TEXAS AGRICULTURAL EXPERIMENT STATIONS

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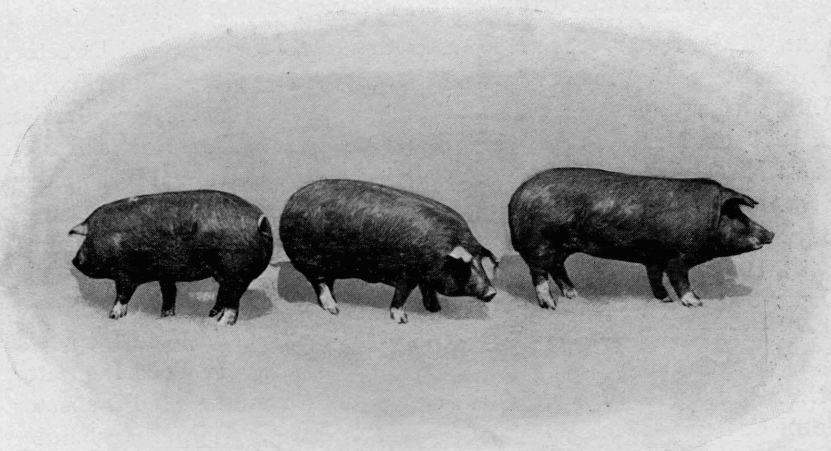
FEEDING FERMENTED COTTONSEED MEAL TO HOGS

BY F. R. MARSHALL



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FEEDING FERMENTED COTTONSEED MEAL TO HOGS.

F. R. MARSHALL.

The growing interest in production of pork in Texas has re-opened the old question of feeding cottonseed meal to swine. Many localities of the State produce crops well adapted to finishing hogs, while in others the home-grown feeds are less satisfactory for fattening than for growing stock. Under nearly all conditions there is felt, the need of some cheap concentrate to supplement the regular ration.

I.—SUMMARY OF INVESTIGATIONS IN FEEDING COTTONSEED MEAL AT OTHER STATIONS.

Except for the work being done in Oklahoma and Arkansas in determining how far and in what combinations cottonseed meal is safe for swine, the experiment stations have practically abandoned the subject. The effect of feeding cottonseed meal to swine as studied in earlier experiments was practically the same at each of the stations mentioned below:

KANSAS.—In January, 1895, four hogs, averaging in weight 30 pounds, were started on a ration of a quarter of a pound of cottonseed meal and one and a quarter pounds of corn meal each per day. The first death was on the twenty-second day and all were finally lost. At the time the first animal died they were eating one-third of a pound of meal and had eaten a total of 6.1 pounds of meal per head.

In May, 1895, three hogs, averaging 43.7 pounds, were started on a ration containing three-fourths corn meal and one-fourth cottonseed meal, about one-third of a pound of the latter. Two of the three died, the first on the forty-eighth day of feeding when they were eating one-half pound meal each per day. At the time of the first loss a total of 16 pounds of cottonseed meal per hog had been consumed.

TEXAS.—In January, 1891, five hogs, averaging in weight 114.5 pounds, were placed on a ration of cottonseed meal, shelled corn and skimmed milk. The average amount fed was one pound meal and two and a half pounds of corn per day. On the forty-ninth day one hog died, and finally the whole lot was lost.

In February, 1892, three hogs of various sizes were started on a ration of one-third of a pound of cottonseed meal and two and one-third pounds shelled corn. The first animal died on the forty-second day and feeding was discontinued after the second death.

IOWA.—In March, 1895, a lot of three hogs, averaging in weight 120 pounds, received a grain ration of four pounds of corn-and-cob meal and one-sixth of a pound of cottonseed meal. One hog died on the forty-eighth day when they were eating two-thirds of a pound of meal each daily and had consumed a total of 28 pounds per head.

At the same time a similar lot was fed the same ration, except that the amount of cottonseed meal was doubled. Two of the three

died after eating 38 pounds each. The first one died on the forty-eighth day of feeding when the ration contained one and one-third pounds meal each per day.

OKLAHOMA.—Four hogs, weighing 47 pounds each, were started on a ration of one-fifth cottonseed meal and four-fifths Kaffir corn meal in January, 1901. Two died, the first on the fortieth day.

Eleven hogs, weighing 79 pounds each, consumed on an average one pound cottonseed meal each per day along with Kaffir corn for forty-seven days. The first twenty-six days they were on a wheat pasture. No deaths resulted. Other experiments showed that, by use of cooling feeds and by alternating periods of meal feeding with no meal, a considerable amount could be used.

