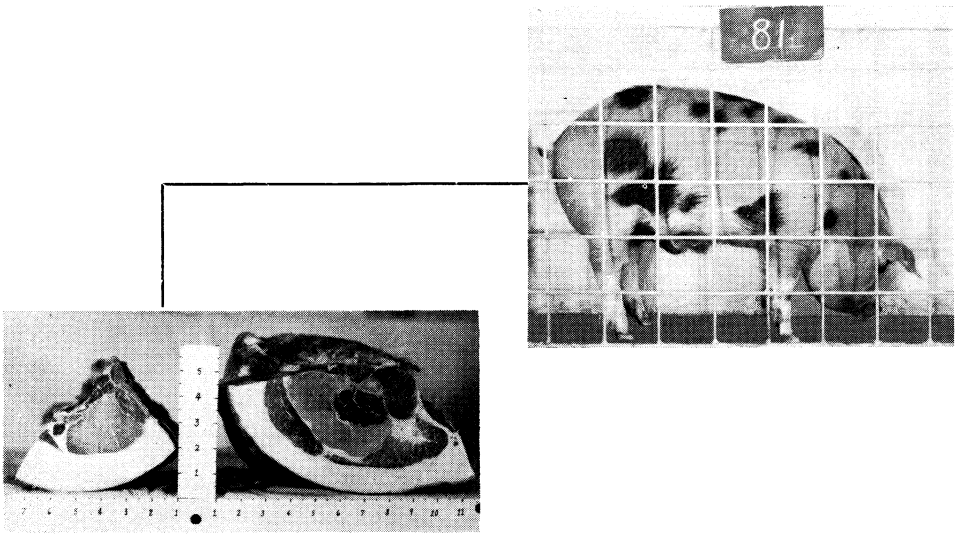
Meat-type HOG PRODUCTION

Influence of Breeding and Energy Content of the Ration On Pork Carcasses

By JAMES A. WHATLEY, Jr., D. I. GARD, J. V. WHITEMAN, and J. C. HILLIER



OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater

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SUMMARY

The identification of meat-type strains of hogs and the selection of individuals of desirable meat type is the best procedure for improving meatiness of pork carcasses, as determined by tests reported in this bulletin.

Forty-eight pigs from seven different breeding lines were fed to determine the effect of breeding and the energy content of the ration on feed lot performance and carcass quality.

Reducing the energy content of a self-fed ration during the latter part of the fattening period reduced the rate of gain and resulted in a leaner carcass. However, the reduction in dressing percentage of pigs on the restricted energy ration offset the advantage of the leaner carcass; consequently, the carcass value of the live hogs were not improved.

Comparisons of the breeding lines showed there were considerable hereditary differences in the ability to produce lean, well-muscled carcasses. These differences in carcass quality among breeding groups were not associated with differences in dressing percentages. The lines which produced the best carcasses also yielded high dressing percentages.

In connection with this study, current swine-breeding programs at the Oklahoma Agricultural Experiment Station are directed toward the carcass evaluation of different breeding lines by slaughter tests, and the selection of breeding stock whose progeny cut good carcasses.

The Cover Pictures

Crossbred barrow 81 was sired by an outbred Duroc boar and out of a Landrace-Poland sow (ODXLP). This barrow represents a good meat-type hog fed a low energy ration in the latter part of the fattening period to produce a carcass with maximum lean development and minimum fat. The area of lean in the cross section of the loin is 46 percent greater than the average of the 48 pigs slaughtered. This pig dressed 74.9 percent and yielded 49.9 percent of closely-trimmed primal cuts, the highest-yielding carcass in the trial. Barrow 81's carcass value per 100 pounds of live hog was $24.55 as compared to the average of $22.78 on all pigs and $21.74 carcass value for the poorest meat-type pig in this pork carcass study.

MEAT-TYPE HOG PRODUCTION:

Influence of Breeding and Energy Content of the Ration On Pork Carcasses*

By J. A. WHATLEY, JR., D. I. GARD, J. V. WHITEMAN, AND J. C. HILLIER

Consumer preference for more lean pork cuts, and reduced demand for lard, is causing considerable interest in the production of a meat-type hog. The earlier price differential between pork and beef was partly due to consumer resistance to excessively fat pork cuts. Improvement in the general quality and meatiness of market hogs would also result in a better competitive position for pork in comparison with other meats. Relatively higher prices for hogs in general could give considerable indirect benefit to the producer.

