956—98 days.

| Treatment | Self-fed, dry lot | | Self-fed, pasture | | Self-fed, dry lot | |
|---|---|---|---|---|---|---|
| | Controls | Implants | Controls | Implants | Controls | Implants |
| Number steers per treatment | 5 | 4 | 5 | 4 | 4 | 4 |
| Initial wt. per steer, lbs. | 717 | 796 | 721 | 790 | 729 | 731 |
| Final wt. per steer, lbs. | 938 | 1039 | 914 | 976 | 958 | 939 |
| Av. total gain, lbs. | 221 | 242 | 193 | 186 | 229 | 208 |
| Av. daily gain, lbs. | 2.26 | 2.48 | 1.97 | 1.90 | 2.34 | 2.12 |

Complete feeding trial—November 30, 1955, to November 10, 1956—344 days.

| | | | | | | |
|---|---|---|---|---|---|---|
| Av. initial wt. per steer, lbs. | 388 | 382 | 395 | 388 | 380 | 386 |
| Final wt., lbs. | 938 | 1039 | 913 | 976 | 958 | 939 |
| Av. total gain, lbs. | 550 | 656 | 519 | 578 | 578 | 553 |
| Daily gain, lbs. | 1.60 | 1.91 | 1.5 | 1.68 | 1.68 | 1.61 |

the controls: implanted animals in the dry lot gained 0.43 pound more per head daily than did the controls.

**Grazing phase.** All animals were grazed in the same pasture during the summer. There was little difference in the rate of gain of stilbestrol-implanted and nonimplanted steers.

**Full-feeding phase.** There appears to be some increase in gain due to implanting for those steers full-fed grain in dry lot after previously being wintered in dry lot.

The gains were about the same for both implants and controls for the steers self-fed grain on pasture. These steers were also wintered in dry lot.

Implanting with stilbestrol appeared to depress weight gain of steers full-fed grain in dry lot after being wintered on pasture the previous winter.

### Summary

Due to the small numbers in this test, definite conclusions cannot be drawn. However, the data available indicate that management or feeds fed, perhaps roughage, may influence the results obtained from the stilbestrol implants.

Steer calves implanted with stilbestrol, wintered in dry lot, grazed on bluestem pasture in early summer, and self-fed grain in dry lot during the fall gained 106 pounds more per head than nonimplanted steers over the three phases.

The implanted steers self-fed grain on grass gained 59 pounds more per head than did the controls over the entire 346-day period.

In direct contrast the implanted steers wintered and summer grazed on bluestem pasture, then full-fed in dry lot, gained 25 pounds less than the controls during the entire 346 days of the test.

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## A Comparison of Wintering in Dry Lot with Wintering on Dry Bluestem Pasture for Yearling Steers on a Wintering, Grazing, and Fattening Program, 1955-1956 (Project 253-4).

E. F. Smith, B. A. Koch, and G. L. Walker

Yearling steers are often used by Kansas producers in a wintering, grazing, and fattening program or some variation of it. They can usually be purchased at a lower price per pound than steer calves and may be finished with a slightly shorter feeding period in the fall. They consume large quantities of roughage which may increase their feed cost considerably in the wintering phase. This study is concerned with lowering the cost of wintering and its effect on future performance, especially with respect to the effect on the carcass produced.

### Experimental Procedure

Twenty head of good-quality yearling Hereford steers were used in the test. They were purchased from the Lonker Ranch, Medicine Lodge, Kans., as calves in the fall of 1954; they were wintered in dry lot and then grazed on bluestem pastures during the summer of 1955. November 16, 1955, they were divided to two lots of 10 steers each. The only difference in treatment of the two lots was during the winter. The treatment for each lot was as follows:

Lot 11, wintered in dry lot on silage supplemented with protein; bluestem pasture from May 3 to July 9; fed grain and protein on grass from July 9 to September 15, 1956.

Lot 12, wintered on dry bluestem pasture supplemented with protein; bluestem pasture from April 7 to July 9; fed grain and protein on grass from July 9 to September 15, 1956.

The 20 steers were grazed together from May 3 until September 15. During the grain-feeding period, July 19 to September 15, the two lots were penned each morning and fed separately.

Half of the steers in each lot were implanted with 84 mgs. of stilbestrol in December of 1955. The results of this treatment may be found elsewhere in this publication.

## Observations

1. The extremely low summer gain of 0.32 pound per head daily of the steers in lot 11 is of special interest in this test. A low summer gain might be expected due to their excellent winter gain; however, this figure appears excessively low. Of interest also is the average condition score of the two lots on July 9. Lot 11, wintered inside on silage, scored somewhat higher than those wintered on dry grass, apparently still showing the effect of their good winter treatment.

2. During the fattening phase, lot 12, wintered on dry grass, gained 0.44 pound more per head daily than lot 11 on the same amount of concentrates and in the same pasture. Apparently their low winter gain was still having its effect during the fattening phase.

3. In a summary of all phases, the following advantages may be pointed out for the steers in lot 11, wintered on sorghum silage:

(a) Gained 56 pounds more per head.

(b) Yielded 1.96 percent more.

(c) Graded about a third of a grade higher.

(d) Scored somewhat more favorably in regard to various carcass measurements.

4. Lot 12, wintered on dry bluestem pasture, had a lower feed cost per 100 pounds gain and sold for about the same price per cwt. as lot 11. These factors enabled lot 12 to make a slightly greater return than lot 11, which was wintered in dry lot on sorghum silage supplemented with protein.

### Table 31

**A Comparison of Wintering in Dry Lot with Wintering on Dry Bluestem Pasture for Yearling Steers on a Wintering, Grazing, and Fattening Program, 1955-56.**

| Lot number | 11 | 12 |
|---|---|---|
| **Phase 1, Wintering, November 16, 1955, to May 3, 1956—169 days.** | | |
| Place wintered | Dry lot | Bluestem pasture |
| Initial wt. per steer, lbs. | 881 | 876 |
| Final wt. per steer, lbs. | 1145 | 920 |
| Gain per steer, lbs. | 264 | 44 |
| Daily gain per steer, lbs. | 1.56 | .26 |
| Feed per steer daily, lbs.: | | |
| Soybean oil meal pellets | 1.0 | 1.0[1] |
| Sorghum silage | 60.8 | |
| Dry bluestem pasture | | Free choice |
| Prairie hay | 2.57[2] | .83[3] |
| Salt | Free choice | |
| Mineral (bonemeal and salt) | Free choice | |
| Feed cost per steer[4] | $14.12 | $11.92 |
| **Phase 2, Grazing, May 3, 1956, to July 9, 1956—68 days.** | | |
| Initial wt. per steer, lbs. | 1145 | 920 |
| Final wt. per steer, lbs. | 1167 | 1078 |
| Gain per steer, lbs. | 22 | 158 |
| Daily gain per steer, lbs. | .32 | 2.32 |
| Condition score, July 9[4] | 4.1 | 2.8 |
| Feed cost per steer | $18.00 | $18.00 |

1. The soybean oil meal pellets for lot 12 were discontinued April 7, 1956.

2. A limited quantity of prairie hay was fed to lot 11 the last six weeks of the test.

3. Prairie hay and a small quantity of alfalfa were fed to lot 12 only when snow covered the grass.

4. Individual steers were scored from 1 to 6 for condition on July 9 by a committee of animal husbandmen. The higher the score, the better the condition.

**Table 31 (Continued).**

| | | |
|---|---|---|
| Phase 3, Fattening, July 9, 1956, to September 15, 1956—68 days. | | |
| Initial wt. per steer, lbs. | 1167 | 1078 |
| Final wt. per steer, lbs. | 1290 | 1229 |
| Gain per steer, lbs. | 123 | 151 |
| Daily gain per steer, lbs. | 1.80 | 2.22 |
| Daily ration per steer, lbs.: | | |
| Ground milo grain | 11.97 | 11.97 |
| Soybean oil meal | 1.63 | 1.63 |
| Bluestem pasture | Free choice | |
| Ground limestone | .06 | .06 |
| Salt | Free choice | |
| Feed per cwt. gain, lbs.: | | |
| Ground milo grain | 661.78 | 539.07 |
| Soybean oil meal | 90.24 | 73.50 |
| Feed cost this phase[6] | $23.09 | $23.09 |
| Feed cost per 100 lbs. gain[6] | 18.77 | 15.29 |
| Summary of Phases 1, 2, and 3, November 16, 1955, to September 15, 1956—305 days. | | |
| Total gain per steer, lbs. | 409 | 353 |
| Daily gain per steer, lbs. | 1.34 | 1.15 |
| Feed cost per steer | $85.21 | $53.01 |
| Feed cost per 100 lbs. gain | 20.83 | 15.01 |
| Necessary selling price per cwt. to pay for original steer cost @ $19 cwt. plus feed cost | 19.58 | 17.25 |
| Selling price per cwt. at market | 20.73 | 20.82 |
| % shrink in shipping to market | 3.7 | 5.2 |
| Dressing %, chilled | 59.34 | 57.38 |
| Carcass data[5]: | | |
| Av. carcass grade, USDA | 17.4 | 16.4 |
| Av. ribeye firmness | 4.14 | 5.16 |
| Av. thickness of outside fat | 4.28 | 4.83 |
| Av. marbling score | 7.42 | 8.50 |
| Av. ribeye size | 4.57 | 4.83 |

5. Three carcasses from lot 11 and four carcasses from lot 12 were shipped from the packing plant before carcass data were obtained from them. Only the packers' grades were available on the missing steers. The following numerals were assigned the USDA grades: High choice, 21; av. choice, 20; low choice, 19; high good, 18; av. good, 17; low good, 16; high standard, 15; av. standard, 14. The ribeyes were visually scored for firmness on the following basis: Moderately firm = 3; modestly firm = 4; slightly firm = 5. Thickness of outside fat was visually scored on the following basis: Modest = 4; slightly thin = 5. Degree of marbling: small amount = 7; slight amount = 8, traces = 9. Ribeye size: Modestly large = 4; slightly small = 5.

6. Feed prices used may be found inside back cover.

## The Value of Phenothiazine and Stilbestrol Implants for Fattening Yearling Heifers; Heifers Implanted As Calves Nine Months Before Fattening (Project 253-2).

E. F. Smith, B. A. Koch, D. L. Good, and G. L. Walker

Many cattle producers practice wintering, grazing, and fattening heifers. The heifers used in this test had undergone a wintering and grazing phase. Part of them were implanted with stilbestrol as calves. Results of this treatment up to the fattening phase are reported elsewhere in this circular. Those that were not implanted were divided into two equal lots on the basis of weight. One served as a control, the other was fed phenothiazine, a worming agent, to study its effect on cattle performance.

### Experimental Procedure

Good-quality yearling Hereford heifers purchased as calves in the fall of 1955 from the Williams Ranches at Lovington, N.M., were used in a wintering and grazing test and re-allotted as equally as possible for use in this test. Each heifer in the stilbestrol-implanted lot was implanted with 36 mgs. of stilbestrol December 20, 1955, when weighing about 475 pounds. The heifers treated with phenothiazine were each given a 60-gm. bolus of phenothiazine at the start of the test and were fed 2 gms. per head daily of phenothiazine mixed with their cottonseed meal throughout the test. Fecal samples taken from the heifers at the start of the test did not show evidence of any internal parasites.

Alfalfa hay was fed free choice to all lots. After the heifers were on full feed they were self-fed ground milo grain. The cottonseed meal was fed once daily on their grain.

### Observations

1. The gain of heifers in lot 7 implanted with stilbestrol when they were calves was depressed during this fattening test. They did not eat quite so much grain as the other lots but ate slightly more hay. The control lot, number 8, was somewhat more efficient in feed use and sold for $2 more per hundredweight. The implanted heifers had some udder development and somewhat of a cowy appearance. They graded one third grade lower in the carcass than the controls in lot 8.

2. The phenothiazine fed to lot 9 apparently depressed the gain of that lot but did not affect feed consumption, so feed efficiency was lowered accordingly. According to fecal samples, there were no internal parasites present in these heifers; therefore, the value of phenothiazine for worm control could not be studied.

### Table 32

**The Value of Phenothiazine and Stilbestrol Implants for Fattening Yearling Heifers; Heifers Implanted As Calves Nine Months Before Fattening.**

August 2 to November 10, 1956—100 days.

| Lot number | 7 | 8 | 9 |
|---|---|---|---|
| Management | Stilbestrol implanted | Control | Fed Phenothiazine |
| Number of heifers per lot | 9 | 8 | 8 |
| Initial wt. per heifer, lbs. | 763 | 734 | 733 |
| Final wt. per heifer, lbs. | 963 | 985 | 953 |
| Gain per heifer, lbs. | 200 | 251 | 220 |
| Daily gain per heifer, lbs. | 2.00 | 2.51 | 2.20 |
| Daily ration per heifer, lbs.: | | | |
| Ground milo grain, self-fed | 15.58 | 16.88 | 16.30 |
| Cottonseed meal | .99 | .96 | .97 |
| Alfalfa hay | 7.00 | 5.52 | 5.64 |
| Salt | .06 | .03 | .04 |
| Phenothiazine, 2 gms. per head daily | No | No | Yes |
| Stilbestrol implants, 36 mgs. each on December 20, 1955 | Yes | No | No |

Table 32 (Continued).

| | | | |
|---|---|---|---|
| Lbs. feed per cwt. gain: | | | |
| Ground milo grain | 779 | 673 | 741 |
| Cottonseed meal | 49.5 | 38.2 | 44.1 |
| Alfalfa hay | 350 | 220 | 256 |
| Salt | 3.0 | 1.19 | 1.81 |
| Feed cost per 100 lbs. gain[6] | $23.56 | $19.37 | $21.52 |
| Selling price per cwt. at market | $18.00 | $20.00 | $19.00 |
| % shrink to market | 3.2 | 5.1 | 4.6 |
| Dressing % | 60.3 | 62.6 | 63.0 |
| Av. slaughter (on foot) grade[1] | 11.4 | 12.1 | 11.6 |
| Carcass grades:* | | | |
| Average choice | | 2 | 1 |
| Low choice | 1 | 1 | 2 |
| High good | 3 | 2 | 3 |
| Average good | 3 | 1 | |
| Low good | | 2 | 1 |
| High standard | 2 | | |
| Av. carcass grades, USDA[1] | 10.1 | 11.0 | 11.3 |
| Av. size ribeye[2] | 4.67 | 4.13 | 4.29 |
| Av. thickness fat at 12th rib[3] | 3.67 | 3.75 | 4.14 |
| Av. degree of marbling[4] | 7.78 | 7.00 | 7.14 |
| Av. firmness[5] | 3.89 | 3.88 | 3.71 |

1. Based on low choice = 12; high good = 11; average good = 10; low good = 9.
2. Based on moderately large = 3; modestly large = 4; slightly small = 5.
3. Based on moderately thick = 3; modestly thick = 4; slightly thin = 5.
4. Based on moderate = 5; modest = 6; small amount = 7; slight amount = 8; traces = 9.
5. Based on moderately firm = 3; modestly firm = 4; slightly firm = 5.
6. Feed prices may be found inside back cover.

* One heifer in lot 9 was condemned at slaughter due to sarcosporidiosis.

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**The Value of Dry Bluestem Pasture and a Comparison of Supplements for Heifer Calves in a Wintering, Grazing, and Fattening Program, 1955-56 (Project 253-2).**

E. F. Smith, B. A. Koch, and D. L. Good

Circular 320 from this station contains a three-year summary comparing heifers wintered in dry lot with heifers wintered on dry grass, and the effect of this winter treatment on their total performance in a wintering, grazing, and fattening program. The heifers wintered on dry grass gained 32 pounds less for the year, had a lower dressing percentage, graded lower, and sold for about $1 a hundred less than heifers wintered in dry lot. However, the heifers wintered on dry grass returned as much money above feed costs as the heifers wintered in dry lot, due primarily to lower winter feed costs and high summer grass gains.

In the test reported here the plane of nutrition has been raised slightly for the heifers wintered on dry grass, to acquire some of the desirable characteristics associated with dry-lot wintering, but still maintaining low winter feed costs. In addition different levels of protein supplementation are compared.

**Experimental Procedure**

Thirty head of good-quality Hereford heifer calves purchased from the Williams Ranches at Lovington, N.M., were used in the test. They were divided on the basis of weight and quality into three lots of 10 calves each and assigned to the following treatments:

Lot 4—Wintered in dry lot on sorghum silage, 3 pounds of alfalfa hay, and 1½ pounds of corn per head daily, grazed on bluestem pasture from May 2 until August 2.

Lot 7—Wintered on dry bluestem pasture, 3 pounds of alfalfa hay, and 1½ pounds of corn per head daily, grazed on bluestem pasture until August 2.

Lot 8—Wintered on dry bluestem pasture and 6 pounds of alfalfa hay per head daily, grazed on bluestem pasture until August 2.

All lots had free access to salt and mineral (equal parts of bonemeal and salt).

