TEXAS AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 201 DECEMBER, 1916

DIVISION OF ANIMAL HUSBANDRY

PEANUT MEAL AND GROUND WHOLE PRESSED PEANUTS FOR HOGS

POSTOFFICE:
COLLEGE STATION, BRAZOS COUNTY, TEXAS.

AUSTIN, TEXAS
VON BOECKMANN-JONES CO., PRINTERS,
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BY

L. B. BURK, B. S.,
Associate Professor of Animal Husbandry
Agricultural and Mechanical College of Texas, cooperating with the Station

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*As of December 1, 1916.
**In cooperation with United States Department of Agriculture.

PEANUT MEAL AND GROUND WHOLE PRESSED PEANUTS FOR HOGS.*

By L. B. Burk, B. S., Animal Husbandman, Swine Investigations.†

The peanut industry is rapidly becoming a very important one throughout the South. Although peanuts have been sold as a confectionery article throughout the world for years, only recently has the crop been grown extensively for its oil content and as a feed for live stock. The peanut is not only one of the best hog forage crops, but when converted into hay, it makes a very desirable legume roughage. It yields satisfactorily and is almost a sure crop. Peanuts, therefore, have become a staple crop in Texas and have assumed an important place in our cropping systems.

The peanut, however, when fed alone to hogs does not produce a satisfactory pork. It is not as firm as pork from grain-fed hogs, and for that reason the producer has been forced in many instances to take from one-half cent to two cents a pound less than was being paid for hogs fattened on a grain ration. This situation, together with the high price of oil, caused the cotton seed oil companies to use their machinery for a double purpose—to crush peanuts for oil, as well as cotton seed. In doing this there was left a by-product corresponding to cotton seed meal or cake. This peanut cake was ground into a meal thus making a feed very rich in protein and fat, as is shown in the composition table.

The experiment herein reported was conducted in order to answer two important questions:

1. What is the relative value of peanut meal as a feed for hogs?
2. Will peanut meal produce soft pork and lard?

The peanut meal used in this experiment was of two kinds: meal made from hulled nuts, and meal made from the whole pressed peanuts, or meal containing the hull. Although these two products were fed in different proportions in combination with milo chops, both were eaten with great relish, and both gave satisfactory results. In fact, the results show that peanut meal is practically equal to tankage and cotton seed meal for supplementing the milo in a fattening ration for hogs.

The following tables give the composition and digestible nutrients of the feeds used:

TABLE 1.
Percentage Composition.

Feed.	Water.	Ash.	Protein.	Nitrogen-free extract.	Crude fiber.	Fat.
Milo chops	5.95	1.60	9.56	77.24	2.43	3.22
Prime cotton seed meal	7.67	6.15	43.00	24.88	10.65	7.65
Ground whole pressed peanuts	6.71	3.66	35.82	22.26	22.33	9.22
Peanut meal (without hulls)	6.51	5.14	41.94	23.26	8.34	14.81
Meat meal	7.27	14.17	53.57	10.21	3.79	10.99

*Ground whole pressed peanuts is the ground residue obtained by grinding the slab or cake which results from pressing the oil out of the whole peanuts with the hull left on. It is often referred to as whole pressed peanut meal.

†Associate Professor of Animal Husbandry, Agricultural and Mechanical College of Texas, cooperating with the Station.

TABLE 2.

Digestible Nutrients.

Feed.	Protein. per cent.	Carbohydrates per cent.	Fat. per cent.
Milo chops	6.099	67.31	2.83
Cotton seed meal	36.12	22.60	7.26
Ground whole pressed peanuts	24.43	13.586	8.298
Peanut meal (without hull)	37.74	20.288	13.329
Meat meal	49.82	.....	10.77

PLAN OF EXPERIMENT.

This experiment was conducted under dry-lot conditions at the feeding and breeding station hog barn. The pens in which the hogs were confined were equal in every respect. The pens were inside the barn, each pen measured 9 x 20 feet in size, and opened into a 20 x 50 feet open lot, where the hogs were free to exercise themselves. All the pens had south front exposures and all the inside pens had concrete floors and feed troughs.

TIME OF EXPERIMENT.

The duration of this experiment was 77 days, beginning May 14, and closing July 30, 1916.

OBJECTS.

The objects of the experiment were as follows:

1. To determine the value of both peanut meal and ground whole pressed peanuts when used as a supplement to milo chops in a ration for fattening hogs.
2. To compare peanut meal and ground whole pressed peanuts with meat meal and cotton seed meal as supplements to milo chops.
3. To compare a narrow peanut meal-milo ration with a balanced peanut meal-milo ration, and to compare both rations with a ration of milo chops when fed alone.
4. To study the effects of peanut meal and ground whole pressed peanuts on the quality of the pork and lard.

