Carcass Quality and Efficiency of Feed Conversion of Swine Slaughtered at Different Weights

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INTRODUCTION

As hogs increase in live weight, the rate of muscle formation decreases, whereas the rate of fat deposition increases (*1,2*).[2] Since lean meat is the most important product of the swine industry, efforts should be made to slaughter the pigs at a weight before the animals slow down in muscle development and the fat deposition becomes more rapid.

Generally speaking, lean meat is produced more efficiently than fat. Researchers have found that the heavier the hog is, the more feed it requires to increase its weight (*3*). If the time or weight at which this change in growth occurs could be determined, it would facilitate reducing the feeding cost—the most limiting factor affecting the expansion of the swine industry in Puerto Rico.

The experiment reported herein was conducted in order to determine the influence of four different slaughter weights of swine on dressing percentage, carcass cut-out values, and efficiency of feed utilization.

EXPERIMENTAL PROCEDURE

Two trials involving 80 barrows were conducted. In each trial 10 litter-mate groups of 4 pigs each were used. One pig from each group was randomly assigned to a growing-fattening pen to be slaughtered at 125, 150, 175 and 200 pounds of live weight, respectively.

These 4 litter-mate groups were, in turn, randomly chosen from 20 litters of the ¾ Duroc x ¼ English Large Black Landrace line of pigs developed at the Lajas Agricultural Substation.

The pigs were weighed every 2 weeks and the feed consumption for each period was recorded. When the weight and the rate of gain of a given pig indicated that it was approaching the assigned slaughter weight, it was reweighed at shorter intervals in order to assure slaughter when that weight was reached.

When each animal reached the assigned weight, it was kept off-feed for a 24-hour period before slaughter. The animal was weighed at the end of this fasting period. The carcass weight, length, and the back-fat thickness

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[2] Italic numbers in parenthesis refer to Literature Cited, pp. 291–2.

were taken right after slaughter. The carcass was then chilled at approximately 40° F. for 24 hours prior to cutting. Conventional cutting procedures were used and carcass measurements were obtained as outlined by Cole (*4*) and described by Zobrinsky (*2*) with some slight modifications. Tracings made of the cross section of the loin eye muscle at the 10th rib were measured by means of a planimeter.

The data were subjected to analysis of variance. The significances of the differences between means were tested using the multiple-range test as

TABLE 1.—*Slaughter weights and means of carcass measurements and yields of pigs slaughtered at 4 different weights*[1]

Slaughter weight (pounds)	Carcass yields		Carcass length	Back-fat thickness	Loin-eye area
	Pounds	*Percent*	*Inches*	*Inches*	*Sq. in.*
125	83.13	66.50	25.00	1.31	2.24
150	103.00	68.66	26.25	1.50	2.45
175	123.86	70.78	27.26	1.61	3.02
200	143.22	71.61	28.37	1.78	3.21

[1] Level of significance[2]

	5 percent				1 percent			
Carcass yield, percent	200	175	150	125	200	175	150	125
Carcass length	200	175	150	125	200	175	150	125
Back-fat thickness	200	175	150	125	200	175	150	125
Loin-eye area	200	175	150	125	200	175	150	125

[2] Any 2 means not underscored by the same line are different at the indicated level of significance.

outlined by Duncan (*5,6*). All correlations were calculated on a within-group basis.

RESULTS AND DISCUSSION

As shown in table 1, the heavier the pigs at slaughter time, the higher the carcass yield, the carcass length, the back-fat thickness, and the loin-eye area. All these differences were highly significant ($P < .01$). However, the heavier hogs had more back-fat and significantly less ($P < .01$) loin-eye area when expressed in square inches per weight of the carcass. The back-fat was a sizable proportion of the total lard stock, which was significantly greater ($P < .01$) for the heavier groups, as shown in table 2. This indicates that the higher carcass yields, exhibited by the heavier hogs were directly related to greater amounts of fat.