ARKANSAS.—Of three 41-pound pigs started January, 1902, on .68 pounds cottonseed meal in a ration, three-quarters of which was corn chops, all died, the first on the thirty-fifth day after a total of 23 pounds meal had been consumed by each animal. In another lot, fed similarly but with the addition of roots, the first died on the fortieth day after having eaten 25 pound cottonseed meal. The remainder died later. A third lot of three head, fed wheat bran in place of corn chops, ate 45 pounds meal each, the first dying on the sixty-first day.

On January 1, 1903, three hogs were put on a ration containing one-fifth cottonseed meal. The allowance was .8 pounds of the meal per animal daily. Later the proportion of the meal was reduced, though the actual amount fed remained .8 pounds for one hundred and fifty-six days with no unfavorable results.

In other experiments Dr. Dinwiddie fed two pigs an average of .8 pounds for 186 days by mixing with wheat chops and cut cow-pea hay. From the summary of Arkansas bulletin No. 85, we quote the following:

"For continuous feeding the following allowances seem to be well within the danger limit:

"Pigs under 50 pounds, one-fourth pound per day.

"Pigs from 50 to 75 pounds, one-third pound per day.

"Pigs from 75 to 100 pounds, two-fifths pounds per day.

"Pigs from 100 to 150 pounds, one-half pound per day."

ALABAMA.—The results are summarized by the author of the bulletin: "Calculated on a basis of 100 pound, live weight, daily doses of .25, .40, .41 and .53 of a pound of cottonseed meal for thirty-four to thirty-eight days fed in different years to shoats of practically the same size caused evident unthrift in one experiment, while in the other no immediate effects were discernible. Shoats averaging 143 pounds in weight were not hurt by eating for thirty-one days .73 of a pound of cottonseed meal daily per 100 pounds live weight."

The accompanying table summarizes those experiments in which cottonseed meal was fed with corn. In all but two cases the experiments were commenced in January or February, and in no case did they extend into such weather as prevailed during our experiment.

TABLE I.—SUMMARY OF RESULTS AT DIFFERENT EXPERIMENT STATIONS.

	0 Kans.	1 Kans.	2 Kans.	3 Texas	4 Texas	5 Iowa	6 Iowa	7 Okla.	8 Okla.	9 Ark.	10 Ark.	Texas Lot III	Texas Lot IV
Year	1895	1895	1895	1891	1892	1895	1895	1900	1901	1902	1903	1905	1905
Number pigs in Lot	4	3	3	5	3	3	3	16	4	3	3	10	10
Average weight of pigs	30	43.7	53	114	.....	120	108	79	47	35	85	123	120
Cottonseed meal eaten daily at start, pounds	.25	.32	.69	1	1	.16	.33	.61	.25	.68	.8	.83	1.25
Other grain fed	corn meal	corn meal	corn meal	corn	corn	corn	corn	Kaffir corn	Kaffir corn	corn	corn	corn	corn
Total grain per pig daily at start, pounds	1.5	1.27	1.38	3.5	2.7	4.2	4.2	3.08	1.3	2.7	4	2.5	2.5
Number of days on feed at time of first death	22	48	45	52	52	48	51	†47	40	34	*156	83	63
Number of deaths	4	2	2	5	2	1	2	0	2	3	0	1	4
Cottonseed meal in ration at time of first death, pounds	.37	.48	1.27	.....	.....	.66	1.3	1.05	.67	.....	.8	1.3	3.5
Total grain ration at time of first death, pounds	1.5	1.9	2.5	.....	.....	5.5	5.1	5.3	3.5	.....	4.8	4	7
Total cottonseed meal eaten per pig at first death, pounds	6.1	16	40	.....	.....	28	36	37.7	17.7	.....	133	100	104
Percentage of total meal eaten to initial weight	20	38	75	.....	.....	23	33	47	38	.....	156	81.7	86
Average daily consumption of meal per pig, pounds	.28	.33	.88	.....	.....	.58	.74	.8	.42	.....	.85	1.2	1.6
Percentage of average daily consumption to initial weight	.93	.77	1.6	.....	.....	.48	.7	1	.89	.....	1	.98	1.3

† First twenty-six days on pasture. * Experiment closed; no deaths.

0—Bulletin 53, page 108. 1—Bulletin 53, page 111. 2—Bulletin 53, page 112. 3—Bulletin 21, page 200. 4—Bulletin 21, page 197. 5—Bulletin 28, Lot II. 6—Bulletin 28, Lot III. 7—Report 1900-01. 8—Bulletin 51, Lot V. 9—Bulletin 76, Lot I. 10—Bulletin 85, Lot III.