In 1950, the Oklahoma Agricultural Experiment Station began a study of the production of a better meat-type hog, using these procedures:

1. Selecting and breeding of animals producing progeny with meatier-type carcasses; and

2. Modifying the feeding program by limiting the feed or energy intake during the fattening period so that the pigs grow more and fatten less than on a full-feeding program.

(Marketing hogs at light weights (200-225 pounds) will also decrease the proportion of fat to lean in the carcass.)

Objectives of the study were:

1. To determine the effect of restricted energy intake during the latter part of the fattening period on rate of gain, feed consumption per 100 pounds of gain, and carcass merit.

2. To compare the feed lot performance and carcass merit of hogs of different breeding when fed on two levels of energy intake in the latter part of the fattening period.

As a by-product of this work, information also was obtained on the carcass merit of barrows and gilts when fed on two levels of energy intake.

The identification of meat-type strains of hogs and the selection of

* From a cooperative project with the Regional Swine Breeding Laboratory, Bureau of Animal Industry, United States Department of Agriculture.

individuals of desirable meat type is the best procedure for improving the meatiness of carcasses, as determined by the Station's study. Therefore, current breeding programs at the Station are directed toward the carcass evaluation of different breeding lines by slaughter tests and the selection of breeding stock whose progeny cut good carcasses.

HOW THE TESTS WERE MADE

Forty-eight pigs—26 barrows and 22 gilts—were used in this experiment. They were farrowed in the fall of 1950 and represented 12 different litters and seven different breeding lines. Four average pigs were selected at weaning from each of the 12 litters.

Three Duroc breeding groups were line T, 2-line cross TX3, and a 4-line cross T-3XC-S. TX Landrace-Poland (TXLP), outbred Duroc X Landrace-Poland (ODXLP), and Minnesota No. 1 X Landrace-Poland (M1XLP) were crossbreds. The seventh group was from a Landrace-Poland (Beltsville No. 1) line developed by the U.S.D.A. Bureau of Animal Industry.

Each litter of four pigs was divided as equally as possible by weight and sex into two lots of two pigs **each.**

All lots were fed alike in dry lot from weaning (average weight of 36 pounds) to 140 pounds. From weaning to 75 pounds, all lots were self-fed a ration of 75 percent corn and 25 percent protein and mineral supplement (Table 1.) From 75 to 140 pounds, all lots were self-fed Ration 2. From 140 to 225 pounds, one lot from each litter was self-fed an 88 percent corn ration (Ration 3H) containing 1.52 therms of metabolizable energy per pound of feed. The other lot from each litter was self-fed a low-energy ration (Ration 3L) of 65 percent corn, 20 percent ground prairie hay, and 15 percent protein and mineral supplement. The energy content of this ration was 1.42 therms of metabolizable energy per pound of feed. From 140 to 225 pounds, 24 pigs were fed the high-energy ration, and 24 the low-energy ration.

Near the end of the experiment, the pigs were weighed at weekly intervals. The ones weighing between 215 and 235 pounds were taken off feed for 20 to 24 hours and slaughtered in the college meats laboratory. Carcass measurements and weights of cuts were taken on all pigs. Cuts were trimmed much closer than is the practice in packing plants.

RESULTS

Rate of Gain

The average daily gain and the feed consumed per 100 pounds gain for the entire feeding period are given in Table 2 for the different breeding groups on the high- and low-energy rations. From 140 to 225 pounds, the pigs on the high-

Table 1.—Percentage Composition, Chemical Analysis, and Cost of Rations Fed to Pigs in Meat-type Production Tests.