Four heifers in each lot or a total of 12 were implanted with 48 mgs. of stilbestrol; results of this test are reported elsewhere. In the test this year there was no fattening phase due to the loss of two of the implanted heifers because of vaginal prolapse.

### Observations

1. In a comparison of dry-lot wintering (lot 4) with wintering on dry grass (lots 7 and 8), the total winter and summer gain is of particular interest. Lot 4 gained 25 pounds more than lot 7 and 44 pounds more than lot 8. Lots 7 and 8 wintered on dry grass on a low plane of nutrition failed to gain enough during the summer to make their total gain equal to the well-wintered lot 4. Cost of gain for lots 7 and 8 wintered on dry grass depends to a large extent on the charge for winter grass.

2. Apparently 3 pounds of alfalfa hay furnishes ample protein for calves wintered on dry bluestem pasture, since lot 7, fed alfalfa and grain, gained slightly more during the winter and summer than lot 8, which received only alfalfa hay. The 1½ pounds of grain fed to lot 7 furnished approximately the same amount of energy as the additional 3 pounds of alfalfa hay fed to lot 8.

### Table 33

**The Value of Dry Bluestem Pasture and a Comparison of Supplements for Heifer Calves, 1955-56.**

Phase 1—Wintering, November 15, 1955, to May 3, 1956—170 days for lot 4; November 15, 1955, to April 7, 1956—144 days for lots 7 and 8.

| Lot number | 4 | 7[1] | 8 |
|---|---|---|---|
| Number of heifers | 10 | 9[2] | 10 |
| Place wintered | dry lot | pasture | pasture |
| Initial wt. per heifer, lbs. | 473 | 474 | 482 |
| Final wt. per heifer, lbs. | 685 | 501 | 501 |
| Gain per heifer, lbs. | 212 | 27 | 19 |
| Daily gain per heifer, lbs. | 1.24 | .19 | .13 |
| Daily ration per heifer, lbs.: | | | |
| Alfalfa hay | 3.0 | 3.0 | 6.0 |
| Corn, ground | 1.4 | 1.5 | |
| Sorghum silage | 28.1 | | |
| Dry bluestem pasture | | Free choice | Free choice |
| Prairie and alfalfa hay | | .29[1] | .29[1] |
| Salt | .09 | .03 | .03 |
| Mineral (bonemeal and salt) | .06 | .04 | .04 |
| Feed cost per heifer, $[3] | 27.97 | 14.23 | 12.37 |
| Phase 2—Grazing, May 3, 1956, to August 2, 1956—91 days for lot 4; April 7, 1956, to August 2, 1956—117 days for lots 7 and 8. | | | |
| Initial wt. per heifer, lbs. | 685 | 501 | 501 |
| Final wt. per heifer, lbs. | 762 | 738 | 727 |
| Gain per heifer, lbs. | 77 | 237 | 226 |
| Daily gain per heifer, lbs. | .85 | 2.03 | 1.93 |
| Feed cost per heifer, $ | 16.00 | 16.00 | 16.00 |

1. Prairie and alfalfa hay in limited quantities were fed to lots 7 and 8 when snow covered the grass.

2. One stilbestrol-implanted heifer was removed from lot 7 with a prolapsed vagina.

3. Feed prices may be found inside the back cover.

Table 33 (Continued).

| Summary—November 15, 1955, to August 2, 1956—261 days. | | | |
|---|---|---|---|
| Initial wt. per heifer, lbs. | 473 | 474 | 482 |
| Final wt. per heifer, lbs. | 762 | 738 | 727 |
| Gain per heifer, lbs. | 289 | 264 | 245 |
| Daily gain per heifer, lbs. | 1.11 | 1.01 | .94 |
| Feed cost per heifer[1] | 43.97 | 30.23 | 28.37 |
| Feed cost per 100 lbs. gain[2] | 15.21 | 11.45 | 11.58 |

**Relationships Between Summer Gains of Yearling Steers on Bluestem Pastures and Feeder Grade, Shade of Color, Weight at the Start of the Grazing Season, and Previous Winter Gain, 1956 (Project 253-3-5).**

**L. A. Holland, J. D. Wheat, E. F. Smith, W. H. Smith, D. L. Good, and R. F. Cox**

The Department of Animal Husbandry purchases steer calves each fall to be wintered and grazed the following summer in studies of different methods of managing bluestem pastures. This affords opportunities to study the relationships between summer gains and feeder grade, shade of color, weight at the start of the grazing season, and previous winter gain. Several years will elapse before definite conclusions can be drawn concerning these relationships. Following, however, is a report of progress to date of the studies made of these factors:

### Experimental Procedure

The 136 Hereford steers in this study were purchased as calves in the fall of 1955 and wintered 170 days in dry lot on sorghum silage, alfalfa hay, and 2 pounds of milo grain per head daily. The summer grazing period was from April 25 to October 1.

The steers were individually scored for feeder grade and shade of red by five animal husbandmen working independently in April, 1956. Feeder grades were the USDA grades fancy, choice, good, medium, and common. Each grade was further subdivided to high, middle, and low. For statistical analysis, a numerical grade of 18 was assigned to high fancy, 17 to middle fancy, 16 to low fancy, etc. Shade-of-red scores were dark, medium, and light; each shade-of-red score was further subdivided to high, middle, and low. High dark was assigned a numerical grade of 9, middle dark a grade of 8, etc. Thus the higher the numerical color score, the more intense was the shade of red.

### Results

Since the steers were allotted to several pastures and some received hormone implants, correlations were computed on a within-treatment, within-pasture basis. The correlations were: Feeder grade and summer gain, —.03; color score and summer gain, —.05; winter gain and summer gain, —.20; and beginning weight and summer gain, —.32.

The correlation between feeder grade and summer gain, —.03, is, for all practical purposes, zero and indicates that feeder grade was not a good indicator of summer gaining ability.

Likewise, the correlation between color score and summer gain, —.05, is essentially zero and indicates that shade of red was not a good indicator of summer gains. On the basis of these results, an advantage could not be claimed for any particular shade of red.

The correlation between winter gain and summer gain, —.20, indicates that steers making high winter gains tended to make lower summer gains and steers making low winter gains tended to compensate with higher summer gains. Animal husbandmen have long known that steers wintered on a low plane of nutrition tend to make higher summer gains than steers wintered on a high nutritional plane. The results in this study point to compensatory gains in the summer even when steers were wintered uniformly on what was considered to be a medium plane of nutrition.

The correlation between beginning weight and summer gain, —.32, shows that light-weight steers at the start of the summer grazing period tended to make larger gains than the heavier steers.

**Different Methods of Managing Bluestem Pastures, 1956 (Projects 253-3 and 253-5).**

E. F. Smith, K. L. Anderson, B. A. Koch, and G. L. Walker

This experiment is to determine the effects of different stocking rates, deferred grazing, and pasture burning on livestock gains, productivity of pastures, and range condition as determined by plant population changes. In addition to the yearly report, a summary of the cattle gains for the first seven years of this test is included.

## Experimental Procedure

Good-quality Hereford yearling steers weighing about 650 pounds were used to stock the pastures. They were purchased as calves from the Williams Ranches near Lovington, N.M., in the fall of 1955. They were wintered at Manhattan in dry lot on sorghum silage, alfalfa hay, and 2 pounds of milo grain per head daily. The method of management of each pasture was:

Pasture 1—Normal rate, 3.75 acres per head.
Pasture 2—Overstocked, 3.0 acres per head.
Pasture 3—Understocked, 5.0 acres per head.
Pastures 4, 5, 6—Deferred grazing, 3.60 acres per head. All steers were held in Pastures 5 and 6 until July 1, then placed on deferred Pasture 4 until mid-September. From mid-September on, they were allowed the run of all three pastures.
Pasture 9—Burned March 8, 1956, normal rate of stocking.
Pasture 10—Burned April 10, 1956, normal rate of stocking.
Pasture 11—Burned April 28, 1956, normal rate of stocking.

The steers were weighed off test October 1, 1956, but remained on the pastures until October 8. Results are presented in Tables 34 and 35.

## Observations

1. The steer gains per head in 1956 were greatest on the mid-spring burned pasture and least on the deferred and rotated pastures.

2. It is of particular interest to note that the steers on the overstocked pastures gained more than those on the understocked pastures and slightly more than those on the normally stocked pastures. This occurred in a year of subnormal moisture which had been preceded by four years of low rainfall. Very little grass remains on the overstocked pasture as compared to the understocked or normally stocked.

3. Pasture 2, overstocked, and Pasture 9, early spring-burned, had the least top growth remaining after the growing season, whereas Pasture 3, understocked, and Pastures 5 and 6 of the deferred pastures had the most top growth remaining at the close of the season.

4. Close use of the overstocked pasture has weakened the grasses and increased weeds, but forage depletion has not yet reached the point where serious reductions in livestock yields are noted. Table 36 shows production and use of both forage and mulch on the six pastures of the grazing study.

Early spring burning is also causing depletion. Bare areas have appeared and weeds are increasing. Amounts of cover remaining at the close of the grazing season are not large enough to protect the soil against runoff and erosion. Table 37 compares these residues with those on Pasture 1, stocked at the same rate but not burned. Table 38 shows the long-time effects of time of burning on bluestem forage yields at the old College plots on an ordinary uplands range site nearer the college campus.

## Table 34

### Comparison of Different Methods of Managing Bluestem Pastures.

April 29, 1956, to October 1, 1956—155 days.

| Pasture number | 1 | 2 | 3 | 4, 5, 6 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| Management | Normally stocked | Over-stocked | Under-stocked | Deferred rotated | Early spring-burned | Mid-spring-burned | Late spring-burned |
| Number of steers per pasture | 16 | 20 | 12 | 50 | 12 | 12 | 12 |
| Acres in pasture | 60 | 60 | 60 | 3-60[1] | 44 | 44 | 44 |
| Number acres per head | 3.75 | 3 | 5 | 3.60 | 3.66 | 3.66 | 3.66 |
| Initial wt., lbs. | 652 | 641 | 645 | 644 | 643 | 645 | 643 |
| Final wt., lbs. | 831 | 825 | 813 | 798 | 855 | 879 | 859 |
| Gain per steer, lbs. | 179 | 184 | 168 | 154 | 212 | 234 | 216 |
| Daily gain, lbs. | 1.15 | 1.19 | 1.08 | 0.99 | 1.37 | 1.51 | 1.39 |
| Gain per acre, lbs. | 47.73 | 61.33 | 33.60 | 51.33 | 57.92 | 63.93 | 59.02 |

1. Three 60-acre pastures.

## Table 35

### Yearly Account of Cattle Gains under Different Methods of Grazing Pastures; Seven-year Summary, 1950-1956. Gain per Steer in Pounds for the Summer Season of Approximately 150 Days.

| Pasture number | 1 | 2 | 3 | 4, 5, 6 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| Management | Normally stocked | Over-stocked | Under-stocked | Deferred rotated | Early spring-burned | Mid-spring-burned | Late spring-burned |
| 1950 | 221 | 210 | 214 | 205 | 216 | 254 | 230 |
| 1951 | 242 | 256 | 250 | 234 | 243 | 265 | 254 |
| 1952 | 246 | 205 | 228 | 197 | 251 | 278 | 283 |
| 1953 | 226 | 194 | 233 | 197 | 205 | 217 | 234 |
| 1954 | 261 | 237 | 236 | 214 | 270 | 271 | 306 |
| 1955 | 270 | 224 | 253 | 213 | 282 | 305 | 307 |
| 1956 | 179 | 184 | 168 | 154 | 212 | 234 | 216 |
| Average | 235 | 216 | 232 | 202 | 240 | 261 | 261 |

## Table 36

**Effect of Stocking Practice on Production and Use of Bluestem Forage and Mulches on Three Major Range Sites. Figures Given Are in Pounds Air-dry Weight per Acre, Average of 1955 and 1956 Yields.**

| Range site | Stocking practice: Heavy, lbs./A. | Medium, lbs./A. | Light, lbs./A. | Deferred rotation, lbs./A. |
|---|---|---|---|---|
| Ordinary upland: | | | | |
| Forage produced | 1780 | 1901 | 2470 | 2149 |
| Forage used | 986 | 803 | 570 | 1051 |
| Limestone breaks: | | | | |
| Forage produced | 1909 | 1806 | 2130 | 2124 |
| Forage used | 875 | 824 | 72 | 548 |
| Clay upland: | | | | |
| Forage produced | 1313 | 1407 | 1370 | 1613 |
| Forage used | 921 | 1019 | 747 | 642 |
| Ordinary upland: | | | | |
| Mulch accumulation | 1487 | 2046 | 2769 | 1964 |
| Mulch disappearance | 487 | 400 | 393 | 145 |
| Limestone breaks: | | | | |
| Mulch accumulation | 988 | 1578 | 3264 | 2173 |
| Mulch disappearance | 132 | 294 | 92 | 239 |
| Clay upland: | | | | |
| Mulch accumulation | 569 | 1317 | 608 | 1265 |
| Mulch disappearance | 67 | 500 | 153 | 208 |

## Table 37

**Effect of Time of Burning on Protective Residue of Top Growth per Acre Remaining at Close of Grazing Season. Air-dry Weight 1955-1956 Grazing Seasons.**

| | Pasture 9 burned, early-spring, lbs. | Pasture 10 burned, mid-spring, lbs. | Pasture 11 burned, late-spring, lbs. | Pasture 1 not burned, lbs. |
|---|---|---|---|---|
| Ordinary uplands | 1049 | 1577 | 1425 | 2530* |
| Limestone breaks | 1179 | 1653 | 1340 | 2695* |

* Includes mulch which has been prevented by fire from accumulating in the burned pastures.

## Table 38

**Effect of Time of Burning Bluestem Grassland on Yields of Top Growth per Acre; Ordinary Uplands Range Site, College Pasture Plots.**

| | Time of burning: Check (not burned), lbs. | Late spring, lbs. | Mid-spring, lbs. | Early spring, lbs. | Winter, lbs. |
|---|---|---|---|---|---|
| 1956 yields | 2351 | 2076 | 1419 | 1276 | 1274 |
| Av. 1953-1956 yields | 2054 | 1673 | 1438 | 1389 | 1259 |
| Long-time average (23 years) | 2502 | 2161 | 1934 | 1845 | 1926 |

**The Use of Stilbestrol[1] and Synovex[2,3] Implants for Steers on a Wintering Ration (Project 253-6).**

**B. A. Koch, E. F. Smith, R. F. Cox, D. Richardson, and G. L. Walker**

This is the second test designed to study the effect of stilbestrol implants on steer calves being fed on a wintering-type ration. Synovex implants were also included in the current study. Both products are being used successfully to promote growth of steers on high-energy fattening rations. However, more information is needed concerning their value when calves are fed high-roughage diets.

### Experimental Procedure

Forty steer calves, weighing approximately 440 pounds each, were divided into three groups (one group of 10 and two groups of 15). Five animals will be removed from each of the larger groups at a later date for use in another study. One group of 15 served as the control lot. Each animal in the other group of 15 received a 24-mg. implant of stilbestrol in the right ear at the start of the wintering period. Each animal in the group of 10 received a Synovex implant (1000 mgs. progesterone plus 20 mgs. estradiol) in the right ear at the start of the wintering period.

Sorghum silage was used as the roughage in all lots and the steers were fed all they would consume each day. The concentrate part of the ration consisted of 5 pounds of milo grain and 1 pound of soybean meal per steer per day. A mineral mixture made up of equal parts of salt and bonemeal was available to the animals at all times. Salt alone was also available to the animals at all times.

**Table 39**

**The Use of Stilbestrol and Synovex Implants for Steer Calves on a Wintering-Type Ration.**

December 4, 1956, to March 26, 1957—112 days.

| Lot number | 1 | 2 | 3 |
|---|---|---|---|
| Treatment | Control | Synovex implants | Stilbestrol implants |
| Number steers | 15 | 10 | 15 |
| Initial wt. per steer, lbs. | 446 | 444 | 442 |
| Final wt. per steer, lbs. | 626 | 659 | 654 |
| Total gain per steer, lbs. | 180 | 215 | 212 |
| Daily gain per steer, lbs. | 1.60±0.05[2] | 1.92±0.06[2] | 1.89±0.08[2] |
| Daily ration per steer, lbs.: | | | |
| Ground milo grain | 4.5 | 4.5 | 4.5 |
| Soybean oil meal | 1 | 1 | 1 |
| Sorghum silage | 25.6 | 25.9 | 27.6 |
| Lbs. feed per cwt. gain: | | | |
| Ground milo grain | 281.25 | 234.45 | 238.05 |
| Soybean oil meal | 62.50 | 52.10 | 52.90 |
| Sorghum silage | 1600.00 | 1349.39 | 1460.04 |
| Feed cost per cwt. gain | $15.62 | $13.07 | $13.64 |
| Implant cost per cwt. gain[1] | | .86 | .03 |
| Total cost per cwt. gain | 15.62 | 13.93 | 13.67 |

1. Stilbestrol cost = approximately 6 cents per steer; Synovex cost = approximately $1.85 per steer (no charge made for actual implanting procedure).
2. Standard error of mean.