Table 2 also shows the differences in percentages of live weight and carcass weight of the primal cuts. There was no significant difference in the percentage of live weight owing to weight of the pigs at slaughter time. There was a highly significant difference ($P < .01$) owing to slaughter weight on percentage of carcass weight, in favor of the lighter pigs. These pigs had much less fat on their carcasses than the other pigs, which accounts for the significant difference.

TABLE 2.—*Primal cuts and lard-stock percentage of pigs slaughtered at 4 different weights*[1]

Item	Slaughter weights at—			
	125 pounds	150 pounds	175 pounds	200 pounds
Primal cuts:				
Percent of live weight	35.21	35.74	35.43	35.20
Percent of carcass weight	54.90	53.36	51.43	50.43
Lard stock:				
Percent of live weight	8.35	9.82	9.95	11.35
Percent of carcass weight	13.02	14.65	14.46	16.29

[1] Level of significance[2]

	5 percent				1 percent			
Primal cuts as percent of live weight	n.s.				n.s.			
Primal cuts as percent of carcass	125	150	175	200	125	150	175	200
Lard stock as percent of live weight	200	175	150	125	200	175	150	125
Lard stock as percent of carcass	200	175	150	125	200	175	150	125

[2] Any 2 means not underscored by the same line are different at the indicated level of significance.

The percentages of primal cuts are shown in table 3. The ham cut was significantly greater ($P < .01$) in the lighter pigs than in the other groups, on both the live-weight and the carcass-weight basis. The lard stock was significantly greater in the heavier pigs.

The loin cut was significantly greater ($P < .01$) in the heavier than in the lighter pigs on a live-weight basis, but there was no significant difference on a carcass-weight basis. This is because, on a live-weight basis, the loins of the heavier pigs, which are the larger pigs, are also heavier than on light pigs, but on a carcass basis, after the loins are trimmed, this is not so. There was no significant difference in percentage of picnic on a live-weight basis, but there was a significant difference ($P < .05$) in favor of light pigs on a carcass basis. Again the matter of a greater amount of fat comes in here.

There were no significant differences in the Boston butt on either live- or carcass-weight basis.

Some efficiency factors of the pigs used in this study are shown in table 4. The food conversion was measured in two ways—per pound of net weight

TABLE 3.—*Ham, loin, picnic, and Boston butt as percentage of live weight and of carcass weight of the pigs slaughtered at different weights*[1]

Primal cuts	Slaughter weights at—			
	125 pounds	150 pounds	175 pounds	200 pounds
Ham:				
Percent of live weight	11.72	11.52	10.99	10.61
Percent of carcass weight	18.27	17.21	15.96	15.20
Loin:				
Percent of live weight	12.33	12.88	13.52	13.53
Percent of carcass weight	19.23	19.24	19.63	19.38
Picnic:				
Percent of live weight	6.63	6.67	6.48	6.46
Percent of carcass weight	10.34	9.96	9.42	9.26
Boston butt:				
Percent of live weight	4.52	4.66	4.63	4.59
Percent of carcass weight	7.05	6.96	6.72	6.57

[1] Level of significance[2]

	5 percent				1 percent			
Ham as percent of live weight	125	150	175	200	125	150	175	200
Ham as percent of carcass	125	150	175	200	125	150	175	200
Loin as percent of live weight	200	175	150	125	200	175	150	125
Loin as percent of carcass	n.s.				n.s.			
Picnic as percent of live weight	n.s.				n.s.			
Picnic as percent of carcass	125	150	175	200	125	150	175	200
Boston butt as percent of live weight	n.s.				n.s.			
Boston butt as percent of carcass	n.s.				n.s.			

[2] Any 2 means not underscored by the same line are different at the indicated level of significance.

and per pound of carcass. In both cases, the lighter pigs had a significantly better food conversion that the heavier pigs ($P < .01$). There was no significant difference in daily gains attributable to the weight of the pigs at slaughter. As a matter of fact, the three heavier groups had the same rate of gain.

The last factor presented in table 4 concerns the matter of shrinkage.