Item	Rations			
	1	2	3H	3L
	Fed at:			
	Weaning to 75 pounds	75 to 140 pounds	140 to 225 pounds	140 to 225 pounds
Contents (Percent)				
Corn	75.00	80.00	88.00	65.00
Ground prairie hay	-----	-----	-----	20.00
Tankage	4.86	3.88	2.33	2.91
Soybean meal	7.28	5.83	3.50	4.37
Cottonseed meal	4.86	3.88	2.33	2.91
Alfalfa meal	4.86	3.88	2.33	2.91
Trace mineralized salt	0.73	0.58	0.35	0.44
Bone meal	0.73	0.58	0.35	0.44
Limestone	0.73	0.58	0.35	0.44
Lederle APF	0.97	0.78	0.47	0.58
Chemical analysis (Percent)				
Water	11.49	12.67	12.15	10.70
Ash	5.63	4.92	4.36	5.65
Protein	16.13	13.98	12.97	12.54
Fat	2.20	2.07	2.42	2.26
Fiber	3.67	2.98	2.61	7.88
Nitrogen-free-extract	60.88	63.38	65.49	61.06
Calcium	0.880	0.695	0.615	0.750
Phosphorus	0.473	0.473	0.436	0.393
Energy content per pound of ration (therms)	1.49	1.49	1.52	1.43
Cost per 100 pounds of ration	$3.49	3.31	3.02	2.70

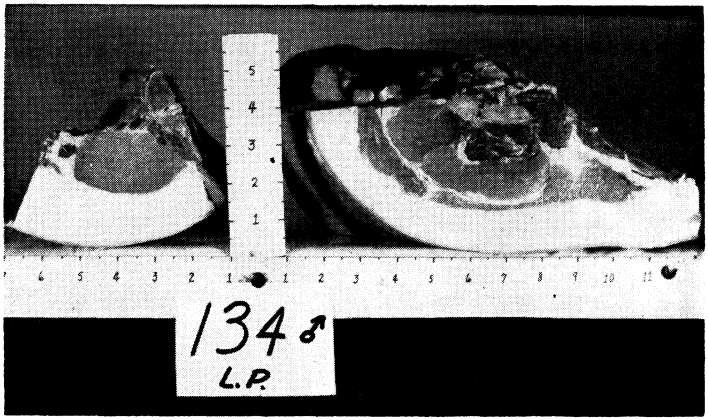
FEED PRICES
(Per Ton)

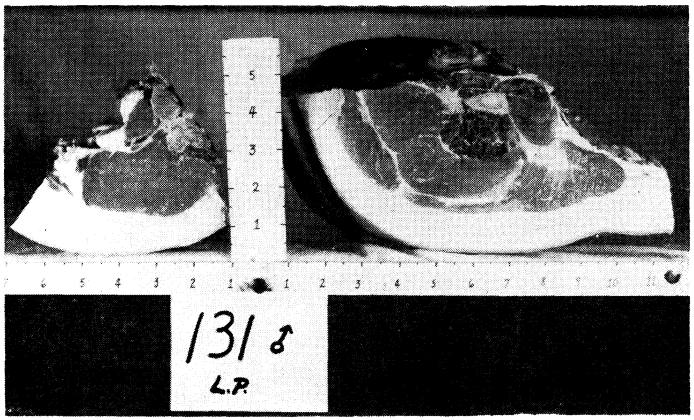
Ground prairie hay	$ 9.00	Alfalfa meal	$ 52.50
Tankage	115.00	Trace mineralized salt	37.00
Soybean meal	75.00	Bone meal	80.00
Cottonseed meal	77.50	Limestone	14.00
Corn (per bushel)	1.45	Lederle APF	790.00

Table 2.—Average Daily Gain and Feed Per 100 Pounds Gain by Ration and Breeding in Tests for Meat-type Hog Production.