HOGS USED.

Sixty pure-bred Duroc-Jersey hogs were used. They weighed an average of 126 pounds at the beginning. The hogs were not as uniform in size as was desired. Considering their breeding, however, they were more uniform than could be purchased locally at that time. The hogs were divided into six lots, of ten hogs each. Every effort was made to make the lots as nearly equal as possible.

WEIGHING.

The hogs were weighed by lots for three consecutive days at the beginning and again at the close of the experiment. The averages of these

three weights were used as the initial and final weights. Weights were also taken every thirty days during the experiment.

RATIONS.

The rations fed were proportioned as follows:

Lot 1: Milo chops, alone.
Lot 2: Milo chops, 6 pounds.
Cotton seed meal, 1 pound.
Lot 3: Milo chops, 10 pounds.
Meat meal, 1 pound.
Lot 4: Milo chops, 7 pounds.
Peanut meal (without hull), 1 pound.
Lot 5: Milo chops, 2½ pounds.
Ground whole pressed peanuts, 1 pound.
Lot 6: Milo chops, 1 pound.
Peanut meal (without hull), 1 pound.

COST OF FEED USED.

Milo chops	$24 00 per ton.
Cotton seed meal	35 00 per ton.
Meat meal	45 00 per ton.
Peanut meal (without hull)	35 00 per ton.
Ground whole pressed peanuts	28 00 per ton.

The feeding was done very regularly twice each day. After the second week the hogs in each lot received all of the feed they would clean up.

Table 3 gives the essential facts of this experiment in condensed form.

TABLE 3.

Results of Experiment.

Rations Fed.	Lot 1 Milo chops alone.	Lot 2 Milo chops 6 parts, cotton seed meal 1 part.	Lot 3. Milo chops 10 parts, meat meal 1 part.	Lot 4. Milo chops 7 parts, peanut meal without hull 1 part.	Lot 5. Milo chops 21-2 parts, ground whole pressed peanuts 1 part.	Lot 6. Milo chops 1 part, peanut meal without hull 1 part.
Number of hogs in lot	10	10	10	10	10	10
Weight per hog at beginning, lbs	124.6	125.8	124.8	125.6	125.8	*129.6
Weight per hog at close, pounds	180.5	222.9	216.1	218.9	220.4	239.3
Total gain per hog, pounds	55.9	97.1	91.3	93.3	94.6	109.7
Average daily gain per hog, pounds.	.727	1.26	1.18	1.21	1.228	1.424
Average feed consumed daily, per hog, pounds	4.7 milo chops	4.51 milo chops .75 cotton seed meal	4.90 milo chops .49 meat meal	4.60 milo chops .65 peanut meal	3.767 milo chops 1.50 ground whole pressed peanuts	2.62 milo chops 2.62 peanut meal
Total amount of feed consumed, pounds	3620	4050	4050	4050	4050	4035
Feed consumed per 100 pounds gain	648	417	455	434	428	368
Cost of feed per 100 pounds gain	$7.77	$5.33	$5.89	$5.51	$5.38	$5.42

*In Lot 6 one hog was found dead on May 29. It ate well at the evening feed of the previous day, and evidently died from heat after eating. When found the next morning it had been partly eaten by the other hogs in the lot, hence an estimated weight was all that could be taken. It was estimated to weigh 120 pounds. The nine remaining hogs in the lot weighed 1400 pounds May 29th. On June 3rd, another hog, weighing 150 pounds, was placed in Lot 6. The ten hogs then weighed 1574 pounds. The entire record of the hog that died was eliminated from the results of the experiment.

The inefficiency of the ration of milo alone was very noticeabl after the second week. The hogs grew tired of their feed and did no eat with the same relish as did those in the other five lots. In fact during the latter part of the feeding period it was necessary to reduc the amount of milo feed to the hogs in Lot 1, because they would no clean up their feed. On the other hand, the hogs in the other lots ha good appetites and continued to eat a larger amount of feed daily. Th hogs which received a ration of milo chops alone required 231 pound more feed to produce 100 pounds of gain than the milo-cotton seed mea lot; 193 pounds more than the milo-meat meal lot; 220 pounds mor than the milo-ground whole pressed peanuts lot; 214 pounds more tha the lot getting a ration of milo and peanut meal 1.7; and 280 pound more than the lot receiving a ration of equal parts of peanut meal an milo chops. The average daily gains show a similar difference, but th total gains show an even greater relative difference.