II.—THE ALLISON METHOD.

Since the early part of this year the discussion of "The Allison Method" of feeding cottonseed meal to hogs has aroused a great deal of interest. Mr. J. W. Allison, of Ennis, Texas, has for a number of years been feeding cottonseed meal to his hogs in considerable quantities. While not feeding heavily to finish his stock for the market, he has carried breeding and growing stock according to his plan for indefinite periods. Mr. Allison attributes his success to the fact that the cottonseed meal is never fed without having been thoroughly soured. This is done by first mixing the cottonseed meal and corn chops dry. Sufficient water is added to cover the mixture. He uses from one-third to one-half cottonseed meal. By stirring the feeds together while dry, the tendency for the meal to form in little balls which remain dry inside is overcome. In no case does he ever allow his hogs any feed not well soured. The souring takes place most rapidly in warm weather. From twenty-four hours in summer to forty-eight hours, or even more in very cold weather, is necessary to produce the characteristic sharp odor produced by the fermentation process. Souring may be hastened by adding to each fresh lot of feed a quart of the already soured feed and by keeping amount of water as low as possible. Where allowed to stand for some time in warm weather it acquires a degree of acidity which causes the hogs to eat it very lightly until fresh water is added.

It is Mr. Allison's opinion that the fermentation removes those qualities of the raw meal which invariably produce unfavorable results.

Three points of the Allison Method should be observed:

1. The meal is thoroughly fermented.
2. It is fed in a thin slop.
3. While sometimes using a ration containing one-half meal, that proportion has not been used for long periods of heavy feeding for market.

The test of the Allison Method then is, whether it renders possible continuous feeding for more than forty days, without injury, greater amounts of meal than proved fatal in experiments cited. The average amount of meal eaten per pig in those experiments was 30 pounds. There is a variation from 8.6 to 45 pounds total meal or 23% to 79% of initial weight. In only one case did animals consume over 60% of their initial weight of cottonseed meal. At Arkansas Station three hogs of 48 pounds weight fed one-fourth cottonseed meal and three-quarters wheat bran, ate cottonseed meal to equal 94% of their initial weight. All died, the first on the sixty-first day.

III.—EXPERIENCES WITH ALLISON METHOD.

So much was claimed for the Allison Method that a great many breeders and feeders adopted it. At a meeting of the Texas Swine Breeders' Association in January, a committee consisting of Prof. J. H. Connell, H. E. Singleton, and W. E. Braly was appointed to investigate and report upon this method. In preparing their report the Committee received letters from twenty-four persons who claimed to have been feeding cottonseed meal according to the method in question. These replies have been printed and from them we have

selected those giving sufficient particulars to enable us to compare their experience with that of others and with our own.

Recent correspondence with these persons has elicited additional information. In each case the feed was fermented. The substance of the replies is given:

W. S. Knight, Eddy, Texas—Fed one-third cottonseed meal and two-thirds wheat for thirty days, then equal parts meal and corn chops for another thirty days. Amount fed and number hogs not stated. No bad results.

J. W. Merrow, Kerens, Texas—Fed one-half pound cottonseed meal and one and one-half pounds corn-and-cob meal to each stock hog for sixty days. Reports some losses, later attributed to carelessness of feeder. Hogs on pasture.

W. J. Duffel, West, Texas—Sixteen 200-pound hogs ate a mixture of one part meal to two parts ground corn for thirty-four days. Twelve head ate equal parts meal and corn for twenty-eight days. Eight head of 200-pound hogs ate one-third meal for thirty-five days. Longer feeding of meal not considered safe.

P. N. Hudspeth, Bowie, Texas—Fed four 147-pound hogs for one hundred and one days 5 pounds each per day of a mixture containing one-half cottonseed meal. Green feed in addition.

M. M. Offut, Cleburne, Texas—Fed thirty pigs, eight weeks to four years old, for four months on a mixture containing from one-fourth to one-sixth meal with rice bran. Four hogs that were fed with this lot for thirty days were taken out and penned and fed all they would clean up, which was about two pounds of cottonseed meal, one pound of rice bran and ten to twelve ears of corn per day. Pen feeding continued for ninety days. Were weighing about 135 pounds when put up, and made good gains.

J. T. McWilliams, Athens, Texas—Fed ninety head for forty days on one-half cottonseed meal and the remainder corn chops or wheat bran.

L. C. Estes, Groesbeck, Texas—Fed sixty-two head for fifty-six days. At start they received 75 pounds of meal and 6 bushels of corn per day. The last thirty days the feed was 150 pounds of meal and 4½ bushels of corn per day.