### Observations

1. Undesirable side effects such as high tailheads, elongated teats, and sexual stimulation were not apparent in any of the implanted steers.

1. Supplied by Wick and Fry, Inc., Cumberland, Ind.
2. Supplied by E. R. Squibb and Sons, New York, N.Y.
3. Each implant contained 1000 mgs. progesterone and 20 mgs. estradiol benzoate.

2. Both of the implanted lots (stilbestrol and Synovex) showed significantly greater daily gains than the control lot.

3. The stilbestrol-implanted calves ate somewhat more silage than the Synovex-implanted calves. Average daily gain was the same for both implant groups.

4. Feed cost per cwt. gain was lowest for the implanted steers. The Synovex-implanted steers apparently utilized silage somewhat more efficiently than those implanted with stilbestrol. However, the higher cost of the Synovex implants eliminated economic advantage in this particular trial.

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**Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1955-56 (Project 253-6).**

**E. F. Smith, B. A. Koch, R. F. Cox, and G. L. Walker**

Dry bluestem pasture has been used successfully several years at this station as a source of winter roughage for steer calves that are to be grazed during the summer and sold off grass as feeder or stocker yearlings. This is the first attempt to supplement dry grass during the winter with several pounds of grain combined with protein, in an effort to attain sufficient winter gain so the calves could be finished on grain in the late summer and sold as fat yearlings. The test is to determine if dry grass can be supplemented in such a manner that calves will compare favorably in total performance with steer calves wintered on good-quality roughages.

The steers were grazed until August 3 on bluestem pasture, then fattened in dry lot to choice grade.

### Experimental Procedure

Seventeen head of good-quality Hereford steer calves from near Lovington, N.M., were assigned to the test. The calves were allotted to their respective treatments on the basis of weight and quality. Eight calves were assigned to the pasture group and nine to the dry-lot group. Nine other calves on a similar treatment were wintered with the dry-lot group.

The treatment assigned to each lot in this experiment is as follows:

Lot 18A—Wintered in dry lot on sorghum silage, 4 pounds of ground milo, and 1 pound of soybean pellets per head daily, free access to salt and mineral (bonemeal plus salt); grazed on bluestem from May 3 to August 3; fattened in dry lot from August 3 until they grade choice.

Lot 15—Wintered on dry bluestem pasture, 4 pounds of milo, and 1 pound of soybean pellets per head daily; continued on grass to August 3 without supplemental feed; fattened in dry lot from August 3 until they grade choice.

Four of the steers in each lot were implanted with 36 mgs. of stilbestrol at the start of the test. Results of this phase of the test are reported in another paper.

### Observations

1. The steers in lot 18A wintered in dry lot gained 105 pounds more per head during the winter period. The cost of gain was not greatly different for the two lots, due primarily to the low cost of winter bluestem pasture charged against lot 15 which was wintered on dry grass.

2. The steers in lot 15 gained 90 pounds more on summer grass than the steers wintered in dry lot. On August 3 there was only 15 pounds difference in gain between the two lots in favor of lot 18A wintered in dry lot.

3. The steers in lot 18A gained slightly more during the fattening phase. Feed consumption was about the same for both lots.

4. For the three phases combined, the steers in lot 18A wintered in dry lot gained 28 pounds more than lot 15; however, their cost to produce a 100 pounds of gain was about $2 a cwt. higher.

Under the costs assigned here, steers wintered in dry lot would have to grade higher and be worth more on the market to make greater returns than those wintered on dry grass.

Table 40

**Winter Management for Steer Calves on a Wintering, Grazing, and Fattening Program, 1955-56.**

Phase 1—Wintering, November 30, 1955, to May 3, 1956*—155 days.

| | | |
|---|---|---|
| Lot number | 18A | 15 |
| Number of steers | 9 | 8 |
| Place of wintering | Dry lot | Bluestem pasture |
| Initial wt. per steer, lbs. | 386 | 379 |
| Final wt. per steer, lbs. | 661 | 549 |
| Gain per steer, lbs. | 275 | 170 |
| Daily gain per steer, lbs. | 1.77 | 1.10 |
| Daily ration per steer, lbs.: | | |
| Ground milo grain | 4.0 | 3.7 |
| Soybean pellets | 1.0 | 1.0 |
| Sorghum silage | 29.8 | |
| Prairie and alfalfa hay | | .57 |
| Dry bluestem pasture | | Free choice |
| Salt | .04 | .05 |
| Mineral (bonemeal and salt) | .04 | .06 |
| Feed cost per steer[1] | $36.01 | $20.85 |
| Feed cost per 100 lbs. gain[1] | 13.09 | 12.27 |

Phase 2—Grazing, May 3, 1956, to August 3, 1956—92 days.

| | | |
|---|---|---|
| Initial wt. per steer, lbs. | 661 | 549 |
| Final wt. per steer, lbs. | 752 | 730 |
| Gain per steer, lbs. | 91 | 181 |
| Daily gain per steer, lbs. | .99 | 1.97 |
| Feed cost per steer[1] | $16.00 | $16.00 |

Phase 3—Full feeding, August 3, 1956, to November 10, 1956—99 days.

| | | |
|---|---|---|
| Initial wt. per steer, lbs. | 752 | 730 |
| Final wt. per steer, lbs. | 983 | 948 |
| Gain per steer in lbs. | 231 | 218 |
| Daily gain per steer, lbs. | 2.33 | 2.20 |
| Daily ration per steer, lbs.: | | |
| Ground milo grain self-fed | 16.4 | 16.0 |
| Cottonseed meal | 1.9 | 1.9 |
| Prairie hay | 4.6 | 4.8 |
| Ground limestone | .1 | .1 |
| Salt | Free choice | Free choice |
| Feed per cwt. gain, lbs.: | | |
| Ground milo grain | 697 | 724 |
| Cottonseed meal | 81 | 86 |
| Prairie hay | 198 | 218 |
| Feed cost this phase[1] | $50.29 | $49.35 |
| Feed cost per 100 lbs. gain[1] | $21.77 | $22.64 |

Summary of phases 1, 2 and 3—November 30, 1955, to November 10, 1956—346 days.

| | | |
|---|---|---|
| Lot number | 18A | 15 |
| Total gain per steer, lbs. | 597 | 569 |
| Daily gain per steer, lbs. | 1.72 | 1.64 |
| Total feed cost per steer | $102.30 | $86.20 |
| Feed cost per cwt. gain[1] | $17.14 | $15.15 |
| Initial steer cost at $22.50 per cwt. plus feed cost | $189.15 | $171.48 |

1. Feed prices may be found inside the back cover; $1 was charged per steer for mineral and salt.

2. November 10 the steers were weighed off test due to a shortage of pen space. The two lots were then fed together until they graded choice on foot. December 30, 1956, four steers from pen 15 and two steers from pen 18A were shipped to market. January 28, 1957, four steers from pen 15 and six steers from pen 18A were sold. One steer in pen 18A died, cause unknown, December 27, 1956.

* Lot 15 was fed supplements on grass only until April 14, 1956.

Table 40 (Continued).

| | | |
|---|---|---|
| Necessary selling price per cwt. to cover initial cost plus feed cost | 19.24 | 18.09 |
| Carcass data[a] | | |
| Dressing percentage, chilled | 62.8 | 61.5 |
| Carcass grade, USDA | | |
| Shipped 12-30-56: | | |
| Av. choice | | 1 |
| Low choice | 1 | 1 |
| High good | | 2 |
| Low good | 1 | |
| Shipped 1-28-57: | | |
| High choice | | 1 |
| Av. choice | 3 | 2 |
| Low choice | 3 | 1 |

**Bringing Cattle to Full Feed of Grain Rapidly (with and without Stilbestrol Implants) (Project 253-6).**

B. A. Koch, E. F. Smith, and R. F. Cox

Bringing cattle to a full feed of grain in the shortest time possible is one way to reduce the total time they require to reach market weight. Producers are always faced with the problem of bringing cattle on feed too fast and causing digestive upsets, which lengthen the feeding period. This study was designed to determine what advantage could be gained by mixing cottonseed hulls with the grain ration. One half the animals in the study were implanted with stilbestrol to secure further information as to its value.

### Experimental Procedure

Twenty head of good-quality two-year-old steers were used in the study. The animals were divided into two uniform lots on the basis of previous treatment and weight. At the start of the study the steers were consuming approximately 25 pounds of cottonseed hulls, 1 pound of alfalfa meal pellets, and 1 pound of soybean pellets per head daily. One half the animals in each lot were impanted in the ear with 84 mg. of stilbestrol on the first day of the study. All animals received a tenth pound of ground limestone mixed in the feed daily and had free access to salt and water during the study. The concentrate portion of the ration was mixed with the cottonseed hulls each day and, as the quantity of milo was increased, the quantity of hulls was decreased.

Treatment differences were as follows:

Lot 1—Started at 4 pounds milo per day and increased 1 pound per head per day until the average daily intake was 12 pounds per head. The cattle were held at that level for one week. The milo intake was then increased 1 pound per day until the animals were eating 22 pounds per head on the 25th day of the trial.

Lot 2—Started at 6 pounds of milo per head daily and increased 2 pounds per head per day until the animals were eating 24 pounds per head on the 10th day of the trial.

### Observations

1. All animals went to full feed without incident. About the 35th day both lots showed signs of going off feed. Milo intake was reduced to 20 pounds per head daily in both lots.
2. An occasional case of mild bloat was noted throughout the trial.
3. Cattle brought on feed fast showed a considerable weight advantage at the end of the first 28-day period. However, for the overall period there was no significant difference in gain.
4. Cost of gain favored the animals brought to full feed at the slower rate.
5. The cattle implanted with stilbestrol made a significantly greater daily gain.

6. Some side effects were noted in some of the implanted animals (raised tailheads, elongated teats).

7. The steers were grouped according to stilbestrol treatment and sold on the Kansas City market. All steers sold for the same price—$19.25 per cwt.

**Table 41**

**Two-Year-Old Steers Brought on Feed at Two Different Rates and Fed for 80 Days.**

February 27, 1956, to May 18, 1956.

| Lot number | 1 | 2 |
|---|---|---|
| Number steers | 9[1] | 10 |
| Av. initial wt., lbs. | 1038 | 1033 |
| Av. daily gain, lbs. per day | 3.16±0.21[2] | 3.28±0.20[2] |
| 1st 28-day period | 2.02 | 4.41 |
| 2nd 28-day period | 4.58 | 2.82 |
| 3rd 24-day period | 2.82 | 2.46 |
| Av. daily ration, lbs.: | | |
| Cottonseed hulls | 9.1 | 7.5 |
| Milo grain | 17.1 | 20.0 |
| Soybean pellets | 2.0 | 2.0 |
| Alfalfa pellets | 1.0 | 1.0 |
| Feed cost per 100 lbs. gain[3] | $17.81 | $18.92 |
| Carcass grades:[4] | | |
| Choice | 2 | 2 |
| Choice— | 1 | 3 |
| Good+ | 3 | 3 |
| Good | 2 | 2 |
| Good— | 1 | |

1. One steer removed during trial.
2. Standard error of mean.
3. Feed prices inside back cover.
4. Steers were slaughtered 30 days after end of feeding trial (total feeding period 110 days).

**Table 42**

**Two-Year-Old Steers with and without Stilbestrol Implants Fed for 80 Days.**

February 27, 1956, to May 18, 1956.

| Treatment | Control | Implanted[1] |
|---|---|---|
| Number steers | 9[2] | 10 |
| Av. initial wt., lbs. | 1042 | 1030 |
| Av. daily gain, lbs. per day | 2.91±0.20[3] | 3.49±0.17[3] |
| 1st 28-day period | 3.45 | 3.12 |
| 2nd 28-day period | 3.18 | 4.09 |
| 3rd 24-day period | 1.99 | 3.25 |
| Carcass grades:[4] | | |
| Choice | 2 | 3 |
| Choice— | 3 | |
| Good+ | 4 | 2 |
| Good | | 4 |
| Good— | | 1 |

1. Seven 12-mg. pellets of stilbestrol in the ear (84 mg. total).
2. One steer removed during the study.
3. Standard error of mean.
4. Steers were slaughtered 30 days after the end of the feeding trial (total feeding period 110 days).

## The Effect of Feeding Stilbestrol[1] to Open and Spayed Heifers (Project 370).

E. F. Smith, D. Richardson, B. A. Koch, D. L. Mackintosh, and W. E. Stitt

Spaying is removing the ovaries, the primary source of estrogenic hormones. Stilbestrol is a synthetic compound resembling these estrogenic hormones in its physiological action. Experimental evidence indicates that spaying lowers the rate of gain, whereas stilbestrol has been successfully used to increase rate of gain in fattening yearling steers. This test is a study of the effect of: 1. spaying, 2. spaying plus stilbestrol, 3. nonspaying, and 4. nonspaying plus stilbestrol on the performance of heifer calves on a high roughage ration, followed by a fattening ration.

### Experimental Procedure

Forty good-quality Hereford heifer calves from the Williams Ranches near Lovington, N.M., were used in the test. They were divided into four lots of 10 heifers each on the basis of weight and quality. The heifers were started on test November 16, 1955. November 17, two lots were spayed. The four lots of heifers were fed the same feeds: 3.8 pounds of ground milo grain and 1 pound of soybean oil meal per head daily, all of the sorghum silage they would eat, and free access to bonemeal and salt. About 6 pounds of alfalfa hay was fed per head daily during the last 17 days of the wintering test. On April 7 the heifers were started on a full feed of grain. During this fattening period the heifers in all lots had free access to ground milo grain in one bunk and alfalfa hay in another bunk. The experimental treatment for each lot was as follows:

Lot 7—Spayed.

Lot 8—Spayed plus 5 mg. of stilbestrol per head daily the first 56 days, and 10 mg. per head daily during the remainder of the test.

Lot 9—Nonspayed (control lot).

Lot 10—Nonspayed plus 5 mg. of stilbestrol per head daily during the first 56 days of the test and 10 mg. per head daily during the remainder of the test.

The stilbestrol was fed mixed with the soybean oil meal.

### Observations

1. In Phase 1, the wintering period, spaying depressed the rate of gain (compare lots 7 and 9). Stilbestrol increased the daily gain on spayed heifers by 0.17 of a pound (see lots 7 and 8). However, the spayed heifers fed stilbestrol in lot 8 did not perform so well as the nonspayed control group, lot 9. Stilbestrol did not increase the gain of the nonspayed heifers. Feed efficiency was somewhat lower for the spayed heifers in lot 7.

2. During the fattening phase, stilbestrol increased the gain of the spayed heifers in lot 8 and the open heifers in lot 10, as compared with the control heifers in lot 9. The spayed heifers of lot 7 were the lowest gainers during this phase as they were during the wintering phase. Spaying seemed to decrease feed consumption in lot 7. Stilbestrol feeding apparently increased grain consumption slightly for lot 10. The most efficient gains were made by the spayed heifers fed stilbestrol.

3. In summarizing the wintering and fattening period combined, all lots made about the same total gain except the spayed heifers in lot 7. Their gain was considerably lower than any other lot. The heifers fed stilbestrol in lot 10 made the lowest financial return, primarily due to their lower selling price. Half of the carcasses in this lot (10) graded only good, whereas only one carcass graded good in each of the other lots. The most desirable treatment in this particular test is probably that of lot 9, the control lot.

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1. Furnished by the Eli Lilly Company, Indianapolis, Ind., as Stilbosol (a diethylstilbestrol premix).