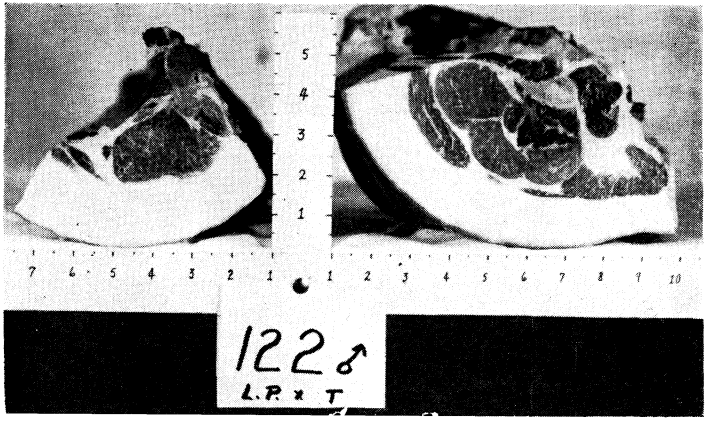
Breeding	Average daily gain			Feed per 100 pounds gain		
	Rations		Average	Rations		Average
	3H	3L		3H	3L	
T	1.64	1.39	1.52	366	425	396
TX3	1.84	1.51	1.68	355	440	398
T-3XC-S	1.81	1.49	1.65	350	455	402
TXLP	1.66	1.54	1.60	368	430	399
ODXLP	1.84	1.40	1.62	332	449	390
M1XLP	1.58	1.42	1.50	344	410	377
LP	1.46	1.28	1.37	388	427	408
Average	1.68**	1.45	1.56	357**	433	395

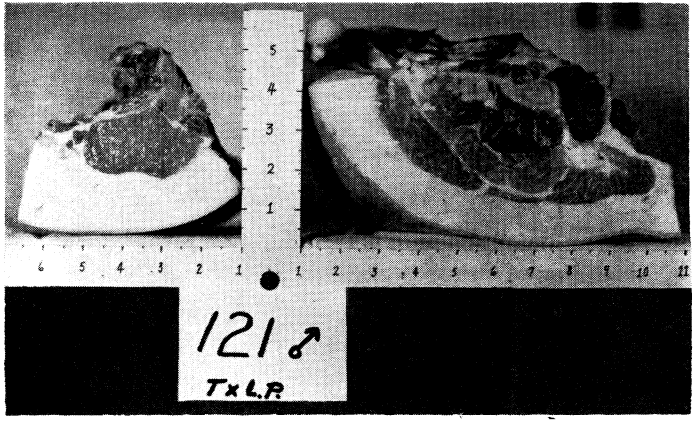
** Significant at .01 level.



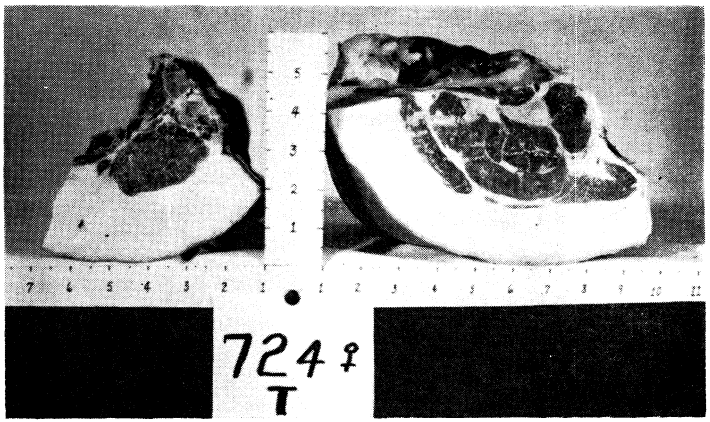


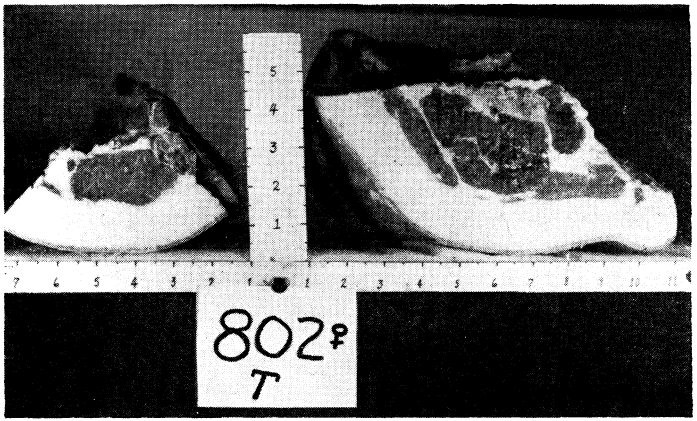
Litter mate barrows from the Landrace-Poland line, the best meat-type line in the trial.
(High energy ration at left; low energy ration, right)





Landrace-Poland X T litter mate barrows.
(High energy ration at left; low energy ration, right)





Line T gilt.