Hy. Pangburn, Hutchins, Texas—Fed forty head for fifty-eight days. Were marketed at ten months, weighing 230 pounds. Used one pound of meal to one and one-half gallons of water.

W. R. Spann, Dallas, Texas—A sow and seven four-weeks-old pigs ate equal parts meal and rice bran for thirty days and were then put on one-fourth corn and three-quarters meal. Pigs began to die on thirtieth day and all were lost. Sow died.

A. E. Elliott, Angus, Texas—Seventy hogs ate equal parts meal and corn chops for fifty days. Lost ten.

W. A. French, Athens, Texas—Five six-weeks-old pigs and seventeen three-weeks-old pigs were fed 50 pounds meal soured with 50 pounds corn chops. Afterward the meal was soured separately. Fed for six or eight weeks and lost one hog.

I. F. Reynolds, LaGrange, Texas—Two hundred head running on pasture ate 2 pounds meal each per day for twenty-seven days. There were some deaths and meal was discontinued. In forty-one days after meal feeding was commenced, sixty-one head died.

A lot of one hundred head of 150-pound hogs were fed all they would eat of a soured mixture of equal parts meal and shorts. In fifty days six head had died and remainder were shipped.

IV.—THE EXPERIMENT WITH ALLISON METHOD.

Plan of Experiment. On April 1, 1905, forty hogs, divided into four lots, were put on feed. The object was to first determine whether or not hogs can safely consume fermented cottonseed meal in larger quantities or for longer periods than when fed without fermentation. The uniform results of all attempts to feed raw cottonseed meal continuously is sufficient strong evidence to make it unnecessary to include such a test lot in this experiment. To be able to compare results with ordinary practice, one lot was fed on corn chops alone which was fermented the same as the mixed feeds. To be able to calculate just how far results could be attributable to cottonseed meal in the fermented mixed rations, one lot was fed on corn chops not fermented—the gains of this lot compared to that receiving fermented chops would indicate if there is any change in nutritive value of corn used in feeding according to the Allison Method.

The designation of the lots for the experiment is as follows:

Lot I.—Corn chops.

Lot II.—Corn chops fermented.

Lot III.—One-third cottonseed meal and two-thirds corn chops fermented.

Lot IV.—One-half cottonseed meal and one-half corn chops fermented.

Stock Used. The hogs used were purchased from R. T. Whisenant & Son, of Allen, Collin County, who secured them from farmers in that vicinity. A lot of about seventy head had been put in the yards to be fed for market and from them the forty used in the experiment were selected. A few appeared to have considerable Berkshire blood, but the majority were a good grade of Poland-China. There were two or three 130-pound hogs in the lot and a few as light as 100 pounds. It was possible to so divide them as to have the same number of large and small, barrows and sows in each lot. Some weeks after the beginning of the experiment some of the sows proved to be in pig and were taken out.

Yards and Weather. It will be observed that the experiments referred to in previous pages were all conducted in winter or spring months. It is generally considered that cottonseed meal is more likely to give unfavorable results in warm than in cold weather. The Oklahoma and Arkansas experimenters have shown that pasturage and cooling feeds help to defer the appearance of the results of meal feeding. This experiment was conducted under conditions, not only having none of such advantages, but the opposite conditions present in such a degree as to afford an extremely severe test of the system under study. These hogs had been fed considerable grain just previous to shipment to College Station. At no time during the experiment did they have any green feed. They were confined in yards that had been previously used for cattle feeding and were consequently entirely bare of vegetation. There was no natural shade, and the board shelters erected for the purpose only partially protected

the animals from the sun and heat. On May 2d the maximum temperature was 86° and the reading was higher than 80° every day until it reached 93° on the 22d and 23d. In June there were but two days when less than 90° was recorded, and 97° was reached on the 14th. After that time there was more or less rain until the experiment was closed on the 25th.

Preparation of Feed. Two half barrels were provided for Lots II, III and IV. On Monday morning one day's corn chops and cottonseed meal were weighed, placed in barrels and wet sufficiently to insure fermentation. This was fed Tuesday evening and Wednesday morning with more water added. Feed for Wednesday night and Thursday morning was similarly prepared on Tuesday morning. By this system all feed was soaked for thirty-six hours. The corn chops for Lot II soured most quickly, and the feed for Lot III, containing two-thirds corn chops, more quickly than the half and half mixture for Lot IV. In warm June weather twenty-four hours was sufficient. The aim was to thin the feed no more than enough to induce hogs to eat it readily. Some of the persons who have reported success in feeding meal to breeding and stock hogs make the slop so thin that the amount the animals consume does not contain sufficient meal to be dangerous.