It is also interesting to note that the four lots which were fed balance rations, namely, Lots 2, 3, 4, and 5, the amount of feed consumed pe 100 pounds of grain is fairly close together. In Lot 3, receiving mil chops supplemented with meat meal, 455 pounds of feed were require to produce 100 pounds of gain. In Lot 2, receiving milo chops supple mented with cotton seed meal, 417 pounds of feed were required to pro

duce 100 pounds of gain. Lot 4, receiving milo chops and neanut meal, and Lot 5, receiving milo chops and ground whole pressed peanuts, required 434 pounds of feed and 428 pounds, respectively, to produce 100 pounds of gain. This would indicate that hogs fed a balanced ration of milo chops and peanut meal required more feed to produce 100 pounds of gain than hogs fed milo chops supplemented with ground pressed peanuts. Although Lot 6 was fed a ration unusually rich in protein, the gains were more rapid and they were more economical than in any of the other lots. It may be noted that the hogs in Lot 2 were fed an average of three-fourths of a pound of cotton seed meal per day for 77 days with excellent results.

In figuring the net profits, much depends on the relative price of feeds and the "spread" between the buying and selling price of the hogs. In this experiment the "spread" was 2.45 cents a pound, which is a good margin. On account of the high price of cotton seed meal and the lower price of peanut products, the difference in net profit is less than it ordinarily would be.

TABLE 4.

Financial Statement.

Lot Number.	1	2	3	4	5	6
Cost per hog at 7 cents per pound..	$ 8.72	$ 8.81	$ 8.74	$ 8.79	$ 8.81	$ 9.07
Total cost of feed consumed.....	43.44	51.78	53.81	51.38	50.91	59.52
Cost of feed consumed per hog during experiment.....	4.34	5.18	5.38	5.14	5.09	5.95
Freight charges per hog at 17 1-2 cents per 100 pounds.....	.32	.39	.38	.38	.39	.42
Cost of yardage per hog.....	.08	.08	.08	.08	.08	.08
Cost of feed in Fort Worth Stock Yards per hog.....	.07	.07	.07	.07	.07	.07
Commission per hog in selling.....	.11	.11	.11	.11	.11	.11
Total cost per hog.....	13.64	14.64	14.76	14.49	14.55	15.70
Selling price per hog at $9.45 per cwt., Fort Worth weights.....	16.35	19.66	19.37	19.47	*19.37	21.26
Net profit per hog.....	$ 2.71	$ 5.02	$ 4.61	$ 4.90	$ 4.82	$ 5.56
Net profit per lot.....	$ 27.10	$ 50.20	$ 46.10	49.00	$ 48.20	$ 55.60

*Lot 5 shows a lower net profit than it should show. This is due to one of the sows proving to be pregnant at marketing time and a 40-pound dock being received on her.

Another good feature about the peanut meal as a feed is that the hogs when marketed killed out firm. A committee composed of S. S. Conway, assistant superintendent of Fort Worth plant of Armour & Co.; F. M. Sherwood, head hog buyer, and A. J. Kelly, superintendent of the hog killing department, also of Armour & Co., passed on each lot of hogs and pronounced them satisfactorily firm. The carcass fat of the hogs of Lot 6, however, appeared to the author to be slightly softer than the other lots.

In order to get a further check on the quality of the pork and lard, four samples were taken from each of two hogs of each lot and the melting point was determined for each sample. A medium sized and well finished hog was selected from each lot for this test. The samples were taken from each hog as follows: (a) immediately back of the shoulder;

(b) immediately in front of the thigh in flank; (c) along the center of the back; (d) leaf fat.

The samples were packed in ice and shipped by express from the packing house to the chemist and the melting points were determined.

MELTING POINTS OF FAT.

Table V shows the melting points and iodine number of fat taken from hogs of the different lots. The "A" hog of each lot was a well finished fat hog, while the "B" hog was only medium in condition. The lower melting point of the fat, the softer is the pork, and the lower the iodine number, the firmer is the pork. Although the melting points of the samples from all of the lots, except Lot 2, were very much lower than 42 degrees centigrade, it was not oily or soft pork. The melting point of firm pork, according to the Alabama Experiment Station, is about 42 degrees centigrade.

TABLE 5.