Line T gilt.

(High energy ration at left; low energy ration, right)
Line T was the poorest meat-type line in the trial.
Symbols: Circle arrow—barrow; circle cross—gilt.

Loin and Ham Cuts from Hogs of Different Breeding Fed High Energy and Low Energy Rations

energy ration gained 1.96 pounds per day, which was .58 of a pound per day more than those on the low-energy ration.

The high-energy ration pigs gained .23 of a pound per day more than those on a low-energy ration over the entire feeding period. The difference in rate of gain was highly significant.

Barrows gained just slightly faster than gilts (1.57 and 1.54 pounds per day), but the difference was not significant.

There were significant differences in rate of gain among the breeding groups. Among the Durocs, the line crosses (TX3, T-3XC-S) gained faster than line T. The TXLP and ODXLP crossbreds gained faster than the M1XLP and LP groups.

Feed Per 100 Pounds Gain

Ration 3L was unpalatable due to the ground prairie hay; consequently, there was considerable waste around the self-feeders containing this ration. For this reason, there was a great difference of 76 pounds of feed per hundred pounds of gain in favor of the pigs on the high-energy over those on the low-energy ration. Although the differences probably would have been in the same direction, the size of the difference certainly would have been smaller if more exact feed consumption records were available. Differences among breeding groups were not significant, although the M1XLP group was the most efficient in feed utiii-zation.

Carcasses

Table 3 shows the effect of ration, sex, and breeding on various carcass characteristics.

Pigs fed the low-energy ration from 140 to 225 pounds produced leaner carcasses than those fed the high-energy ration, as shown by less back fat, higher carcass specific gravity (1),* and larger areas of loin and ham. They also yielded a higher percentage of lean cuts (trimmed ham, loin, and shoulder). However, they dressed 2 percent lower than the high-energy pigs, and the average weight of the intestinal tract and contents at slaughter was 2 pounds heavier. The carcass value per 100 pounds of live hog was 17 cents less than for the high-energy pigs, because of the lower dressing percentage. Possible differences in the quality of the carcasses of the two groups were not considered.

Gilts produced leaner carcasses than barrows and yielded a higher percentage of lean cuts. In spite of a slightly lower dressing percentage (.9 of 1 percent), the carcass values made the gilts worth 20 cents more for 100 pounds of live hog than barrows.

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* Numbers in parentheses refer to Literature Cited, page 11.

Table 3.—Carcass Data by Ration, Sex, and Breeding in Meat-type Hog Production Tests.

Item	Ration		Sex		Breeding						
					Duroc			Crossbred			
	H	L	Barrows	Gilts	T	TX3	T-3XC-S	TXLP	ODXLP	MIXLP	Landrace-Poland
No. of pigs	24	24	26	22	8	8	8	8	4	8	4
Shrunk live wt.	217	215	215	217	216	214	218	216	216	216	217
Dressing Pct.	74.6**	72.6	74.0**	73.1	73.1	74.0	73.6	73.9	74.2	72.4	74.8
Sk. ham[1]	11.7*	12.0	11.5**	12.2	10.5**	11.3	11.4	12.2	13.3	12.6	13.3
Tr. loin	10.0*	10.4	9.9**	10.5	9.4*	9.5	10.1	11.1	10.8	10.2	11.0
Tr. shoulder	11.2*	11.6	11.3	11.4	11.5	11.3	11.3	10.9	12.3	11.2	12.0
Lean cuts	32.9**	33.9	32.8**	34.2	31.3*	32.0	32.8	34.2	36.4	34.0	36.4
Belly	12.4**	11.6	12.4**	11.6	12.6	12.2	12.0	12.2	11.4	11.3	12.3
Primal cuts	45.4	45.5	45.2*	45.8	43.9	44.2	44.8	46.3	47.8	45.3	48.7
Fat trim	19.9	17.4	19.4	17.7	20.0	20.7	19.2	17.4	17.2	17.9	16.1
Lean trim	3.6	3.5	3.5	3.5	3.2	3.4	3.7	3.8	3.6	3.3	4.1
Carcass value per 100 pounds live weight	$22.87	22.70	22.69	22.89	21.99	22.38	22.57	23.13	23.80	22.69	24.12
Carcass length (inches)	29.7*	30.0	29.6**	30.1	29.7	29.2	29.5	30.9	28.6	29.8	31.2
Average back fat (inches)	1.81**	1.60	1.76**	1.64	1.86*	1.88	1.74	1.57	1.54	1.68	1.45
Specific gravity	1.032**	1.039	1.033**	1.039	1.032*	1.032	1.033	1.038	1.038	1.039	1.040
Loin lean area	4.70	4.94	4.59	5.14	3.88*	4.18	4.12	5.27	6.78	5.38	5.41
Ham lean area	25.2	26.0	25.1	26.2	22.4**	23.9	24.3	27.0	28.0	27.5	29.5
Shrink off feed (pounds)	10	11	10	12	10	13	10	11	9	9	11
Wt. intestinal tract & contents (pounds)	15.2	17.8	15.8	17.3	17.1	15.6	16.7	17.0	14.9	17.5	15.2
Wt. of killing fat (pounds)	6.8	6.8	7.1	6.5	6.7	6.3	7.2	5.3	5.6	8.8	7.6