## Table 43

### The Effect of Feeding Stilbestrol to Open and Spayed Heifers.

Phase 1, Wintering, November 16, 1955, to April 7, 1956—143 days.

| Treatment | Spayed | Spayed[1] plus stilbestrol | Nonspayed | Nonspayed[1] plus stilbestrol |
|---|---|---|---|---|
| Lot number | 7 | 8 | 9 | 10 |
| Number heifers per lot | 10 | 10 | 10 | 10 |
| Initial wt. per heifer, lbs. | 366 | 365 | 364 | 365 |
| Final wt. per heifer, lbs. | 574 | 597 | 613 | 613 |
| Gain per heifer, lbs. | 208 | 232 | 249 | 248 |
| Daily gain per heifer, lbs. | 1.45 | 1.62 | 1.74 | 1.73 |
| Daily ration per heifer, lbs.: | | | | |
| Ground milo grain | 3.81 | 3.81 | 3.81 | 3.81 |
| Soybean oil meal | 1.02 | 1.02 | 1.02 | 1.02 |
| Sorghum silage | 25.54 | 25.29 | 24.86 | 25.10 |
| Alfalfa hay[2] | .82 | .81 | .82 | .81 |
| Mineral (bonemeal and salt) | .07 | .08 | .05 | .06 |
| Salt | .07 | .06 | .05 | .07 |
| Lbs. feed required per 100 lbs. gain: | | | | |
| Ground milo grain | 262 | 235 | 219 | 220 |
| Soybean oil meal | 70 | 63 | 59 | 59 |
| Sorghum silage | 1756 | 1559 | 1428 | 1448 |
| Alfalfa hay | 56 | 51 | 47 | 47 |
| Mineral (bonemeal and salt) | 5 | 3 | 3 | 4 |
| Salt | 5 | 5 | 3 | 4 |
| Feed cost per 100 lbs. gain[3] | $15.11 | $13.80 | $12.48 | $12.84 |
| **Phase 2—Full feeding, April 7, 1956, to July 27, 1956—111 days.** | | | | |
| Initial wt. per heifer, lbs. | 574 | 597 | 613 | 613 |
| Final wt. per heifer, lbs. | 758 | 822 | 812 | 829 |
| Gain per heifer, lbs. | 184 | 225 | 199 | 216 |
| Daily gain per heifer, lbs. | 1.66 | 2.03 | 1.79 | 1.95 |
| Daily ration per heifer, lbs.: | | | | |
| Ground milo grain, self-fed | 10.80 | 11.53 | 11.49 | 12.05 |
| Soybean oil meal | 1.00 | 1.03 | 1.03 | 1.03 |
| Alfalfa hay | 5.07 | 5.76 | 5.89 | 5.66 |
| Sorghum silage[4] | 2.04 | 2.79 | 2.38 | 2.37 |
| Salt | .03 | .04 | .03 | .03 |
| Lbs. feed per cwt. gain: | | | | |
| Ground milo grain | 652 | 569 | 640 | 619 |
| Soybean oil meal | 60 | 51 | 57 | 53 |
| Alfalfa hay | 306 | 284 | 312 | 291 |
| Sorghum silage | 129 | 138 | 136 | 122 |
| Salt | 2 | 2 | 2 | 1 |
| Feed cost per heifer[3] | $38.49 | $42.18 | $41.02 | $43.26 |
| Feed cost per 100 lbs. gain[3] | 20.91 | 18.74 | 20.61 | 20.03 |
| **Summary of Phases 1 and 2—November 16, 1955, to July 27, 1956—254 days.** | | | | |
| Lot number | 7 | 8 | 9 | 10 |
| Total gain per heifer, lbs. | 392 | 457 | 448 | 464 |
| Daily gain per heifer, lbs. | 1.54 | 1.80 | 1.76 | 1.83 |
| Feed cost per cwt. gain[3] | $17.83 | $16.22 | $16.06 | $16.18 |
| Total feed cost per heifer[3] | 69.92 | 74.21 | 71.99 | 75.11 |

1. Five mg. of stilbestrol was fed the first 56 days of the test and 10 mg. thereafter.

2. Alfalfa hay was fed only the last 17 days of the test at the rate of about 6 pounds per head daily.

3. Feed prices may be found inside the back cover; 0.6 cent per head per day was charged for 10 mg. of stilbestrol.

4. Sorghum silage was fed only the first four weeks of the fattening period.

Table 43 (Continued).

| | | | | |
|---|---|---|---|---|
| Initial heifer cost @ $19.50 per cwt. | 71.37 | 71.18 | 70.98 | 71.18 |
| Selling price per cwt. | 22.00 | 21.50 | 22.50 | 20.00 |
| Return per heifer above initial cost, plus feed cost | 22.47 | 31.34 | 39.73 | 19.51 |
| % shrinkage in shipping to market | 3.03 | 1.20 | 1.84 | 2.29 |
| Dressing %, chilled | 60.19 | 59.67 | 59.25 | 58.72 |
| Carcass grades, USDA: | | | | |
| Low prime | 0 | 0 | 1 | 0 |
| High choice | 0 | 0 | 2 | 1 |
| Av. choice | 3 | 4 | 3 | 1 |
| Low choice | 6 | 5 | 3 | 3 |
| High good | 1 | 0 | 1 | 2 |
| Av. good | 0 | 1 | 0 | 3 |
| Av. grade[5] | 13.2 | 13.2 | 13.9 | 12.5 |
| Av. marbling score[6] | 6.8 | 6.8 | 6.0 | 7.2 |
| Av. fat thickness score[7] | 3.9 | 4.0 | 3.8 | 4.1 |
| Av. ribeye size score[8] | 4.2 | 4.1 | 4.1 | 4.4 |
| Av. firmness score[9] | 3.4 | 3.7 | 3.4 | 3.9 |

5. Average grade was based on low prime = 16, high choice = 15, average choice = 14, low choice = 13, high good = 12, average good = 11.

6. Marbling score was based on: moderate = 5, modest = 6, small amount = 7, slight amount = 8.

7. Fat thickness score at 12th rib based on: moderate = 3, modest = 4, slightly thin = 5.

8. Ribeye score size was based on: moderately large = 3, modestly large = 4, slightly small = 5.

9. Firmness of ribeye was based on: firm = 2, moderately firm = 3, modestly firm = 4, slightly firm = 5.

## Progress Report for 1956-57 on Project 370

Little difference in performance was noted between open or nonspayed heifers in lot 13, nonspayed plus stilbestrol in lot 14, and spayed plus stilbestrol in lot 16. The spayed heifers in lot 15 gained considerably less, 34 pounds per head, than the open or nonspayed heifers in lot 13 and their cost to produce 100 pounds of gain was greater.

The milo mill-feed fed to lot 17 proved fully equal to the ground milo grain fed to lot 13A. Milo mill-feed is a by-product obtained in dry milling milo grain. A chemical analysis of this product is given in the feedstuff analysis table in this circular.

## Table 44

**The Feeding of Stilbestrol to Spayed and Nonspayed Heifer Calves on Roughage Rations; Milo Mill-Feed Compared with Milo Grain.**

December 8, 1956, to April 3, 1957—116 days.

January 9 to April 3, 1957—84 days on lots 13A and 17.

| Treatment | Nonspayed | Nonspayed plus stilbestrol | Spayed | Spayed plus stilbestrol | Ground[1] milo grain | Milo mill-feed |
|---|---|---|---|---|---|---|
| Lot number | 13 | 14 | 15 | 16 | 13A | 17 |
| Number of heifers per lot | 10[1] | 11 | 11 | 11 | 10 | 11 |
| Initial wt. per heifer, lbs. | 373 | 370 | 371 | 370 | 420 | 422 |
| Final wt. per heifer, lbs. | 570 | 572 | 534 | 565 | 570 | 571 |
| Gain per heifer, lbs. | 197 | 202 | 163 | 195 | 150 | 149 |
| Daily gain per heifer, lbs. | 1.69 | 1.74 | 1.41 | 1.68 | 1.78 | 1.77 |
| Daily ration per heifer, lbs.: | | | | | | |
| Ground milo grain | 4.66 | 4.66 | 4.66 | 4.63 | 4.98 | |
| Milo mill-feed[2] | | | | | | 4.93 |
| Soybean meal[3] | .17 | .17 | .17 | .17 | .23 | .23 |
| Sorghum silage | 17.0 | 17.0 | 15.3 | 15.9 | 18.62 | 17.1 |
| Alfalfa hay | 2.65 | 2.70 | 2.50 | 2.66 | 2.43 | 2.45 |
| Salt | .07 | .03 | .06 | .03 | .07 | .08 |
| Stilbestrol, 5 mgs. per head daily the first 56 days of test, 10 mgs. daily thereafter[4] | | yes | | yes | | |
| Lbs. feed required for 100 lbs. gain: | | | | | | |
| Ground milo grain | 273 | 266 | 332 | 277 | 277 | |
| Milo mill-feed | | | | | | 272 |
| Soybean meal | 10 | 10 | 12 | 10 | 13 | 13 |
| Sorghum silage | 996 | 980 | 1086 | 953 | 1026 | 945 |
| Alfalfa hay | 153 | 154 | 190 | 159 | 138 | 136 |
| Feed cost per 100 lbs. gain[5] | $13.12 | $13.32 | $15.47 | $13.36 | $13.29 | $12.75 |

1. One heifer was removed from this lot because she failed to recover sufficiently from dehorning.
2. The milo mill-feed was furnished by Grain Products, Inc., Dodge City, Kans.
3. Soybean meal was fed at the rate of .5 lb. per head daily the last 30 days of test.
4. Stilbestrol was furnished by Eli Lilly and Co., Indianapolis, Ind., as Stilbosol (a diethylstilbestrol premix).
5. Feed prices for 1956-57 are inside back cover.

**The Effects of Diethylstilbestrol Administered by Implantation and by Ingestion on Growth, Fattening, and Carcass Characteristics of Beef Steers (Project 370).**

**Don L. Good, D. L. Mackintosh, Ralph P. Soule, Rufus F. Cox, and Dorothy L. Harrison**

Two trials each with 12 individually fed, long yearling, good-to-choice Hereford steers were used to study the effects of diethylstilbestrol administered by implantation and by ingestion on growth, fattening, and carcass characteristics of beef steers. The cattle were divided by weight into three groups of four steers each for each trial. Four steers served as controls, four were implanted at the base of the ear with 84 mgs. of stilbestrol, and four were fed 10 mgs. of stilbestrol per head daily.

The feeding period for each trial was 117 days and the ration consisted of three parts by weight of yellow corn, one part by weight of chopped alfalfa hay and one half pound soybean oil meal per head daily. A mineral mixture of equal parts steamed bonemeal and salt was provided free choice, and fresh water was available at all times.

Stilbestrol ingested or implanted increased appetite, and the gains were greater and more economical. The controls gained 2.71 pounds per head daily, those fed stilbestrol 2.97 pounds, and the implanted cattle 3.28 pounds per head daily. The least efficient were the controls. They required 86 pounds more feed than the implanted group and 107 pounds more than the stilbestrol-fed group to produce 100 pounds of gain.

This study shows that both feeding and implanting stilbestrol cause side effects, but in these trials the effects were not sufficiently strong to affect significantly the performance of steers. The side effects were more pronounced in the implanted group.

Teat length and the size of the sex organs were increased significantly by feeding and by implanting stilbestrol. The diameter and length of the penis was increased and the bulbo-urethra and prostate glands showed hypertrophy as the result of stilbestrol treatment. The bulbo-cavernosus and retractor penis muscles were also enlarged as a result of the hormone treatment.

Stilbestrol administered by ingestion or by implantation did not significantly affect dressing percentage, shrink to market, carcass grade, cooler shrink, moisture content of fat or lean, cooking quality, or measurements of the right metacarpus.

Mechanical separation of fat, lean, and bone revealed that the stilbestrol fed significantly increased the percentage of lean meat in the carcass and decreased the percentage of fat. The average percentage of nitrogen content of the eye muscle was significantly increased by the stilbestrol implants.

The only carcass measurement affected significantly by stilbestrol treatment was width of round, which was increased.

In this study there was not much difference between results obtained by feeding or implanting stilbestrol. Both treatments show an advantage over the controls in average daily gain.

Tables 45 and 46 show the average figures by treatment for each trial and for the combined trials on feed-lot performance, and some of the more important carcass characteristics.

## Table 45

The Effect of Stilbestrol Ingested (10 mgs. per Head Daily) or Implanted (84 mgs.) on Dressing %, Carcass Shrink, and Carcass Grade, Area of Ribeye, Thickness of Fat at 12th Rib.

| Comparisons | Trial A | | | Trial B | | | Combined trials | | |
|---|---|---|---|---|---|---|---|---|---|
| | Controls | Fed | Implanted | Controls | Fed | Implanted | Controls | Fed | Implanted |
| Number of steers | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 |
| Av. dressing %[1] | 61.2 | 61.7 | 61.5 | 63.2 | 62.2 | 63.1 | 62.2 | 61.9 | 62.3 |
| Av. hot to cold carcass shrink, % | 2.7 | 2.6 | 2.4 | 1.9 | 1.9 | 1.8 | 2.3 | 2.3 | 2.1 |
| Av. 12-day cooler shrink, % | 1.5 | 1.5 | 1.6 | 0.75 | 0.98 | 0.64 | 1.1 | 1.2 | 1.1 |
| Av. carcass grade[2] | good | good | good+ | good | good | good | good | good | good+ |
| | 16 | 16 | 14.5 | 16 | 15.5 | 15 | 16 | 15.75 | 14.75 |
| Area of ribeye, sq. in. | 12.61 | 13.37 | 13.24 | 11.68 | 11.84 | 12.25 | 12.14 | 12.61 | 12.74 |
| Thickness of fat at 12th rib, cms. | 1.44 | 1.69 | 1.82 | 1.77 | 2.06 | 2.13 | 1.61 | 1.88 | 1.97 |

1. Based on cold carcass.
2. Numbers were assigned to grades: choice 19, choice− 12, good+ 14, good 16, good− 15, etc.

## Table 46

The Effect of Stilbestrol Ingested or Implanted on Growth Rate, Feed Consumption, Feed Efficiency, Grade in Feed Lot, Shrink to Market, and Selling Price (Ration: 3 Parts by Weight Yellow Corn, 1 Part by Weight Chopped Alfalfa Hay, ½ Pound Soybean Oil Meal per Head Daily, Mineral Free Choice).

| Comparisons | Trial A | | | Trial B | | | Combined trials | | |
|---|---|---|---|---|---|---|---|---|---|
| | Controls | Fed* | Implanted** | Controls | Fed* | Implanted** | Controls | Fed* | Implanted** |
| Number of steers | 4 | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 |
| Days on feed | 117 | 117 | 117 | 118 | 118 | 118 | 117.5 | 117.5 | 117.5 |
| Av. initial wt., lbs. | 677 | 678 | 672 | 811 | 811 | 809 | 744 | 745 | 741 |
| Av. final wt., lbs. | 1000 | 1031 | 1050 | 1125 | 1156 | 1203 | 1062 | 1093 | 1126 |
| Av. daily gain, lbs. | 2.76 | 3.02 | 3.23 | 2.67 | 2.92 | 3.33 | 2.71 | 2.97 | 3.28 |
| Av. total feed consumed, lbs. | 2506 | 2553 | 2642 | 2760 | 3391 | 3102 | 2633 | 2572 | 2872 |
| Lbs. feed per 100 lbs. gain | 805 | 730 | 714 | 879 | 746 | 798 | 842 | 735 | 756 |
| Av. grade in feed lot | good+ | choice− | choice− | good | good | good+ | good+ | good+ | good+ |
| Av. shrink to market, % | 4.6 | 4.8 | 3.8 | 4.87 | 4.80 | 4.88 | 4.71 | 4.79 | 4.32 |
| Av. selling price per cwt., $ | 19.75 | 20.50 | 21.00 | 19.50 | 19.00 | 19.00 | 19.63 | 19.75 | 20.00 |

* Fed 10 mgs. of stilbestrol per head daily.

** Implanted with 24 mgs. of stilbestrol.

## The Value of Stilbestrol in Beef Cattle Rations. Wintering, Grazing, and Fattening Phases (Project 370).

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

This is the second test designed to study the value of stilbestrol with steer calves in the deferred feeding system. A complete report of the first test may be found in Kansas Agricultural Experiment Station Circular 335:40-45, 1956.

### Experimental Procedure

Twenty-seven Hereford steer calves averaging about 400 pounds were divided into three lots of nine animals each. Lot 1 received stilbestrol during the wintering and fattening phase. Lot 2 received stilbestrol only during the fattening phase. Lot 3 did not receive stilbestrol and served as the control lot. The stilbestrol was mixed with soybean oil meal and fed at the rate of 10 mgs. per head daily except for the first 56 days of the wintering phase, when the calves received only 5 mgs. per day. Previous studies indicated better results by starting calves at the 5-mg. level than the 10-mg. level. Due to lack of lot space, lots 2 and 3 were fed in the same lot during the wintering phase. None of the animals received stilbestrol while on grass; they grazed together in the same pasture. Carcass data were obtained on individual animals after slaughter.

### Results, Discussion, and Observations

The results of this test, including carcass data, are presented in Table 47. Lot 1 animals that received stilbestrol gained 0.25 and 0.30 pound more daily than did the control animals during the wintering phase. At current feed prices, this resulted in $1.33 and $1.89 less feed cost per 100 pounds gain. No harmful side effects were observed. It is believed that 5 mgs. is more desirable than 10 mgs. per head daily at the beginning of the feeding period for calves.

There was no beneficial carryover effect on the grazing phase from feeding stilbestrol during the wintering phase. This agrees with the previous test.

Gains in all lots were lower than expected on grass. This was probably because the animals had made good winter gains and were in good condition when they went to pasture. Another factor could have been the shortage of watering places in the large pasture in which the animals grazed.

Lots 1 and 2 received 10 mgs. per head daily during the fattening phase. This was the first time for lot 2 to receive stilbestrol. The rate of gain was highest in lot 1; however, there was one animal in each of lots 2 and 3 that did not do so well as he should have. This, to some extent, accounts for the lower gains in lots 2 and 3. Animals receiving stilbestrol produced 100 pounds of gain for $1.50 to $2.08 less feed cost than the controls. There was a tendency for the animals that received stilbestrol to shrink more to market and to have lower dressing percentages. Carcass grades were also lower. This was particularly true for lot 1 animals that received stilbestrol in the wintering and fattening rations. Animals in lot 1 appeared fatter and were graded higher before slaughter by a panel of 10 persons; however, their carcass grades were the lowest. This was due primarily to less marbling and a tendency toward less firmness of the carcass. There was no difference between lots in outside fat covering of the carcass.