Lot Number.	Melting Point.						Iodine Number					
	1	2	3	4	5	6	1	2	3	4	5	6
Shoulder fat "A"	28.6	38.4	29.6	29.7	28.0	28.9	61.7	52.5	55.6	57.4	56.5	62.2
Shoulder fat "B"	28.8	39.2	29.6	30.8	34.1	27.2	61.2	54.1	55.3	56.8	58.1	66.0
Average.....	28.7	38.8	29.6	30.2	31.0	28.0	61.4	53.3	55.4	57.1	57.3	64.1
Back fat "A".....	34.5	41.8	31.5	31.0	31.8	27.6	62.8	52.5	57.2	57.5	58.0	66.0
Back fat "B".....	30.5	40.5	38.2	30.5	29.3	33.0	61.1	52.3	54.8	57.7	54.6	63.3
Average.....	32.5	41.1	34.8	30.7	30.5	30.3	61.9	52.4	65.5	57.6	56.3	64.6
Leaf fat "A".....	41.0	46.7	42.5	42.1	40.3	41.8	55.7	45.6	49.9	51.2	50.0	57.1
Leaf fat "B".....	39.6	42.9	39.9	41.6	42.1	41.4	55.0	48.9	51.2	50.8	47.6	56.5
Average.....	40.3	44.8	41.2	41.8	41.2	41.6	55.3	47.2	50.5	51.0	48.8	56.8
Rear flank fat "A"	31.8	39.4	29.5	32.8	28.0	29.3	59.7	53.2	56.9	56.9	57.1	65.0
Rear flank fat "B"	29.9	32.2	33.5	35.2	31.4	34.5	58.8	54.8	54.6	54.6	53.3	60.5
Average.....	30.8	35.8	31.5	34.0	29.7	31.9	59.2	54.0	55.7	55.4	55.2	62.7

In comparing the melting points of the samples of fat taken, it will be noticed that there is quite a wide variation. Lot 1, which received milo chops alone, is strikingly similar to Lot 6, which received a ration of equal parts of milo chops and peanut meal. Lot 3, which received a ration of milo chops and meat meal, shows melting points very similar to those of Lot 6, with the exception of the back fat, which is much higher. Lot 4, which received peanut meal without hull, and Lot 5, receiving ground whole pressed peanuts, show melting points that are very similar, with the exception of the rear flank fat. With the exceptions of the back fat of No. 1 and 3 and the flank fat of No. 4, the melting points of all of the samples from Lots 1, 3, 4, 5, and 6, are strikingly low and close together. Lot 2, which received milo chops and cotton seed meal, shows a much higher melting point from each sample taken. This would indicate that cotton seed meal does have a hardening quality when fed in a balanced ration with milo chops. It is also quite noticeable that the samples of leaf fat show a much higher melting point than the samples of fat taken from back, shoulder and flank.

ACKNOWLEDGMENT.

Much credit is due the officials of Armour & Co. for their complete cooperation and untiring efforts in assisting the author in getting the samples of fat necessary for the melting point tests. No charges were made by them for these samples, and every effort was made to get samples that would give an accurate test. Credit is due Dr. G. S. Fraps, the Station chemist, for analyses of feeds and determinations of the melting points of fats. Credit is also due Mr. T. E. Owens, the swine herdsman, for his careful and accurate work in carrying out instructions in the feeding of all lots.

SUMMARY.

1. Although Lot 1, fed milo chops alone, produced a profit, the gains, and hence the profit, were unsatisfactory when compared with the other lots.

2. Lot 2 rendered 85 per cent.; Lot 3, 70 per cent.; Lot 5, 77 per cent.; Lot 4, 81 per cent., and Lot 6, 105 per cent. greater profits than Lot 1.

3. Lot 2, which received a ration of 6 pounds milo and 1 pound cotton seed meal, made greater and more economical gains than Lot 3, which received a ration of 10 pounds milo and 1 pound meat meal.

4. The ten hogs of Lot 2 received an average of three-fourths of a pound of cotton seed meal each day for 77 days without any indication of cotton seed meal poisoning and without deaths.

5. Lots 4 and 5, which received milo chops supplemented with peanut meal, produced more profitable gains than the milo-meat meal ration, but less profit than was secured from the milo-cotton seed meal ration.

6. In Lot 5, milo chops supplemented with ground whole pressed peanuts, produced greater gains than did milo and peanut meal without the hull. Lot 6, which received equal parts of milo and peanut meal with the hull, produced the fastest and most economical gains of any of the other lots.

7. Although half of the ration that was fed to the hogs of Lot 6 was peanut meal, the pork proved to be firm.

8. Although some of the melting points of samples of fat were as low as 29 degrees Centigrade, the pork was pronounced by the packers to be firm.