Amount Fed. The different lots were fed practically the same amounts throughout the experiment. It was the intention to feed the amount of meal that had usually caused death in other experiments until the usual result appeared or the length of time required to cause death had passed. It was considered that before fermented meal could be considered absolutely safe, it should be fed at least one hundred days. For the first forty-five days the hogs ate with little variation 2½ pounds of grain each per day, meaning for Lot IV, 1¼ pounds cottonseed meal daily to a hog weighing 118 pounds. While this was not a ration to produce maximum gains, the rate of increase was sufficient to make the hogs of desired weight at the end of one hundred days. The first forty-five days having passed without the unfavorable indications usually in evidence at that time, it was decided to disregard the financial outcome of the experiment and see what effect heavier feeding would produce. It would be unwise practice to feed for heavy weights in the dry lot in our May and June weather, but the fermentation method having enabled us to feed twenty head without loss for a longer time than usually proves disastrous, we subjected it still further to the severe test of very heavy feeding in very hot weather. After the forty-fifth day the feed was increased regularly until on May 28th, the sixty-third day of feeding, the entire lot was eating 7 pounds per head. On the 30th and 31st the thermometer stood at 93° for several hours each day. This weather continued on into June and it was necessary to reduce the feed for all the lots. While the conditions were such as to make it appear that deaths in the meal-fed lots might be due to other causes, attention is directed to the record of the corn-fed lots fed under exactly the same conditions.

The detailed record of each lot is given in the following pages.

Plate I.—The hogs in Lot I (corn chops) at the beginning of the experiment.

TABLE II.—FEED EATEN AND GAINS MADE BY LOT I, RECEIVING UNFERMENTED CORN CHOPS.

Number Hogs	Average Weight April 3d	Total Feed Eaten	Total Gain	Average Daily Gain First 43 Days	Average Daily Gain Last 40 Days	Pounds Feed per Pound Gain	Cost per Pound Gain
10	**120.5** lbs.	**3080** lbs. corn chops	**404** lbs.	**.38** lb.	**.54** lb.	**7.62** lbs.	**8.4**c.

During the first forty-three days Lot I ate 25 pounds of feed per day. After that time, when the feed was raised for all the lots, they were raised to 70 pounds on the sixty-first day. After five days of this feeding it was necessary on account of hot weather to reduce them to 50 pounds. On June 19th one piggy sow weighing 147 pounds was taken from this lot.

Plate II.—The hogs in Lot II (fermented corn chops) at the beginning of the experiment.

TABLE III.—FEED EATEN AND GAINS MADE BY LOT II, RECEIVING CORN CHOPS FERMENTED.

Number Hogs	Average Weight April 3d	Total Feed Eaten	Total Gain	Average Daily Gain First 43 Days	Average Daily Gain Last 40 Days	Pounds Feed per Pound Gain	Cost per Pound Gain
10	118.7 lbs.	2805 lbs. corn chops	323 lbs.	.28 lb.	.58 lb.	8.68 lbs.	9.57c.

LOT I, UNFERMENTED CORN CHOPS, FOR COMPARISON WITH LOT II.

10	120.5 lbs.	3030 lbs. corn chops	404 lbs.	.38 lb.	.54 lb.	7.62 lbs.	8.4c.

The feeding of Lot II was the same at all times as for Lot I. On April 18th one piggy sow weighing 125 pounds was taken out. Their record as compared with that of Lot I, fed unfermented corn chops, is also shown.

Plate III.—The hogs in Lot III (one-third cottonseed meal, two-thirds corn chops, fermented) at the beginning of the experiment.

TABLE IV.—FEED EATEN AND GAINS MADE BY LOT III, RECEIVING ONE-THIRD COTTONSEED MEAL AND TWO-THIRDS CORN CHOPS, FERMENTED.

Number Hogs	Average Weight April 3d	Total Feed Eaten	Total Gain	Average Daily Gain First 43 Days	Average Daily Gain Last 40 Days	Pounds Feed per Pound Gain	Cost per Pound Gain
10	**123** lbs.	**920** lbs. cottonseed meal, **1844** lbs. corn chops	**380** lbs.	**.63** lb.	**.38** lb.	**7.27** lb.	**8.06**c

LOT II, FERMENTED CORN CHOPS, FOR COMPARISON WITH LOT III.

10	**118.7** lbs.	**2805** lbs. corn chops	**323** lbs.	**.28** lb.	**.58** lb.	**8.68** lbs.	**9.57**c.