## Table 47

**Results with and without Stilbestrol in Wintering and Fattening Rations and Grazing without Stilbestrol.**

Wintering phase, December 1, 1955, to May 16, 1956—168 days.

| Lot | 1[1] | 2 | 3 |
|---|---|---|---|
| Number steer calves per lot | 9 | 9 | 9 |
| Av. initial wt., lbs. | 397 | 402 | 397 |
| Av. final wt., lbs. | 701 | 663 | 650 |
| Av. daily gain, lbs., | 1.80 | 1.55 | 1.50 |
| Av. daily ration, lbs.: | | | |
| Soybean oil meal | 1.0 | 1.0 | 1.0 |
| Ground milo grain | 4.0 | 4.0 | 4.0 |
| Atlas sorghum silage | 27.5 | 27.3 | 27.3 |
| Lbs. feed per 100 lbs. gain: | | | |
| Soybean oil meal | 55.3 | 64.1 | 66.4 |
| Ground milo grain | 221.9 | 256.8 | 265.1 |
| Atlas sorghum silage | 1692.3 | 1946.0 | 2014.2 |
| Feed cost per 100 lbs. gain | $15.11 | $16.44 | $17.00 |
| **Grazing phase, May 17 to August 17, 1956—92 days.** | | | |
| Av. initial wt., lbs. | 701[2] | 665 | 649 |
| Av. final wt., lbs. | 741 | 714 | 716 |
| Av. daily gain, lbs. | .43 | .53 | .73 |
| **Fattening phase, August 17, 1956, to January 7, 1957—142 days.** | | | |
| Av. initial wt., lbs. | 741[3] | 714[3] | 716 |
| Av. final wt., lbs. | 1088 | 1042 | 1032 |
| Av. daily gain, lbs. | 2.44 | 2.33 | 2.22 |
| Av. daily ration, lbs.: | | | |
| Soybean oil meal | 1.0 | 1.0 | 1.0 |
| Ground milo grain | 16.9 | 16.3 | 17.7 |
| Prairie hay | 5.2 | 5.1 | 5.0 |
| Lbs. feed per 100 lbs. gain: | | | |
| Soybean oil meal | 40.9 | 43.3 | 44.9 |
| Ground milo grain | 692.2 | 705.9 | 797.0 |
| Prairie hay | 214.8 | 218.9 | 223.4 |
| Feed cost per 100 lbs. gain | $24.43 | $24.93 | $26.51 |
| **Carcass data** | | | |
| % shrink to market | 3.33 | 3.98 | 3.18 |
| Dressing % (hot wt.) | 61.5 | 62.3 | 62.4 |
| Carcass grade before and after ribbing: | before after | before after | before after |
| Top choice | | | 2 |
| Av. choice | | | 1 |
| Low choice | 1 | 2 3 | 3 2 |
| Top good | 3 4 | 5 5 | 3 2 |
| Av. good | 5 4 | 1 | 3 1 |
| Low good | 1 | | 1 |
| Standard | | 1 1 | |
| Number of carcasses upgraded | 3 | 3 | 6 |
| Number of carcasses downgraded | 1 | 1 | 1 |
| Av. degree of marbling[4] | 7.66 | 6.44 | 6.44 |
| Av. size ribeye[5] | 4.00 | 4.22 | 4.00 |
| Av. firmness of carcass[6] | 4.11 | 4.11 | 3.66 |

1. Fed 5 mgs. of stilbestrol per head for first 56 days and 10 mgs. per head daily thereafter.
2. Stilbestrol discontinued while on grass.
3. Received 10 mgs. stilbestrol per head daily in soybean oil meal.
4. Based on moderate = 5; modest = 6; small amount = 7; slight amount = 8; traces = 9.
5. Based on large = 2; moderately large = 3; modestly large = 4; slightly small = 5; small = 6.
6. Based on firm = 2; moderately firm = 3; modestly firm = 4; slightly firm = 5; soft = 6.

## Improvement of Beef Cattle Through Breeding Methods (Project 286).

Walter H. Smith, Lewis A. Holland, John D. Wheat, and William G. Amstein, Jr.

The purebred Shorthorn cattle-breeding project was established in 1949. Two inbred lines were established by the use of two herd sires, College Premier 29th 2368167 and Gregg Farm's Hoarfrost 2492499, and these two breeding groups were designated as the Wernacre Premier and Mercury lines, respectively, in reference to the two foundation sires. Each of the two breeding groups has been closed to outside breeding since its establishment. The Wernacre Premier line now is in the third generation of inbreeding, while the Mercury line is in the second generation.

An inbreeding program was initiated in the Wernacre Premier line in 1949 by breeding College Premier 29th to his half-sisters. Inbreeding has been continued by using two sons of College Premier 29th on the foundation females and those produced in the line since its establishment.

Gregg Farm's Hoarfrost was purchased in 1950 and was used as the foundation sire to establish the Mercury inbred line. Two sons of Gregg Farm's Hoarfrost have been used in the Mercury line since 1953. The replacement females in the line have been descendants of Gregg Farm's Hoarfrost, and inbreeding was initiated by using these two sons on their half-sisters. The calves sired by Gregg Farm's Hoarfrost were not inbred because the Mercury line-foundation cows were unrelated to him.

The Shorthorn beef cattle-breeding experiment was established to study beef cattle production traits and the effects of inbreeding. The females have produced calves in the spring of each year as a result of summer pasture breeding. The calves are not creep fed during the suckling period while the cows are on grass. The calves were weaned at 196 days of age in 1950 and placed on individual feeding trials for 196 days after a three-week adjustment period following weaning. The weaning age and individual feeding period were changed to 182 days in 1951 and have remained the same since that time.

The full-feed ration for the bulls and steers consisted of 75 percent cracked corn and 25 percent chopped alfalfa hay; that for the heifers, 55 percent cracked corn and 45 percent chopped alfalfa hay.

The feeding trial data for the 1955 calf crop are summarized in Table 48, and a partial summary of the 1956 calf crop is presented in Table 49. Since the feeding trials for the 1956 calves are not complete, the number of days of feeding as of March 18, 1957, is designated for each calf.

Since the project started, a total of 70 heifers, 30 bulls, and 33 steers have been individually fed, not including the 1956 calves which have not completed their feeding trials. The data pertaining to the calves produced in two lines are presented in Table 50.

Table 48

Summary of the 1955 Shorthorn Calves of the Wernacre Premier and Mercury Lines.

| Tag number | Coefficient of inbreeding[2] | Birth weight | Weaning weight | Weaning score | Days fed | Initial weight | Final weight | Total gain | Average daily gain, lbs. | Final score | Lbs. corn per 100 lbs. gain | Lbs. alfalfa per 100 lbs. gain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wernacre Premier Line** | | | | | | | | | | | | |
| Bulls | | | | | | | | | | | | |
| 154 | 32.03 | 77 | 446 | 2− | 182 | 486 | 882 | 396 | 2.18 | 3− | 433 | 212 |
| Steers | | | | | | | | | | | | |
| 11 | 22.98 | 56 | 310 | 2− | 182 | 345 | 693 | 348 | 1.91 | 3 | 461 | 236 |
| Heifers | | | | | | | | | | | | |
| 68 | 23.44 | 79 | 370 | 2− | 182 | 425 | 710 | 285 | 1.57 | 2− | 386 | 337 |
| 14 | 15.35 | 75 | 360 | 3+ | 182 | 395 | 655 | 260 | 1.43 | 3+ | 333 | 300 |
| 23 | 15.45 | 60 | 370 | 2+ | 182 | 425 | 670 | 245 | 1.35 | 1− | 384 | 343 |
| 18 | 15.09 | 76 | 311 | 3 | 182 | 360 | 626 | 266 | 1.46 | 3− | 404 | 353 |
| 10 | 23.74 | 59 | 290 | 3 | 182 | 330 | 605 | 275 | 1.51 | 2 | 364 | 320 |
| 7 | 20.70 | 69 | 305 | 3 | 182 | 340 | 663 | 323 | 1.77 | 3+ | 328 | 303 |
| 50 | 23.40 | 56 | 300 | 3 | 182 | 320 | 602 | 282 | 1.55 | 3 | 344 | 319 |
| Av. | 19.60 | 68 | 329 | 3+ | 182 | 371 | 647 | 277 | 1.52 | 2− | 363 | 325 |

## Mercury Line

### Bulls

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 6.44 | 72 | 450 | 2+ | 182 | 500 | 945 | 445 | 2.45 | 2+ | 364 | 178 |
| 15 | 14.18 | 57 | 340 | 1− | 182 | 410 | 855 | 445 | 2.15 | 1− | 401 | 190 |
| 30 | 1.76 | 61 | 350 | 1− | 182 | 402 | 800 | 398 | 2.19 | 2+ | 415 | 219 |
| 8 | 14.45 | 60 | 365 | 2+ | 182 | 400 | 870 | 470 | 2.58 | 1 | 388 | 193 |
| Av. | 9.21 | 63 | 376 | 1− | 182 | 428 | 868 | 440 | 2.42 | 1− | 392 | 195 |

### Steers

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 184 | 14.26 | 66 | 360 | 2− | 182 | 445 | 850 | 405 | 2.33 | 3 | 584 | 272 |
| 108 | 12.92 | 61 | 305 | 2+ | 182 | 350 | 692 | 342 | 1.88 | 3 | 417 | 209 |
| 58 | 12.50 | 57 | 308 | 2 | 182 | 350 | 740 | 390 | 2.14 | 3+ | 200 | 129 |
| 12 | 14.30 | 57 | 260 | 3+ | 182 | 300 | 600 | 300 | 1.65 | 3 | 473 | 238 |
| 61 | 13.48 | 71 | 325 | 2− | 182 | 325 | 696 | 371 | 2.04 | 3− | 384 | 205 |
| Av. | 13.49 | 62 | 312 | 2− | 182 | 354 | 716 | 362 | 1.99 | 3 | 412 | 211 |

### Heifers

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 1.80 | 62 | 356 | 2 | 182 | 372 | 622 | 250 | 1.37 | 1− | 440 | 384 |
| 180 | 1.68 | 59 | 395 | 2+ | 182 | 420 | 603 | 183 | 1.01 | 2− | 418 | 383 |
| 31 | 14.30 | 55 | 326 | 1− | 182 | 365 | 590 | 225 | 1.24 | 2+ | 420 | 373 |
| 1 | 4.01 | 57 | 310 | 2− | 182 | 325 | 698 | 373 | 2.05 | 3 | 259 | 247 |
| 49 | 13.48 | 62 | 312 | 2 | 182 | 340 | 681 | 341 | 1.87 | 2− | 370 | 328 |
| 35 | 25.00 | 62 | 300 | 2+ | 182 | 300 | 585 | 285 | 1.57 | 2+ | 368 | 337 |
| 2 | 1.96 | 66 | 283 | 3+ | 182 | 290 | 615 | 325 | 1.79 | 1− | 308 | 289 |
| 90 | 16.50 | 72 | 355 | 2+ | 182 | 375 | 635 | 260 | 1.43 | 1 | 454 | 423 |
| 22 | 15.72 | 71 | 330 | 2+ | 182 | 352 | 634 | 282 | 1.55 | 1− | 402 | 376 |
| Av. | 10.49 | 63 | 330 | 2 | 182 | 349 | 629 | 280 | 1.54 | 2+ | 382 | 349 |

1. The coefficient of inbreeding means the percentage of inbreeding. Individuals from full brother-sister matings are 25 percent inbred. Individuals produced from mating half-sibs are 12.5 percent inbred.

Table 49

Partial Summary of the 1956 Shorthorn Calves of the Wernacre and Mercury Lines.

| Tag number | Coefficient of inbreeding | Birth weight | Weaning weight | Weaning score | Initial weight | Weight on 2-18-57 | Days on trial | Daily gain during trial |
|---|---|---|---|---|---|---|---|---|
| | | | | **Wernacre Premier Line** | | | | |
| | | | | **Bulls** | | | | |
| 56 | 32.03 | 71 | 406 | 2– | 450 | 830 | 140 | 2.71 |
| 31 | 23.74 | 59 | 405 | 3+ | 417 | 745 | 140 | 2.34 |
| Av. | 27.89 | 65 | 405 | 2– | 434 | 788 | | 2.53 |
| | | | | **Steers** | | | | |
| 82 | 32.03 | 68 | 380 | 4 | 360 | 700 | 140 | 2.43 |
| | | | | **Heifers** | | | | |
| 30 | 23.56 | 78 | 430 | 2 | 440 | 707 | 140 | 1.91 |
| 68 | 32.03 | 70 | 395 | 2 | 406 | 581 | 140 | 1.25 |
| 173 | 15.36 | 69 | 395 | 2– | 416 | 670 | 140 | 1.81 |
| 108 | 30.20 | 69 | 340 | 3+ | 350 | 592 | 140 | 1.73 |
| 38 | 15.09 | 74 | 305 | 2– | 350 | 470 | 70 | 1.71 |
| Av. | 23.25 | 72 | 373 | 2– | 392 | 604 | | 1.68 |

## Mercury Linc

### Bulls

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 189 | 14.19 | 61 | 365 | 1– | 400 | 743 | 140 | 2.44 |
| 105 | 15.72 | 56 | 412 | 1– | 455 | 810 | 140 | 2.54 |
| 7 | 25.00 | 62 | 409 | 2 | 427 | 806 | 140 | 2.71 |
| 154 | 3.37 | 71 | 457 | 2– | 500 | 860 | 140 | 2.57 |
| Av. | 14.57 | 63 | 411 | 2+ | 446 | 805 | | 2.57 |

### Steers

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 13.48 | 65 | 312 | 2+ | 371 | 532 | 70 | 2.30 |
| 8 | 3.61 | 58 | 355 | 3+ | 355 | 665 | 140 | 2.21 |
| 36 | 12.92 | 65 | 370 | 2 | 391 | 620 | 140 | 1.64 |
| Av. | 10.00 | 63 | 346 | 2 | 372 | 606 | | 2.05 |

### Heifers

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13 | 11.23 | 54 | 315 | 2 | 312 | 550 | 140 | 1.70 |
| 760 | 3.91 | 58 | 360 | 1– | 365 | 518 | 140 | 1.09 |
| 12 | 6.45 | 66 | 380 | 1– | 405 | 605 | 140 | 1.45 |
| 184 | 13.48 | 51 | 352 | 2+ | 378 | 572 | 140 | 1.39 |
| 10 | 14.26 | 55 | 345 | 1 | 350 | 540 | 140 | 1.36 |
| 58 | 14.46 | 65 | 365 | 1– | 388 | 583 | 140 | 1.39 |
| 15 | 8.01 | 62 | 372 | 1– | 395 | 613 | 140 | 1.56 |
| 103 | 14.31 | 63 | 315 | 3+ | 355 | 465 | 70 | 1.57 |
| Av. | 10.76 | 59 | 351 | 2+ | 369 | 556 | | 1.44 |

Table 50

**Summary of the Average Initial Weights, Coefficients of Inbreeding, Average Daily Gains, and Total Digestible Nutrients Required per 100 Pounds of Gain for the Bulls, Steers, and Heifers Produced in the Wernacre Premier and Mercury Lines from 1950 through 1955.**

| Line | Sex | Initial weight | Coefficient of inbreeding | Average daily gain | TDN per 100 lbs. gain[1] |
|---|---|---|---|---|---|
| Wernacre Premier | | | | | |
| | Bulls | 489 | 13.21 | 2.52 | 499 |
| | Steers | 434 | 12.26 | 2.11 | 538 |
| | Heifers | 392 | 15.58 | 1.65 | 547 |
| Mercury | | | | | |
| | Bulls | 407 | 5.63 | 2.41 | 422 |
| | Steers | 385 | 6.00 | 2.13 | 480 |
| | Heifers | 355 | 4.59 | 1.60 | 532 |

1. The TDN values represent the pounds of total digestible nutrients, in both the cracked corn and alfalfa hay of the rations used for 100 pounds of live bodyweight gain.

The summary presented in Table 50 includes averages for the four variables, initial weight, coefficient of inbreeding, average daily gain, and TDN per 100 pounds of gain, for all of the calves that have completed individual feeding trials to date in each of the two lines. Analyses of variance have been computed on the complete data for each of these variables. These analyses were computed within each of the three sexes, bulls, steers, and heifers. The between-lines, within-years source of variance and the between-years source of variance were tested statistically for significance.

The average initial weight of the Wernacre Premier calves is higher than that of the Mercury calves; however, analyses of variance revealed that the two lines differed significantly within years only in the case of the steers. The between-years source of variance was highly significant in the data on the bulls, indicating that year effects may be of appreciable importance.

The between-lines, within-years source of variance was highly significant for coefficients of inbreeding in all three of the sexes. This was to be expected because inbreeding has been approximately one generation in advance in the Wernacre Premier line compared with the Mercury line.