The carcasses were kept for 24 hours in a refrigerator at about 40° F. and about 90-percent relative humidity. The carcasses of the lighter pigs had a significantly higher ($P < .01$) shrinkage than those of the heavier carcasses. This is because the greater amount of back-fat in the carcasses of the heavy pigs helps to reduce the evaporation of water.

TABLE 4.—*Feed conversion and daily gains of the pigs slaughtered at 4 different weights and the shrinkage of their carcasses*[1]

Slaughter weight at (pounds)	Food conversion—		Daily gains per day	Shrinkage
	Per pound of net gain	Per pound of carcass		
	Pounds	*Pounds*	*Pounds*	*Percent*
125	3.60	4.41	1.61	7.73
150	3.98	4.86	1.66	7.44
175	4.18	5.21	1.66	6.53
200	4.49	5.63	1.66	5.55

[1] Level of significance[2]

	5 percent				1 percent			
Food conversion per pound of net gain	200	175	150	125	200	175	150	125
Food conversion per pound of carcass	200	175	150	125	100	175	150	125
Daily gains			n.s.				n.s.	
Shrinkage	125	150	175	200	125	150	175	200

[2] Any 2 means not underscored by the same line are different at the indicated level of significance.

CONCLUSIONS

The slaughter weight had various effects on the carcass quality and the efficiency of gains of the pigs used in this experiment. The light-weight pigs (125–150 lb.) had higher proportions of lean cuts on a carcass basis that the heavyweight pigs (175–200 lb.). A generalization that can be made in this respect is that the lean cuts, on a carcass basis, diminished in proportion as the slaughter weight increased, while the lard stock increased. More specifically, the 125-pound pigs had significantly higher lean cuts as a percentage of the chilled-carcass weight, ham as percentage of the chilled-carcass weight, and picnic as percentage of the chilled-carcass weight. They had less back-fat thickness, shorter body length, and smaller loin-eye area as percentage of the weight at slaughter.

The lightweight pigs had a significantly better food conversion than the heavier pigs, although the rate of gain was practically the same for all the

groups of pigs. The greater amount of back-fat in the carcasses of the heavy pigs helped to reduce the shrinkage during the 24-hour chilling period.

It seems more convenient from the standpoint of the production of leaner carcasses to slaughter the pigs at about 125 to 150 pounds of live weight. Pigs at these weights are more efficient in converting feed to meat than at heavier weights. This results in a saving of feed needed per pound of gain in weight of the animal as shown in table 4. Pigs slaughtered at 125 to 150 pounds of live weight also produce smaller cuts which are in more demand by consumers of pork.

SUMMARY

An experiment was carried out using 80 pigs of the ¾ Duroc x ¼ English Large Black Landrace line to study the influence of slaughter weight on the carcass quality and the feed efficiency. These pigs were randomly assigned to one of four lots, from each one of which pigs were slaughtered when they reached 125, 150, 175, and 200 pounds of live weight respectively.

As slaughter weight increased the percentage of the four primal cuts on a chilled-carcass basis, the percentage of ham and picnic on a chilled-carcass basis, and the feed efficiency decreased significantly, while the amount of fat in carcasses increased significantly.

RESUMEN

En la Subestación Experimental Agrícola de Lajas se llevó a cabo un experimento con 80 cerdos de la línea ¾ *Duroc* x ¼ *English Large Black Landrace* para estudiar el efecto del peso de los animales, al tiempo de sacrificarse, sobre la calidad de los canales y sobre la eficiencia de la conversión del alimento a carne. Los cerdos bajo estudio se asignaron, al azar, a uno de los cuatro grupos que representaban los cuatro diferentes pesos a que se sacrificaron los animales, a saber: 125, 150, 175 y 200 libras de peso vivo.

El experimento demostró que según aumentaba el peso a que se sacrificaban los animales, disminuía significativamente el porcentaje de los cuatro cortes principales, del de jamón y de la pata delantera (*picnic*), a base del canal enfriado durante 24 horas. También, según los cerdos aumentaron de peso, su eficiencia en la conversión del alimento a carne fue significativamente inferior. La cantidad de grasa en los canales aumentó significativamente, según subió el peso a que se sacrificaron los cerdos.

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