On April 18th one sow was taken out of Lot III. As in other lots those in Lot III ate 2½ pounds of feed per day during the first forty-three days. Their gains were considerably greater than in those lots, however. There was also a very noticeable difference in the appearance of the hogs in this lot as compared with those in the corn-fed lots. They made more growth and seemed more thrifty and healthy as shown by smoother, softer coats. There was no trouble of any kind in getting them to eat their feed, until, the same as in the corn lots, they were eating 7 pounds each, containing two and one-third pounds meal on the sixty-first day. After five days of this feeding they were taken back to 5 pounds of this mixture June 15th. The seventy-fourth day of feeding **two** hogs in this lot were reported as not right. Four days later these animals were eating with the rest, though they had fallen off considerably. Eight days after first noticing disorder in this lot **one** of the hogs died. The **other** continued to eat, but made no gains and was not marketed with the lot.

While the decrease in the rate of gains made by this lot during the last forty days was largely due to the losses of those that were ailing, none of the animals appeared to be doing as well as they had previously been doing or as well as those in Lots I and II.

There were seven remaining in good marketable condition at the end of eighty-three days' feeding, after having eaten a total of 100 pounds cottonseed meal each.

This ration has a nutritive ratio of 1: :3.7 as compared to 1: :5.9 of the feeding standard.

Plate IV.—The hogs in Lot IV (one-half cottonseed meal, one-half corn chops, fermented) at the beginning of the experiment.

TABLE V.—FEED EATEN AND GAINS MADE BY LOT IV, RECEIVING ONE-HALF COTTONSEED MEAL AND ONE-HALF CORN CHOPS, FERMENTED.

Number Hogs	Average Weight April 3d	Total Feed Eaten	Total Gain	Average Daily Gain First 43 Days	Average Daily Gain Last 40 Days	Pounds Feed per Pound Gain	Cost per Pound Gain
10	**120** lbs.	**1331** lbs. cottonseed meal, **1455** lbs. corn chops	**279** lbs.	**.54** lb.	**.12** lb.	**10** lbs.	**11.1**c.

LOT II, FERMENTED CORN CHOPS, FOR COMPARISON WITH LOT IV.

10	**118.7** lbs.	**2805** lbs. corn chops	**323** lbs.	**.28** lb.	**.58** lb.	**8.68** lbs.	**9.57**c.

After having been brought to a ration of 7 pounds per day or 3½ pounds meal, on June 21st, the sixty-first day of feeding, Lot IV gave evidences of trouble. June 4th two hogs were reported as not eating well. One of these remained in a sickly condition, eating a little on some days and not at all on others and lost in flesh very badly, dying on June 9th. On the same day, June 9th, a 180-pound hog died very suddenly. There was one death on June 3d, a 147-pound hog dying unnoticed at the close of an excessively hot day. On the 15th, a 125-pound hog died. Another hog, which showed signs of sickness among the first in the lot, was alive and marketed separately at the close, having fallen off to a weight of 100 pounds.

The ration of Lot IV has a nutritive ratio of 1: :2.7 as compared to 1: :5.9 of the feeding standard.

In our feeding, done under very unfavorable circumstances, we fed an average of 1.2 and 1.6 pounds meal for eighty-three and sixty-three days respectively. Except for Lot IV, as reported in Bulletin 85 from Arkansas, these are much greater amounts and longer periods than in any other instance where a strictly meal and corn ration was used in the dry yard. In the exception cited the meal constituted one-fifth of the ration. The pigs remaining in such good condition at the expiration of the time in which deaths usually result would indicate that the system of feeding, followed during the first six weeks, is safe, and that the greater amounts fed later were in excess of what can be recommended for practical feeding.

Comparison of our results with those of all other experiments conducted under similar conditions indicate that cottonseed meal fermented is less injurious than when fed without fermentation. It is a very concentrated feed, and aside from any poisonous properties it may possess is likely to cause trouble when fed in considerable quantities without extreme care. We feel that the importance of the question requires the publication of the results of this experiment at this time. It is our plan to continue this work with the hope of being able to determine in what amounts and for what length of time the fermented meal may be fed economically for different classes of hogs.

To those wishing to use cottonseed meal for hogs now, we recommend:

1. For animals on heavy feed, that not more than one-fourth the weight of the grain ration consist of cottonseed meal.
2. That this feeding continue not more than fifty days, or that the proportion of meal be reduced if feeding is to be continued longer.
3. That the meal be mixed with the other feed and all soured together.
4. That as much green feed as possible be furnished the hogs.
5. That a close watch be kept, and meal taken from any animals not eating or not gaining well.