Considerable variation existed among the average daily gains of the individual calves within each sex in all years. Analyses of variance did not indicate that either the between-years or the between-lines, within-years source of variance was significant for any one of the three sexes. Except for the steers, which were approximately the same, the Wernacre Premier calves had a higher average daily gain than the Mercury calves, although the differences in the average daily gains of the bulls and heifers of the two lines were not significant.

Averages in Table 50 show that the Mercury calves tended to make the most efficient gains; however, the between-lines, within-years source of variance was not significant in any of the three sexes in regard to this variable. The between-years source of variance was highly significant for the bulls and heifers, indicating that year effects may have an important influence on this variable.

The relationships between initial weight, coefficient of inbreeding, average daily gain, and feed efficiency, or TDN requirement per 100 pounds of gain, were studied by methods of correlation analyses within each of the three sexes of calves. These analyses revealed that initial weight and average daily rate of gain were highly significantly related to feed efficiency in the data on the heifers. These relationships were not significant in the data on the bull and steer calves.

These data are limited in regard to the number of animals used for the study, and these findings should not be regarded as conclusive; how-

ever, it appears that initial weight influences feeding efficiency to about the same extent as does average daily gain. In general, the lighter calves at the start and the faster-gaining calves during the feeding period make the most economical gains.

Inbreeding did not appear to be related to feed efficiency, although it was highly significantly related to initial weight in the bulls and heifers. The more highly inbred calves tended to weigh less at the start of the feeding trials compared with noninbred calves of approximately the same age. Inbreeding did not appear to be related to average daily gain in any of the three sexes.

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## Fundamental Studies of Sorghum Roughages and Grains. I. A Study of the Value of Pelleting Milo Grain. II. A Study of the Value of Levels of Hormone and Synthetic Hormonelike Substances (Project 222).

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

Previous work has shown that rate of gain and carcass quality are essentially the same with milo grain and corn when self-fed in a beef-fattening ration (Kansas Agricultural Experiment Station Circulars 308, 320, and 335). However, the animals eat more milo grain than corn per pound of gain. Because of its relatively small size, the milo grain is more difficult to prepare than the larger grain of corn.

This is a progress report of a preliminary test to evaluate grinding milo grain to a meal and then making it into a pellet. Source and level of hormones and synthetic hormonelike substances used as implants are also being studied. The reader should keep in mind that this test is still in progress and results given here are incomplete.

### Experimental Procedure

Thirty-six of the heaviest Hereford steer calves purchased for experimental work were assigned to this test. Since lot space was not available, they were fed together in a group until the test started. They were divided on the basis of weight and conformation into three lots of 12 animals each, January 15. At that time they were consuming 5 pounds of grain per day and their average weight was about 540 pounds.

The daily ration for all animals consisted of grain, 1 pound soybean oil meal, 2 pounds alfalfa hay and all of the sorghum silage they would clean up. Equal quantities of grain were fed as follows: Lot 4, rolled corn; lot 5, finely ground pelleted milo grain; and lot 6, rolled milo grain. It should be observed that silage was the only ingredient not kept on an equal weight basis between lots. The calves are hand fed in the morning and afternoon.

The animals in each lot were assigned to four groups of three animals each on the basis of weight. One group served as the control, one group had 24 mgs. of stilbestrol implanted under the skin of the ear, and another group received 36 mgs. The fourth group received the Synovex implant (1000 mgs. progesterone and 20 mgs. estradiol benzoate). This gave three animals in each lot per treatment or a total of nine on each treatment. The calves were implanted 28 days after starting the test. They had been on a full feed of grain (10 pounds daily) for several days at that time.

### Results and Observations

The results of this test to date are shown in Tables 51 and 52. The calves receiving corn were the first to reach a full feed of grain followed by those receiving pelleted milo. Lot 6 calves (rolled milo) would consume more grain than the others; however, grain consumption is being kept the same in all lots. Lot 6 calves are consuming more silage. After about 60 days on test, the calves on pelleted milo grain seemed reluctant to eat for a few days. No apparent reason for this was observed and normal feed consumption has been resumed.

All of the hormone and hormonelike substances have increased the rate of gain.

**Table 51**

**Comparative Results with Rolled Corn, Pelleted Milo Grain, and Rolled Milo Grain in Beef Steer Calf Fattening Ration.**

January 15, 1957, to April 19, 1957—84 days.

| Lot number | 4 | 5 | 6 |
|---|---|---|---|
| Number calves per lot | 12 | 11[1] | 12 |
| Av. initial wt., lbs. | 541.3 | 537.3 | 538.8 |
| Av. final wt., lbs. | 763.3 | 747.3 | 741.7 |
| Av. daily gain per calf, lbs. | 2.64 | 2.50 | 2.42 |
| Av. daily ration, lbs.: | | | |
| Sorghum silage | 14.8 | 14.6 | 16.7 |
| Alfalfa hay | 2.0 | 2.0 | 2.0 |
| Soybean oil meal | 1.0 | 1.0 | 1.0 |
| Rolled corn | 10.3 | | |
| Pelleted milo grain | | 10.3 | |
| Rolled milo grain | | | 10.3 |
| Lbs. feed per 100 lbs. gain: | | | |
| Sorghum silage | 559.0 | 560.0 | 692.0 |
| Alfalfa hay | 74.7 | 79.0 | 81.8 |
| Soybean oil meal | 37.3 | 40.0 | 40.9 |
| Rolled corn | 388.1 | | |
| Pelleted milo grain | | 409.6 | |
| Rolled milo grain | | | 424.8 |
| Feed cost per 100 lbs. gain[2] | $16.86 | $17.67 | $18.14 |

1. One animal removed because of urinary calculi.

2. Grain was prepared by Department of Flour and Feed Milling Industries, Kansas State College. Cost per 100 lbs.: rolled corn, $3; rolled milo, $2.85; and pelleted milo, $2.99.

**Table 52**

**Results of Implanting 24 and 36 Milligrams Stilbestrol and Synovex Pellets with Beef Steer Calves on a Fattening Ration.**

February 12, 1957, to April 9, 1957—56 days.

| Treatment | Control | 24 mgs. stilbestrol | 36 mgs. stilbestrol | Synovex[2] |
|---|---|---|---|---|
| Number calves per treatment | 9 | 9 | 8[1] | 9 |
| Av. initial wt., lbs. | 618.9 | 614.4 | 611.3 | 610.0 |
| Av. final wt., lbs. | 737.8 | 755.6 | 757.5 | 745.0 |
| Av. daily gain per calf, lbs. | 2.12 | 2.52 | 2.61 | 2.41 |

1. One calf removed because of urinary calculi.

2. Contains 1000 mgs. progesterone and 20 mgs. estradiol benzoate.

**The Use of a Pelleted Ration for Fattening Beef Heifers (Project 222).**

**F. H. Baker, E. F. Smith, D. Richardson, and R. F. Cox**

An experiment previously conducted at this station demonstrated that beef heifers fed a completely pelleted ration made inferior gains, and had significantly lower carcass grades and dressing percentages than heifers fed the same balanced fattening ration in a natural state. However, these heifers consumed materially less of the pelleted ration and converted the feed to flesh as efficiently as the more rapidly gaining control group of heifers. There was definite evidence that the heifers consuming the pelleted ration ruminated less and craved coarse roughage. The experiment reported here was designed to determine if feeding limited quantities of natural roughage would stimulate feed consumption and permit normal rumination and normal gains of heifers fed pelleted rations.

## Procedure

Twenty yearling heifers of good to choice quality were used. The heifers were purchased in the fall of 1954, used in wintering experiments until May 7, 1955, and continued on a growing ration in dry lot until June 15. Assignment of the heifers to lots in this experiment was on the basis of weight, feeder grade, and winter treatment.

The experimental rations were prepared in the following manner:

Lot 1—Coarsely cracked corn, cottonseed meal, and blackstrap molasses were commercially mixed together. The alfalfa hay was chopped as coarsely as possible in a forage chopper and blended with the other ingredients as the ration was self-fed to the heifers.

Lot 2—This ration was prepared by finely grinding, mixing, and pelleting the ingredients into pellets ⅜ inch in diameter. In addition to these pellets, 10 pounds of long alfalfa hay was fed per heifer daily for the first 3 days of the experiment. The hay intake was gradually decreased until a level of 1½ pounds per head daily was reached at the end of 12 days. This amount of hay was hand-fed daily while the pellets were self-fed during the remainder of the trial. For the first 43 days of the study the composition of the pellets was corn, 65 percent; molasses, 5 percent; cottonseed meal, 5 percent; and alfalfa hay, 25 percent. During the last 70 days the corn content of the pellets was increased to 70 percent and the alfalfa decreased to 20 percent. This change permitted the concentrate intake to be maintained at a higher level during the latter phase of the full-feeding period. The concentrate-to-hay ratio was equalized as nearly as possible between lots throughout the experiment.

It is recognized that these rations in the quantities consumed by the heifers provided more protein than is normally fed to fattening cattle. The cottonseed meal was included in the mixture to insure that the daily protein intake would be adequate for maximum gains in both lots even though the total feed consumption might be lower in one of the lots. Molasses was included in the rations to improve the consistency of the mixture and to facilitate the pelleting process.

## Observations

1. Feed consumption was materially higher for the cattle fed the coarsely ground grain and chopped hay ration.

2. Feed efficiency was significantly improved by pelleting the ration.

3. Rate of gain, rumination, and the general feed-lot performance were normal for the heifers fed the pelleted ration and a small quantity of alfalfa hay. This small quantity of coarse roughage appears to be essential in obtaining a normal rate of gain and feed-lot performance from cattle fed pelleted rations. This observation is based on a comparison of these results with those of the previous experiment as well as results of tests conducted at other experiment stations.

**Table 53**

**A Study of the Preparation of Rations for Fattening Beef Heifers.**

| Management | Chopped hay and coarsely ground grain ration | Pelleted ration |
|---|---|---|
| Lot number | 1 | 2 |
| Number heifers per lot | 10 | 10 |
| Initial wt., lbs. | 710 | 710 |
| Final wt., lbs. | 1011 | 1000 |
| Gain per heifer, lbs. | 301 | 290 |
| Daily gain per heifer, lbs. | 2.66 | 2.57 |
| Daily ration per heifer, lbs.: | | |
| Corn | 14.74 | |
| Cottonseed meal | 1.13 | |
| Molasses | 1.13 | |
| Alfalfa hay | 7.13 | 2.01 |
| Salt | .02 | .02 |
| Pellets | | 17.58 |
| % concentrate | 70.5 | 70.0 |

Table 53 (Continued).

| | | |
|---|---|---|
| % roughage | 29.5 | 30.0 |
| Lbs. feed per cwt. of gain: | | |
| Corn | 553.2 | |
| Cottonseed meal | 42.6 | |
| Molasses | 42.6 | |
| Alfalfa hay | 267.8 | 78.3 |
| Salt | .8 | .9 |
| Pellets | | 685.2 |
| Total | 907.0 | 764.4 |
| Feed cost per cwt. of gain[1] | $ 22.62 | $ 21.80 |
| Initial cost of heifer @ $19 | $134.90 | $134.90 |
| Feed cost per heifer | $ 68.10 | $ 63.22 |
| Heifer cost plus feed cost | $203.00 | $198.12 |
| Market wt., lbs. | 987 | 995 |
| Necessary selling price | $ 20.57 | $ 19.91 |
| Selling price per cwt. | $ 21.50 | $ 21.50 |
| Dressing % | 61.8 | 60.8 |
| Carcass grades:[2] | | |
| Choice+ | 1 | |
| Choice | 6 | 3 |
| Choice− | 1 | 3 |
| Good+ | 1 | 3 |
| Good | 1 | |
| Marbling score: | | |
| Moderate | 6 | 2 |
| Modest | 2 | 3 |
| Small | 1 | 3 |
| Slight | 1 | 1 |

1. Feed prices: corn, $2.87 per cwt.; cottonseed meal, $72 per ton; alfalfa hay, $20 per ton; molasses, $2.20 per cwt.; salt, $15 per ton; preparation of pelleted ration (grinding, mixing, pelleting, and hauling), $12 per ton; preparation of coarse concentrate mixture (mixing and hauling), $5 per ton.

2. The carcass grade for one heifer from lot 2 was lost.

## Sources of Phosphorus for Beef Cattle (Project 536[1]).

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

In a previous test it was found that phosphoric acid can be used as a source of phosphorus for beef heifer calves on dry bluestem pasture. A phosphorus balance study with lambs also indicated efficient use of phosphorus from phosphoric acid. This test was conducted to further evaluate phosphoric acid as a source of phosphorus in the wintering and fattening ration under dry-lot feeding conditions.

### Experimental Procedure

Seventy-four Hereford heifer calves were divided into five lots as equally as possible on the basis of weight and type. Ten animals were placed in the control lot and 16 animals in each of the others.

The control ration consisted of ¾ pound of soybean oil meal, ½ pound of dehydrated alfalfa meal, 2 pounds of dehydrated ammoniated hydrol product (Dex-Mo-Lass made with ammoniated hydrol), and all of a corncob-blackstrap molasses mixture that the animals would clean up each day. The corncob-molasses mixtures contained approximately 22 percent molasses for the first 84 days. It was then increased to 40-45 percent molasses. When the molasses concentration was increased, 1½ percent each of ground limestone and salt was added to retard "setting up" of the mixture. The limestone was decreased to ¾ percent after about 30 days. The soybean oil meal and dehydrated alfalfa meal were made into pellets containing approximately 10 percent molasses. The added phosphorus was put in these pellets in the form of phosphoric acid

1. This project was in cooperation with Westvaco Mineral Products Division, Food Machinery and Chemical Corporation, New York 17, N.Y.

or steamed bonemeal. Salt alone and a mixture of ground limestone and salt were available to all animals free choice.

The control ration supplied approximately 6 grams of phosphorus per head per day. This is one half the National Research Council recommendation of 12 grams per head per day. Source and amount of phosphorus in the ration were the only variations. The treatments were as follows, which indicate the amount of added phosphorus per head per day:

Lot 1—Control ration.
Lot 2—Control ration + 3 grams phosphorus from phosphoric acid.
Lot 3—Control ration + 6 grams phosphorus from phosphoric acid.
Lot 4—Control ration + 3 grams phosphorus from steamed bonemeal.
Lot 5—Control ration + 6 grams phosphorus from steamed bonemeal.

Blood samples were taken at the end of the wintering phase to determine serum phosphorus and calcium levels.

After the end of the wintering phase, approximately 30 days were used to adjust the animals to hay and grain before starting the fattening phase. At the beginning of the fattening phase, lots 2, 3, 4, and 5 were subdivided into two groups each, i.e., 2 and 2A. One group continued to receive supplemental phosphorus; the other group did not. This was to determine the value of supplemental phosphorus in the fattening ration. The control animals in lot 1 never got any supplemental phosphorus. Carcass data were obtained after slaughter. The shank bone from the right front leg was obtained for measurements and ash determination.

## Results and Discussion

Wintering phase: Results are presented in Table 54. As the experimental ration used in this test was designed to be low in phosphorus, the roughage and source of energy had to be from ingredients low in phosphorus. Although there was considerable variation from time to time in consumption of the corncob-molasses mixture, no difficulty was experienced in keeping the animals on feed. After increasing the percentage of molasses, the animals were getting approximately 1 pound of molasses per 100 pounds bodyweight. Trouble with scouring was observed when the consumption of molasses exceeded that quantity.

Fattening phase: Feedlot, carcass, and bone data are shown in Table 55. It was discovered early in the fattening phase that four of the heifers were pregnant and they were removed from the test (3 from lot 2 and 1 from lot 3A). Two animals in lot 3A died but no reason for death was determined by postmortem examination. All animals went on feed without any trouble except the control lot. Some trouble was experienced in getting them on a full feed of grain. They would eat well for a time and then refuse to eat. This happened twice.

Supplemental phosphorus made no significant differences in rate of gain. Feed efficiency tended to be highest with animals that received phosphoric acid as a source of phosphorus. There were no significant differences in carcass grades, dressing percentage, degree of marbling, size of ribeye, or degree of firmness. Shank bones from animals that had received supplemental phosphorus tended to be longer and greater in diameter and thickness.

## Observations

Wintering phase:

1. No harmful or ill effects of any kind were observed from feeding phosphoric acid as a source of phosphorus.
2. No deficiency symptoms, phosphorus, vitamin A, etc., were observed. Animals in all lots gnawed on the fence; however, there were no differences among lots.
3. Feed containing phosphoric acid was highly palatable and the total consumption tended to be greater.
4. Rate of gain and feed efficiency increased as the level of phosphorus was increased. There was no difference between steamed bonemeal and phosphoric acid at the higher level; however, phosphoric acid tended to be more efficient at the lower level.