[1] Cuts very closely trimmed and expressed as a percentage of the shrunk live weight.
* Significant difference at .05 level.
** Significant difference at .01 level.

There were significant differences in carcass value among the breeding groups. There were no significant differences in dressing percentage, although the M1XLP group dressed about 1½ percent less than the average of the other groups. The M1XLP pigs had 2 pounds more internal fat and 1 pound heavier intestinal tract than the average. The poorest carcasses were produced by the line T Durocs, and the best carcasses were the Landrace-Poland and ODXLP groups. In terms of the shrunk live weight at slaughter, line T pigs yielded 31.3 percent lean cuts and Landrace-Poland pigs, 36.4. In general, the Landrace-Poland and crossbreds with one Landrace-Poland parent yielded significantly better carcasses than any of the three Duroc groups. There were notable differences in the thickness of back fat. The average of the three Duroc groups was 1.83 inches compared to 1.58 inches on the Landrace-Poland and Landrace-Poland crossbred groups.

In carcass value per 100 pounds live weight, the Landrace-Poland pigs were worth $2.13 more than the line T pigs. The Landrace-Poland and crossbred pigs were worth $.95 more per 100 pounds of live hog than the average pigs for all of the three Duroc groups.

COMMENTS AND OBSERVATIONS

Restricted energy intake in the latter part of the fattening period reduced the rate of gain and resulted in a leaner carcass, but at the expense of dressing percentage. Reduction in dressing percentage offset the advantage of the leaner carcass, thus the carcass value of the live hog was about the same for restricted and full-fed pigs. Possible differences in value because of differences in quality were not considered since they were not measured in this experiment. However, such differences would have to be quite large to change these conclusions.

Other experiments with restricted feeding also have shown 1 to 3 percent lower dressing percentage for restricted feeding compared to full feeding. Winters **et al.** (2), Dickerson and Lasley (3), Lasley and Tribble (4), and Smith **et al.** (5), reported lower dressing percentages for pigs on restricted feeding whether on pasture or dry lot. These workers reported that pigs on restricted feeding gained slower and produced leaner carcasses than full-fed pigs.

McMeekan and Hammond (6) found that rapid early growth and slow later growth in hogs produced the best developed muscle and a minimum of fat.

In the above experiments, the most economical gains generally were obtained by moderate limitation of feed on pasture. Although the yield of primal cuts as a percentage of the live weight was not increased, the production of leaner

carcasses makes the carcasses more desirable. Consequently, the system of moderate limited feeding on pasture may be the most useful feeding system for producing leaner carcasses, because it combines cheaper gains and more desirable carcasses.

On the other hand, comparisons of different lines of breeding indicate that considerable hereditary variations exist in carcass fatness. Further, the production of leaner carcasses is not necessarily accompanied by a reduction in dressing percentage, and the carcass value in terms of the live hog may be considerably different. Therefore, it is more economical and easier to produce meat-type hogs by proper breeding than by modifying the feeding procedure. This can be accomplished by the identification of meat-type strains and selection of individuals of desirable meat type within breeds.

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