Feeders who have had experience with the meal will probably be able to exceed these recommendations, which however, allow the use of enough meal to greatly improve a corn diet. One pound of cottonseed meal to five of corn furnishes the nutrients in the most desirable proportions for fattening, while one to two of corn are more nearly correct for young growing stock. Of course other feeds are desirable for their influences not attributable to their composition, but it is not often that the adopted standards can be ignored in feeding any animals for profit.

V. THE SLAUGHTER TEST.

The hogs were sold on the Fort Worth market on Tuesday, June 26th, by the Cassidy-Southwestern Co., as follows:

	No. Hogs	Total Weight	Per Cwt.
Lot I. Corn	9	1390	$5.25
Lot II. Fermented corn	9	1390	5.10
Lot III. One-third cottonseed meal, two-thirds corn	7	1230	5.00
Lot IV. One-half cottonseed meal, one-half corn	5	800	5.15

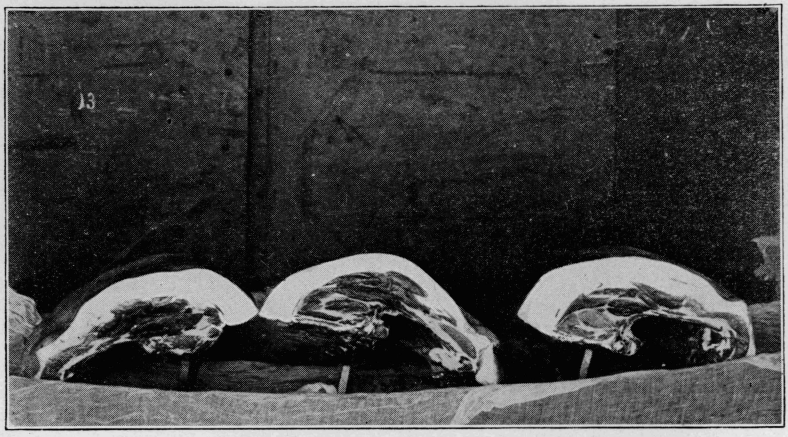

Plate V.—End view of three representative sides from Lot I that received corn chops.

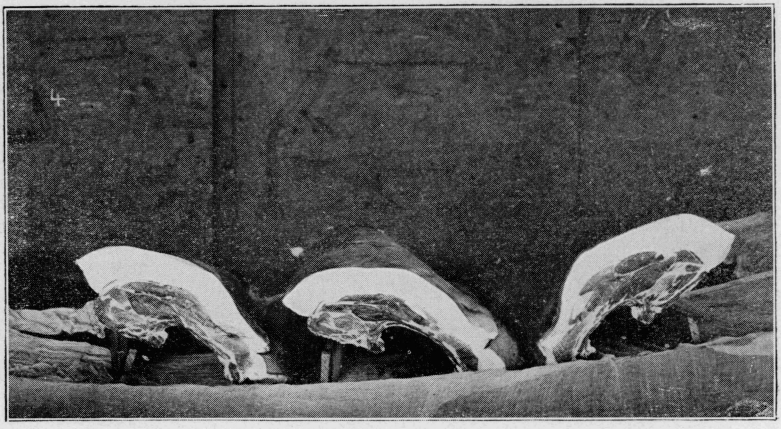

Plate VI.—End view of three representative sides from Lot II that received fermented corn chops.

Plate VII.—End view of three representative sides from Lot III that received one-third cottonseed meal and two-thirds corn chops, fermented.

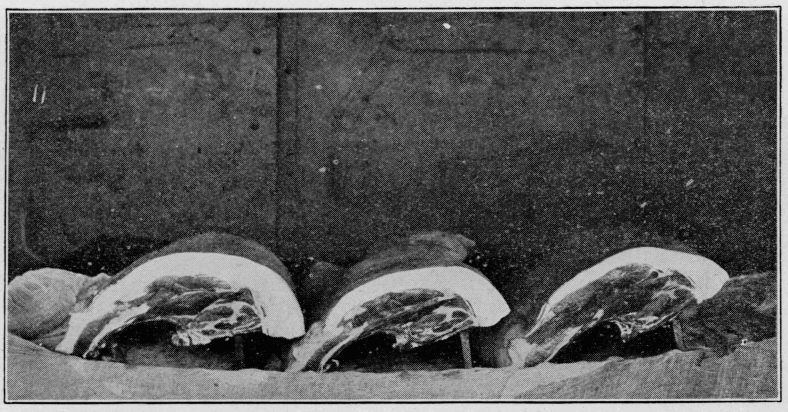

Plate VIII.—End view of three representative sides from Lot IV that received one-half cottonseed meal and one-half corn chops, fermented.