5. Serum calcium levels were normal; however, they were highest in the phosphorus-deficient lot.

6. Serum phosphorus levels were all within normal range; however, lot 1 showed borderline deficiency.

Fattening phase:

1. Animals that received supplemental phosphorus during the wintering phase were easier to get on a full feed of grain.

2. Supplemental phosphorus was of no value in the fattening ration.

3. Shank bones from animals that had received phosphorus tended to be longer and greater in diameter and thickness. The average percentage of ash in the bones tended to be higher for animals that received supplemental phosphorus in the wintering ration except lot 3 (3 + 3A); however, there were no significant differences.

**Table 54**

**Results of Wintering Phase, Including Blood Data, on Level and Source of Phosphorus with Beef Heifer Calves.**

November 9, 1955, to April 11, 1956—154 days.

| Lot number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Added phosphorus | none | 3 gms. from phos. acid | 6 gms. from phos. acid | 3 gms. from steamed bonemeal | 6 gms. from steamed bonemeal |
| Number heifers per lot | 10 | 16 | 16 | 16 | 15[1] |
| Av. initial wt., lbs. | 441 | 442 | 440 | 441 | 442 |
| Av. final wt., lbs. | 603 | 612 | 623 | 606 | 624 |
| Av. total gain, lbs. | 162 | 170 | 183 | 165 | 182 |
| Av. daily gain, lbs. | 1.05 | 1.11 | 1.18 | 1.07 | 1.18 |
| Av. daily ration, lbs.: | | | | | |
| Corncob-molasses mixture | 9.02 | 10.37 | 10.03 | 9.87 | 9.80 |
| Soybean oil meal-dehydrated alfalfa pellets | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| Dehydrated amm. hydrol product | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Limestone and salt | .03 | .02 | .02 | .02 | .02 |
| Salt | .05 | .04 | .02 | .04 | .03 |
| Lbs. feed per 100 lbs. gain: | | | | | |
| Corncob-molasses mixture | 857.7 | 939.8 | 844.1 | 921.0 | 828.8 |
| Soybean oil meal-dehydrated alfalfa pellets | 123.5 | 118.8 | 110.4 | 122.4 | 111.0 |
| Dehydrated amm. hydrol product | 190.1 | 181.2 | 168.3 | 186.7 | 169.2 |
| Limestone and salt | 2.6 | 1.8 | 1.7 | 1.9 | 1.4 |
| Salt | 5.1 | 3.8 | 1.7 | 3.7 | 2.6 |
| Av. serum calcium, mg. %[2] | 12.23 | 11.41 | 11.41 | 11.30 | 11.19 |
| Av. serum phosphorus, mg. %[2] | 5.52 | 7.21 | 9.13 | 8.11 | 8.94 |

1. One sick animal removed.

2. Blood samples taken at end of wintering phase.

## Table 55

**Results of Fattening Phase, Including Carcass and Bone Data, on Levels and Source of Phosphorus in Beef Heifer Fattening Rations.**

May 10 to August 20, 1956—103 days.

| Lot number | 1 | 2 | 2A | 3 | 3A | 4 | 4A | 5 | 5A |
|---|---|---|---|---|---|---|---|---|---|
| Treatment | Control | No suppl. phosphorus | 3 gms. phos. from phosphoric acid | No suppl. phosphorus | 6 gms. phos. from phosphoric acid | No suppl. phosphorus | 3 gms. phos. from steamed bonemeal | No suppl. phosphorus | 6 gms. phos. from steamed bonemeal |
| Number heifers per lot | 10 | 5 | 8 | 8 | 5 | 8 | 8 | 7 | 8 |
| Av. initial wt., lbs. | 634.5 | 644.0 | 634.0 | 646.0 | 653.0 | 640.0 | 641.0 | 651.0 | 648.0 |
| Av. final wt., lbs. | 831.8 | 860.6 | 840.2 | 886.6 | 869.8 | 844.5 | 842.0 | 860.4 | 865.4 |
| Av. daily gain, lbs. | 1.92 | 2.10 | 2.00 | 2.34 | 2.11 | 1.99 | 1.95 | 2.04 | 2.13 |
| Av. daily ration, lbs.: | | | | | | | | | |
| Alfalfa hay | 5.5 | 5.8 | 5.1 | 4.0 | 4.9 | 4.4 | 5.9 | 5.1 | 5.6 |
| Milo grain | 13.3 | 14.8 | 13.9 | 15.6 | 13.4 | 13.9 | 14.1 | 15.0 | 15.1 |
| Pellets | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Av. lbs. feed per 100 lbs. gain: | | | | | | | | | |
| Alfalfa hay | 286.0 | 274.0 | 257.0 | 172.0 | 234.0 | 222.0 | 301.0 | 253.0 | 264.0 |
| Milo grain | 693.0 | 696.0 | 696.0 | 666.0 | 639.0 | 699.0 | 722.0 | 734.0 | 728.0 |
| Pellets | 78.0 | 71.0 | 75.0 | 64.0 | 71.0 | 76.0 | 77.0 | 74.0 | 71.0 |
| Feed cost per 100 lbs. gain[1] | $22.91 | $22.63 | $22.59 | $20.61 | $20.79 | $22.35 | $23.75 | $23.47 | $23.32 |
| Carcass data: | | | | | | | | | |
| Av. dressing % (includes 3% cooler shrink) | 59.4 | 61.1 | 61.4 | 60.9 | 61.6 | 61.1 | 59.8 | 61.2 | 60.3 |
| Av. carcass grade[2] | 11.2 | 13.6 | 13.0 | 10.5 | 11.2 | 12.5 | 13.5 | 10.9 | 11.5 |
| Av. degree of marbling[3] | 6.6 | 7.4 | 7.4 | 5.9 | 6.4 | 6.7 | 7.2 | 6.3 | 6.8 |
| Av. size ribeye[4] | 4.3 | 3.6 | 4.3 | 4.3 | 3.6 | 4.1 | 4.4 | 4.0 | 4.4 |
| Av. firmness of carcass[5] | 3.6 | 4.4 | 4.0 | 3.6 | 3.8 | 4.2 | 4.0 | 3.9 | 3.8 |
| Data from front shank bone, M.M.: | | | | | | | | | |
| Av. length | 190.0 | 194.6 | 189.0 | 193.0 | 194.8 | 193.5 | 195.4 | 195.1 | 194.0 |
| Av. diameter | 30.3 | 30.9 | 30.2 | 31.4 | 30.9 | 31.8 | 31.2 | 31.3 | 30.8 |
| Av. thickness | 7.1 | 8.2 | 7.7 | 7.7 | 7.8 | 9.1 | 8.9 | 8.2 | 7.8 |
| Av. % ash (center of shank) | 69.47 | 69.52 | 69.68 | 68.80 | 68.89 | 69.32 | 69.84 | 69.51 | 69.92 |

1. Alfalfa hay @ $30 per ton; milo grain @ $2.50 per 100 pounds; pellets @ $70 per ton.
2. Carcass grade based on top choice 8, average choice 10, low choice 12, top good 14, average good 16.
3. Based on slightly abundant 4, moderate 5, modest 6, small amount 7, slight amount 8.
4. Based on large 2, moderately large 3, modestly large 4, slightly small 5.
5. Based on firm 2, moderately firm 3, modestly firm 4, slightly soft 5.

## Self-Feeding Molasses Mixed with Various Combinations of Urea or Ammonia with Phosphoric Acid and with or without Ethyl Alcohol in the Wintering Ration of Beef Heifer Calves (Projects 536[1] and 537[2]).

D. Richardson, Ed F. Smith, Berl A. Koch, and Rufus F. Cox

It has been shown that phosphoric acid is an excellent source of phosphorus and ammoniated hydrol (corn molasses) is a good source of protein equivalent when used in ruminant rations (Kansas Experiment Station Circulars 320 and 335). Urea, a nonprotein nitrogen compound, has long been recognized as a good source of protein equivalent for ruminants. Recently, the idea has been advanced that small amounts of ethyl alcohol would be beneficial in ruminant rations. Also, the practice of self-feeding liquid feed seems to be gaining in popularity. All of the above-mentioned ingredients can be mixed easily and thoroughly with molasses. This test was conducted to study the value of self-feeding molasses when mixed with several combinations of the above ingredients in a wintering ration with beef heifer calves.

### Experimental Procedure

Sixty-six Hereford heifer calves averaging about 435 pounds each were divided on the basis of weight and conformation into 6 lots of 11 animals each. All lots received all of the sorghum silage the animals would clean up each day. The remainder of the ration was as follows:

Lot 7—Control, 1 pound soybean oil meal and 2 pounds milo grain.

Lot 8—Free-choice mixture, 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea, and 10 percent water (30 percent protein equivalent).

Lot 9—Free-choice mixture, 71 percent blackstrap molasses, 3 percent phosphoric acid, 6 percent ethyl alcohol, 10 percent urea, and 10 percent water (30 percent protein equivalent).

Lot 10—Free-choice mixture, ammoniated blackstrap molasses with added phosphorus (15 percent protein equivalent).

Lot 11—Free-choice mixture, ammoniated blackstrap molasses with added phosphorus and 3 percent ethyl alcohol (15 percent protein equivalent).

Lot 12—0.5 pound soybean oil meal plus free-choice mixture of ammoniated hydrol with added phosphorus.

Lot 7 had salt and a mixture of 2 parts bonemeal and 1 part salt fed free choice. The other lots had salt and a mixture of equal parts limestone and salt fed free choice. Electrically heated automatic water fountains provided drinking water at all times. The calves were started on test without any preliminary feeding of the various molasses mixtures. All animals were weighed at 28-day intervals.

This test is being continued by adding grain to the ration for fattening. The various molasses mixtures will continue to be fed free choice. Carcass data will be obtained when the animals are marketed and slaughtered.

### Results and Observations

The results of the wintering phase of this test are shown in Table 56.

1. It was the second day on test before the animals started consuming any of the molasses mixtures. There was no marked variation in consumption of the molasses in an individual lot throughout the test. Of course, there was a tendency toward increased consumption as the animals became larger.

2. The ammoniated blackstrap molasses appeared to be more palatable and was consumed in greater quantity than the other mixtures. In fact, it is believed that this product was too palatable. The large amount of molasses tended to cause looseness or borderline scouring. A condition of this kind does not promote best utilization of nutrients.

3. No unusual behavior or toxic effects were observed.

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1. This project was in cooperation with Westvaco Mineral Products Division, Food Machinery and Chemical Corporation, New York 17, N.Y.

2. This project was in cooperation with Clinton Corn Processing Company, Clinton, Iowa.

3. Ingredients for the molasses mixture in lots 8 and 9 were supplied and mixed by Feed Service Corporation, Crete, Nebr.

4. Animals receiving molasses urinated more than those on the control ration. Increased urination tended to vary with the rate of molasses mixture consumption. This condition resulted in excessively wet and muddy lots.

5. Silage consumption decreased when molasses consumption increased.

6. Although satisfactory gains were made with the nonprotein-nitrogen sources of protein, they were not so good as those where natural protein was used.

7. Gains in lots 10 and 11 were very poor for the first 28 days; however, they were about the same as lots 8 and 9 for the remainder of the test. This indicates the possibility that a longer period is needed for the rumen microorganisms to adjust to utilization of ammonia nitrogen.

8. One half pound of soybean oil meal per head in lot 12 greatly improved gains. Thus, it is indicated that a combination of natural protein and nonprotein-nitrogen is better than nonprotein-nitrogen alone.

9. The addition of ethyl alcohol tended to increase consumption of the molasses mixtures and increase rate of gain.

10. Limestone consumption was lower than expected; however, the quantity consumed, plus the amount of calcium in the silage, meets the recommended nutrient allowances.

## Table 56

**Results of Self-Feeding Molasses Mixed with Various Combinations of Urea or Ammonia with Phosphoric Acid and with or without Ethyl Alcohol in the Wintering Ration of Beef Heifer Calves.**

December 15, 1956, to April 6, 1957—112 days.

| Lot number | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|
| Number heifers per lot | 11 | 11 | 11 | 11 | 11 | 10[1] |
| Av. initial wt., lbs. | 435.0 | 435.5 | 434.5 | 433.6 | 434.0 | 431.0 |
| Av. final wt., lbs. | 601.4 | 565.0 | 567.7 | 526.4 | 540.9 | 579.5 |
| Av. daily gain per heifer, lbs. | 1.49 | 1.16 | 1.19 | .83 | .95 | 1.33 |
| Av. daily ration, lbs.: | | | | | | |
| Sorghum silage | 29.4 | 30.1 | 30.5 | 22.1 | 23.0 | 26.7 |
| Soybean meal | 1.0 | | | | | 0.5 |
| Milo grain | 2.0 | | | | | |
| Urea-blackstrap molasses No. 1[2] | | 2.1 | | | | |
| Urea-blackstrap molasses No. 2[3] | | | 2.3 | | | |
| Ammoniated blackstrap molasses No. 1[4] | | | | 5.2 | | |
| Ammoniated blackstrap molasses No. 2[5] | | | | | 5.9 | |
| Ammoniated hydrol[6] | | | | | | 3.2 |
| Bonemeal and salt, equal parts | 0.10 | | | | | |
| Salt | 0.05 | 0.12 | 0.14 | 0.15 | 0.15 | 0.11 |
| Limestone | | 0.02 | 0.04 | 0.05 | 0.04 | 0.02 |
| Lbs. feed per 100 lbs. gain: | | | | | | |
| Sorghum silage | 1978.0 | 2600.0 | 2563.0 | 2666.0 | 2408.0 | 2015.0 |
| Soybean meal | 67.3 | | | | | 37.7 |
| Milo grain | 134.6 | | | | | |
| Urea-blackstrap molasses No. 1 | | 180.6 | | | | |
| Urea-blackstrap molasses No. 2 | | | 193.3 | | | |
| Ammoniated blackstrap molasses No. 1 | | | | 633.4 | | |
| Ammoniated blackstrap molasses No. 2 | | | | | 617.5 | |
| Ammoniated hydrol | | | | | | 241.8 |
| Bonemeal and salt, equal parts | 7.0 | | | | | |
| Salt | 3.4 | 10.0 | 13.2 | 17.5 | 15.7 | 8.2 |
| Limestone | | 1.9 | 3.4 | 5.5 | 4.3 | 1.8 |

1. One sick heifer removed.

2. Mixture of 77 percent blackstrap molasses, 3 percent phosphoric acid, 10 percent urea and 10 percent water (30 percent protein equivalent).

3. Mixture of 71 percent blackstrap molasses, 3 percent phosphoric acid, 6 percent ethyl alcohol, 10 percent urea and 10 percent water (30 percent protein equivalent).

4. Ammoniated blackstrap molasses with added phosphorus (15 percent protein equivalent).

5. Ammoniated blackstrap molasses with added phosphorus and 3 percent ethyl alcohol (15 percent protein equivalent).

6. Ammoniated hydrol with added phosphorus (15 percent protein equivalent).

## The Value of Ammoniated Hydrol in the Fattening Ration of Yearling Beef Heifers (with and without Stilbestrol Implants) (Project 537).

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

Ammoniated hydrol (ammoniated corn molasses) has been used successfully as a partial nitrogen source in the wintering rations of beef cattle. This trial was designed to determine the value of the product in fattening rations for yearling beef heifers. Part of the animals in each treatment group were also implanted with stilbestrol.

### Experimental Procedure

Twenty-seven yearling Hereford heifers were used in this study. They were divided into three equal groups on the basis of weight and previous treatment. Six heifers in each lot were implanted with stilbestrol, three at the 24-mg. level, and three at the 36-mg. level. All animals had free access to a mixture of salt and ground limestone, salt alone, and water.

Each group was fed twice daily and the concentrates, molasses, and cottonseed hulls were mixed together when fed. The control lot, lot 1, received 1 pound of soybean meal per head daily. In lot 2, one half the soybean meal nitrogen was replaced by nitrogen from ammoniated hydrol, and in lot 3, by nitrogen from dehydrated ammoniated hydrol. Cane molasses was used to equalize the molasses intake in all lots.

At the conclusion of the feeding period the heifers were grouped according to stilbestrol treatment and sold on the Kansas City market.

### Observations

1. Hydrol was apparently as palatable as cane molasses.
2. Rate of gain was essentially the same in all lots. Those cattle receiving the liquid ammoniated hydrol were less efficient than the other groups.
3. The stilbestrol implants did not increase the rate of gain of the heifers regardless of implant level.
4. Some of the implanted heifers showed evidence of so-called side effects (elongated teats, raised tailheads, looseness and swelling about the external genitalia). The side effects seemed to reach a maximum about 60 days after implanting and then regress somewhat.
5. Although heifers implanted at two levels were fed in the same lot with nonimplanted heifers, no excessive riding or other stimulatory symptoms were noted.
6. The implanted groups showed carcass grades somewhat lower than those of the control groups.