The sale was made to Armour & Co., each lot being priced separately on its merits. Lot I was somewhat the fatter, and the buyer stated that, but for two head of light hogs in Lot II, that lot would have sold with Lot I. Lots III and IV were heavier, but not so fat as the others.

The result of the slaughter test is seen in the following table prepared by Armour & Co.:

TABLE VI.—TEST ON HOGS KILLED FOR TEXAS EXPERIMENT STATION BY ARMOUR & COMPANY, NORTH FORT WORTH.

	Lot I	Lot II	Lot III	Lot IV
Number hogs	9	9	7	5
Live weight, pounds	1390	1390	1230	800
Dressed weight hot; pounds	976	993	865	573
Dressed weight chilled; pounds	955	982	855	560
Per cent pork chilled	.68	.70	.69	.70
Weight leaf lard; pounds	45½	40½	29	14½
Weight caul fat; pounds	6	6	5	4
Weight gut fat; pounds	59	57	48	32
Weight of livers, hearts and lungs; pounds	22	20	13	8

The point of greatest interest is the effect of feeding cottonseed meal upon the firmness of the carcass. The Fort Worth packers are caused a considerable loss from "soft" or "oily" carcasses which are marketable only at a serious discount. Usually the long-fed, well-fattened hogs give a smaller proportion of oily carcasses than are found among the lighter and thinner sorts. The cottonseed meal fed lots, while averaging heavier, were not fatter.

An examination of the cooled carcases showed that there was, on the average, considerably less fat and more lean meat in the meal-fed hogs. On this account the yield of lard was less than in the corn-fed lots.

As to the firmness of the fat, there were soft hogs in each lot, though none were decidedly oily. The proportion of "soft hogs" was greater in the corn-fed lots. These, the corn-fed lots, each contained one or two good firm sides and the remainder inclining to soft. In the meal-fed lots there were but one or two as soft as the average of the corn lots, and many that were as firm as the best one or two of those lots.

The following letter from Armour & Co. gives their judgment on this point:

ARMOUR & COMPANY,
NORTH FORT WORTH, TEXAS.

OFFICE OF SUPERINTENDENT.

July 7th, 1905.

Mr. F. R. Marshall,
Agricultursl Experiment Station,
College Station, Texas.

Dear Sir:-

Herewith hand you tests on four lots of hogs killed in our plant some few days since. Lots 3 and 4 were the heaviest hogs originally, evidence of which is confirmed by their appearance after killing and while we found some soft hogs in these two lots the proportion was not nearly so great as in Lots 1 and 2.

Almost the entire quantity in Lots 1 and 2 were soft and did not make a very desirable product after being dressed and chilled.

We are sending you by express samples of the lard retained from these when they were butchered, and would ask for your analysis on same.

Thanking you kindly, we are

Yours very truly,y,

Armour & Company

McCaskill

There seems to be a popular idea at the Fort Worth stock yards that the influence of cottonseed meal is to render the carcass soft. There is no evidence to support such an impression, and this and other tests go to show that cottonseed meal has a strong tendency to produce a firmer carcass than a straight corn ration.

VI. SUMMARY.

1. A comparison of the results of this experiment with those of other stations at which cottonseed meal was fed in the ordinary way indicates that cottonseed meal may be used in larger quantities and for longer periods when fermented and fed in a slop than when fed without being fermented.

2. The reports of feeders who have used cottonseed meal for hogs indicate that a light feed of cottonseed meal may be continued indefinitely and that the consumption of green feed lessens the danger of death from feeding cottonseed meal.

3. In this trial the hogs were yard-fed during the hot summer season, consequently they were under conditions making the trial as severe as possible. Under such conditions fermenting cottonseed meal does not entirely remove its injurious effect when fed to hogs.

4. The results of this experiment show that for the first forty-three days of the feeding the mixture containing cottonseed meal and corn gave larger and cheaper gains than the straight corn ration, while during the second period of forty days the results were reversed. This leads to the suggestion that, to improve a corn ration, it would be advisable to add cottonseed meal to it for about forty days, preferably, for other reasons also, during the last 40 days of the feeding.

5. The hogs that received cottonseed meal as a part of their ration in this trial showed less fat and more lean meat in the carcass.

6. The carcasses of the hogs that received cottonseed meal, contrary to the previously expressed opinion of the packers, were firmer and therefore more acceptable to them than those of the corn-fed hogs.