**Table 57**

**Ammoniated Hydrol As a Partial Nitrogen Source in the Fattening Ration of Beef Heifers.**

May 9, 1956, to September 6, 1956—120 days.

| Treatment | Control | Liquid amm. hydrol | Dehydrated amm. hydrol |
|---|---|---|---|
| Number heifers | 9 | 9 | 9 |
| Av. initial wt., lbs. | 667 | 671 | 671 |
| Av. daily gain, lbs. | 1.59±0.12[1] | 1.55±0.06[1] | 1.67±0.08[1] |
| Av. final wt., lbs. | 858 | 857 | 872 |
| Av. daily ration, lbs.: | | | |
| Milo grain | 10.6 | 11.6 | 11.2 |
| Soybean oil meal | 1.0 | 0.5 | 0.5 |
| Alfalfa pellets | 1.0 | 1.0 | 1.0 |
| Cottonseed hulls | 3.4 | 3.4 | 3.4 |
| Molasses | 1.5 | .... | 0.9 |
| Dehyd. amm. hydrol | .... | .... | 1.0 |
| Amm. hydrol | .... | 1.5 | .... |
| Feed per cwt. gain, lbs.: | | | |
| Milo grain | 667.9 | 752.8 | 673.3 |
| Soybean oil meal | 61.0 | 31.5 | 29.4 |
| Alfalfa pellets | 61.0 | 63.0 | 58.8 |

1. Standard error of mean.

Table 57 (Continued)

| | | | |
|---|---|---|---|
| Cottonseed hulls | 214.8 | 221.5 | 207.0 |
| Molasses | 91.4 | .... | 53.5 |
| Amm. hydrol | .... | 94.6 | .... |
| Dehyd. amm. hydrol | .... | .... | 58.8 |
| Carcass grades: | | | |
| choice+ | 1 | 3 | 1 |
| choice | 3 | 2 | 3 |
| choice— | 4 | 1 | 2 |
| good+ | .... | 3 | 1 |
| good | .... | .... | 2 |
| good— | 1 | .... | .... |

Table 58

**Heifers Implanted with Two Levels of Stilbestrol at Beginning of the Fattening Period.**

May 9, 1956, to September 6, 1956—120 days.

| Implant level | 0 mg. | 24 mg. | 36 mg. |
|---|---|---|---|
| Number heifers | 9 | 9 | 9 |
| Av. initial wt., lbs. | 671 | 668 | 674 |
| Av. daily gain, lbs. | 1.59±0.08[1] | 1.60±0.12[1] | 1.62±0.07[1] |
| Av. final wt., lbs. | 860 | 860 | 868 |
| Carcass grades: | | | |
| choice+ | 2 | 2 | 1 |
| choice | 4 | 2 | 2 |
| choice— | 3 | .... | 4 |
| good+ | | 3 | 1 |
| good | | 1 | 1 |
| good— | | 1 | |
| Selling price ($/cwt.) | | | |
| 25.25 | 9 head | | |
| 24.50 | | | 7 head |
| 23.00 | | 8 head | |
| 20.00 | | 1 head | 2 head |

1. Standard error of mean.

**Nutritive Value of Forages as Affected by Soil and Climatic Differences (Project 430).**

**B. A. Koch, E. F. Smith, D. Richardson, R. F. Cox, and A. Ordoveza**

This report is a summary of progress to date in one phase of the study designed to determine differences in the results obtained when cattle consume forage grown on limestone or sandstone soils.

In any study of this sort there are many variables which cannot be completely controlled or eliminated. Regardless of the care used in selection, pastures and meadows will differ somewhat in type and yield of forage. Rainfall differs, even on pastures within a few miles of each other. And the previous histories of the pastures are somewhat different. All these and many other variables affect the results obtained. Therefore, several years of comparisons will be needed before definite conclusions can be drawn. Results obtained to date should be looked upon as suggestive rather than as final conclusions.

**Experimental Procedure**

Thirty-nine choice Hereford heifer calves purchased from the Williams Ranches in Lovington, N.M., are being used in this study. The heifers were spayed to eliminate the possibility of their being bred during the study. They were then divided into two lots of approximately the same average weight. Twenty of the heifers were wintered on native sandstone

pasture and 19 were wintered on native limestone pasture. The predominant species in both pastures was native bluestem grass. The pastures were located within 8 miles of each other in Ellsworth County. Both lots of heifers received 1½ pounds of cottonseed cake daily as protein supplement during the winter period.

At the end of the winter period it was necessary to place the cattle in different pastures. Pastures used during the grazing period were approximately 20 miles apart and were as similar as possible except that one was on limestone soil and one was on sandstone soil. Frequency and quantity of rainfall differed on the two pastures. Rainfall was inadequate on both pastures during the grazing period.

Due to the drouth conditions of the pastures, the cattle were returned to Manhattan at the end of the pasture season. During the past winter they received prairie hay grown on either limestone or sandstone soil in Woodson County. One half of the heifers in each group received 4 grams of supplemental phosphorus per day during the winter period. All of the cattle received 1½ pounds of soybean meal per day during this period.

During all phases of the study the animals were weighed periodically. Blood samples were collected from a representative group of the animals at indicated intervals. Soil, water, and forage samples were also collected periodically throughout the different phases of the study.

March 11, 1957, the animals were started on a full feed fattening ration. They will be fed to choice slaughter grade. Further blood and skeletal studies are planned at the time of slaughter.

Results of all phases of the study to date are summarized in the tables that follow.

**Table 59**

**Average Weight Gain of Spayed Heifers Eating Forage Grown on Limestone or Sandstone Soils.**

| Soil type | Limestone | Sandstone |
|---|---|---|
| Number of animals | 19 | 20 |
| Av. initial wt., lbs. | 553 | 558 |
| Phase 1—December 5, 1955, to April 15, 1956 (131 days) | Pasture | Pasture |
| Av. total gain, lbs. | 63±5.7[1] | 6±5.1[1] |
| Phase 2—April 15, 1956, to October 8, 1956 (176 days) | Pasture | Pasture |
| Av. total gain, lbs. | 180±5.6 | 193±6.2 |
| Phase 3—October 8, 1956, to March 8, 1957 (151 days) | Dry lot | Dry lot |
| Av. total gain, lbs. | 149±8.4 | 114±8.4 |
| Av. total gain December 5, 1955, to March 8, 1957, lbs. | 392 | 313 |
| Av. wt., March 8, 1957, lbs. | 945 | 871 |

1. Standard error of mean.

**Table 60**

**Value of Added Phosphorus for Spayed Heifers Wintered on Prairie Hay from Limestone or Sandstone Soil Areas.**

| Soil type | Limestone | | Sandstone | |
|---|---|---|---|---|
| Treatment | Control | +P | Control | +P |
| Number of animals | 9 | 10 | 10 | 10 |
| Av. initial wt., lbs. | 861 | 869 | 787 | 798 |
| Av. total gain, lbs., November 28, 1956, to March 8, 1957 | 74±7.1[1] | 79±8.9[1] | 80±5.0[1] | 79±8.4[1] |
| Av. hay consumed per day, lbs. | 17 | 18 | 17 | 17 |
| Soybean meal per day, lbs. | 1.5 | 1.5 | 1.5 | 1.5 |
| P from $H_3PO_4$[2] per day, gms. | 0 | 4 | 0 | 4 |

1. Standard error of mean.
2. Phosphoric acid mixed in soybean meal.

## Table 61
### Blood Analyses of Cattle on Limestone or Sandstone Forage.

| Soil type | Date taken | Limestone, Mgs., % | Sandstone, Mgs., % |
|---|---|---|---|
| Calcium | | | |
| | 3/14/56 | 11.44±0.16[1] | 11.26±0.10[1] |
| | 11/13/56 | 11.31±0.27 | 11.37±0.20 |
| | 3/13/57 | 11.45±0.31 | 11.44±0.12 |
| Phosphorus | | | |
| | 3/14/56 | 7.68±0.12 | 8.00±0.18 |
| | 11/13/56 | 7.58±0.28 | 6.93±0.21 |
| | 3/13/57 | 7.74±0.25 | 6.84±0.33 |

1. Standard error of mean.

## Table 62
### Analyses of Forage Grown on Limestone or Sandstone Soils.

| | Winter pasture | | Summer pasture | | Prairie hay | |
|---|---|---|---|---|---|---|
| | Limestone % | Sandstone % | Limestone % | Sandstone % | Limestone % | Sandstone % |
| Dry matter | 94.6 | 93.4 | 93.3 | 93.4 | 94.6 | 94.4 |
| Protein (NX6.25) | 7.1 | 4.7 | 6.1 | 5.7 | 5.1 | 4.9 |
| Ether extract | 1.8 | 1.6 | 2.3 | 2.2 | 1.9 | 2.2 |
| Crude fiber | 29.6 | 31.1 | 29.4 | 30.5 | 34.6 | 34.1 |
| Nitrogen free extract | 42.0 | 45.0 | 48.3 | 48.9 | 46.5 | 47.1 |
| Ash | 14.1 | 11.0 | 7.1 | 6.2 | 6.5 | 6.2 |
| Calcium | .9 | .4 | .8 | .5 | | |
| Phosphorus | .5 | .2 | .1 | .1 | | |

## Table 63
### Soil and Water Analyses from Limestone and Sandstone Areas.

| | Limestone | | Sandstone[1] | |
|---|---|---|---|---|
| Water analyses | Winter pasture | Summer pasture | Winter pasture | Summer pasture |
| Total hardness (ppm $CaCO_3$) | 567.0 | 140.0 | 87.3 | 408.0 |
| $P_4$ (ppm) | .03 | 0.5 | .01 | 1.2 |
| Ca (ppm) | 108.0 | 26.0 | 15.7 | 57.0 |
| Na (ppm) | 14.0 | 167.5 | 8.7 | 82.0 |
| K (ppm) | 5.0 | 13.5 | 6.8 | 10.0 |
| Cl (ppm) | 24.0 | 23.0 | 2.2 | 97.0 |
| **Soil analyses** | | | | |
| Organic matter content (%) | 3.2 | 2.86 | 2.27 | 2.42 |
| pH value | 7.13 | 7.18 | 6.45 | 6.28 |
| Available phosphorus, lbs. per acre | 31.00 | 18.0 | 21.33 | 14.8 |
| Exchangeable potassium, lbs. per acre | 476.7 | 347.2 | 491.0 | 447.0 |

1. Water trucked to summer pasture due to drouth.

## The Effect of Feeding a Systemic Insecticide to Control Cattle Grubs (Project 249).[1]

Departments of Animal Husbandry and Entomology, Cooperating
R. F. Cox, C. E. Roan, and E. F. Smith

The steer calves used in this study were purchased near Santa Rosa and Melrose, N.M., and were received at Manhattan in November, 1956. One hundred calves were assigned on the basis of weight to four lots in November, 1956. Three of the lots were fed a systemic insecticide (0,0-dimethyl 0-2,4,5-trichlorophenyl phosphorothioate) which was mixed with soybean meal and made into pellets. The treatment each lot received was as follows:

Lot 3—No treatment.
Lot 1—Fed 50 mgs. per kg. of bodyweight of systemic insecticide daily for three days.
Lot 7—Fed 75 mgs. per kg. of bodyweight of systemic insecticide daily for three days.
Lot 2—Fed 110 mgs. per kg. of bodyweight of systemic insecticide for one day.

Prior to the test, the calves were being fed soybean pellets. However, the pellets containing the medication were larger and were not readily consumed. About 1 pound of ground milo grain was fed per calf daily and the pellets were crushed in the bunk to encourage consumption.

After the treatment period of three days, the calves were all placed together in one lot and fed sorghum silage, a small quantity of alfalfa hay, and about 1 pound of protein concentrate per head per day for the remainder of the test.

**Table 64**

**The Value of Feeding a Systemic Insecticide for Cattle Grub Control,[1] December 4, 1956, to March 2, 1957—88 days.**

| Treatment | No treatment | 50 mgs. per kg. bodyweight for 3 days | 75 mgs. per kg. bodyweight for 3 days | 110 mgs. per kg. bodyweight for 1 day |
|---|---|---|---|---|
| Lot number | 3 | 1 | 7 | 2 |
| Number steers per lot | 25 | 25 | 25 | 25 |
| Av. initial wt., lbs. | 369 | 362 | 368 | 369 |
| Av. final wt., lbs. | 465 | 454 | 455 | 454 |
| Av. gain, lbs. | 96 | 92 | 87 | 85 |
| Av. daily gain, lbs. | 1.09 | 1.04 | .98 | .96 |
| Av. number of grubs: | | | | |
| December 4, 1956 | 5.5 | 4.2 | 11.0 | 13.2 |
| January 3, 1957 | 5.4 | 2.3 | 1.7 | 5.9 |
| February 2, 1957 | 1.8 | .4 | 0 | .3 |
| March 2, 1957 | 0 | 0 | 0 | 0 |

1. A product called Dow ET-57, chemical name: 0,0-dimethyl 0-2,4,5-trichlorophenyl phosphorothioate, furnished by the Dow Chemical Company, Midland, Mich.

At the beginning of the test and each 28 to 30 days thereafter, each steer was checked for grubs, and the number of grubs that could be felt on their backs was recorded.

### Observations

December 5, when the calves were first fed the pellets containing the systemic insecticide, they would not readily eat the pellets. This may have been due to their being accustomed to eating smaller pellets. Ground milo grain was mixed with the pellets in the bunks and the pellets were crushed to obtain better consumption. Some of the calves may not have

1. The material fed was furnished by Dow Chemical Company, Midland, Mich., and is known by its code name: Dow ET-57. Its chemical name is 0,0-dimethyl 0-2,4,5-trichlorophenyl phosphorothioate.

consumed their share of the medication. Lots 1 and 7 treated again December 6 and 7 consumed all their pellets by noon without the addition of ground milo.

The number of grubs was decreased in all treated lots by the end of the first 30 days, and at the close of 60 days scarcely any remained.

No grubs were recorded for any of the steers treated or nontreated at the end of 88 days on March 2.

Treatment for grubs had no apparent effect on rate of gain.

## Table 65

### Chemical Analysis of Feeds Used in Beef Cattle Feeding Trials, 1936-37 (As Fed).

| Description | Protein (N×6.25), % | Ether extract, % | Crude fiber, % | Moisture, % | Ash, % | N-free extract, % | Carbohydrates, % |
|---|---|---|---|---|---|---|---|
| Alfalfa hay | 15.63 | 1.48 | 29.49 | 6.98 | 7.93 | 38.49 | 67.98 |
| Rolled corn | 11.00 | 3.44 | 1.92 | 11.19 | 1.36 | 71.09 | 73.01 |
| Ground corn | 10.06 | 4.10 | 1.94 | 11.38 | 1.56 | 70.96 | 72.90 |
| Rolled milo | 9.94 | 3.19 | 2.24 | 9.48 | 1.80 | 73.35 | 75.59 |
| Ground milo | 10.56 | 3.12 | 1.90 | 11.45 | 1.79 | 71.18 | 73.08 |
| Pelleted ground milo | 10.00 | 3.28 | 1.83 | 10.89 | 1.72 | 72.28 | 74.11 |
| Milo mill-feed | 10.50 | 8.01 | 4.60 | 10.62 | 4.10 | 62.17 | 66.77 |
| Cottonseed meal | 41.19 | 2.95 | 11.15 | 8.42 | 6.46 | 29.83 | 40.98 |
| Sorghum silage (as received) | 3.68 | 1.01 | 11.64 | 52.87 | 4.07 | 26.73 | 38.37 |
| Sorghum silage (dry) | 7.80 | 2.15 | 24.69 | | 8.63 | 56.73 | 81.42 |
| Soybean oil meal | 49.69 | 1.55 | 5.47 | 6.80 | 6.44 | 30.05 | 35.52 |
| Prairie hay, limestone soil | 5.10 | 1.87 | 34.60 | 5.38 | 6.52 | 46.50 | 81.10 |
| Prairie hay, sandstone soil | 4.88 | 2.12 | 34.06 | 5.62 | 6.20 | 47.08 | 81.14 |

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**Feed Prices Used in Beef Cattle Tests[1]**

| | 1955-56 | 1956-57 |
|---|---|---|
| Milo, per cwt. | $ 2.35 | $ 2.50 |
| Corn, per bu. | 1.60 | 1.60 |
| Corn and alfalfa pellets, per ton | 62.00 | |
| Cottonseed oil meal pellets, per ton | 70.00 | 70.00 |
| Soybean oil meal pellets, per ton | 70.00 | 70.00 |
| Sorghum silage, per ton | 6.50 | 8.00 |
| Alfalfa hay, per ton | 20.00 | 25.00 |
| Prairie hay, per ton | 20.00 | 25.00 |
| Molasses, per cwt. | 2.20 | 3.25 |
| Bluestem pasture, summer, yearling, per head | 16.00 | 16.00 |
| Two-year-old, per head | 20.00 | 20.00 |
| Bluestem pasture, winter, calf, per head per month | .50 | .50 |
| Yearling, per head per month | .75 | .75 |
| Bonemeal and salt mixture, per ton | 80.00 | 80.00 |
| Salt, per ton | 15.00 | 15.00 |
| Ground limestone, per ton | 15.00 | 15.00 |

1. The prices reported here were used in calculating beef cattle feed costs, unless otherwise stated.