

Heritability Estimates and Phenotypic Correlations for Various Measures of Carcass Meatiness in Swine¹

V. G. Arganosa and I. T. Omtvedt

Story in Brief

Swine carcass data were analyzed to estimate heritabilities and phenotypic correlations among various measures of carcass meatiness. The results revealed that the various measures of meatiness, such as percent lean and ham-loin index, tended to be highly heritable ($h^2 \geq .40$). Ham-loin index was more closely correlated with total lean-cut weight and percent lean cuts than was loin eye area but showed no advantage over percent ham of slaughter weight. Ham-loin index accounted for 71 percent of the variation in percent lean of live weight, while percent ham of slaughter weight accounted for 69 percent of the variation in percent lean of live weight.

Introduction

Ham-loin index is commonly used in pork carcass evaluation as a measure of muscling. However, the heritability of this measurement or its relationship to other measures of carcass merit are not known. This study was initiated to estimate the heritabilities of various measurements of carcass meatiness and to determine the phenotypic correlations among them.

Methods and Materials

The data used in this report was collected from 1964 fall through 1966 fall involving 650 pigs out of 280 dams, 89 sires and seven lines of breeding. All pigs were self-fed in confinement in groups of six pigs per pen from approximately eight weeks of age to 200 pounds live weight. Carcasses were evaluated 48 hours after slaughter.

Closely trimmed hams, loins, and shoulders were used to evaluate meatiness. These three lean cuts were expressed as total lean-cut weight, as percent of slaughter weight, and as percent of chilled carcass weight. Percent ham, percent loin, percent ham and loin, and ham-loin index

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were also calculated. The ham-loin index was computed using the following method:

$$\text{H-L Index} = 10 (\% \text{ ham of sl. wt.} - 10) + 10 (\text{loin eye area}).$$

Loin eye area was measured between the 10th and 11th ribs, carcass backfat was measured at the first rib, last rib and last lumbar vertebra at the midline.

All data were adjusted to a barrow equivalent basis. The analysis of variance for a nested classification with unequal number of sub-classes was used to account for the season and line of breeding effects. Heritability estimates of the different traits were calculated using the paternal half-sib correlation analysis. Phenotypic correlations among the traits were also calculated on a within year-season-line of breeding basis.

Results and Discussion

The means and standard deviations of the different traits studied are presented in Table 1, the heritability estimates in Table 2, and the phenotypic correlations in Table 3.

Heritability Estimates:

The heritability estimates obtained for the different measures of meatiness tended to be high; ranging from 0.47 (loin eye area) to 0.82 (percent ham + loin of carcass weight).

Expressing lean-cut weight either as percent of slaughter weight or as percent of chilled carcass weight did not affect the magnitude of the heritability estimates. This was attributed to the small amount of varia-

Table 1. Means and Standard Deviations for Traits Studied.

Trait	Mean	Standard Deviation
Percent of slaughter weight:		
Ham	14.1	.60
Loin	12.0	.56
Ham + loin	26.1	.99
Ham + loin + shoulder	37.0	1.30
Percent of carcass weight:		
Ham	20.1	.78
Loin	17.0	.75
Ham + loin	37.1	1.26
Ham + loin + shoulder	52.5	1.69
Ham-loin index	81.6	8.48
Lean cut weight, lb.	76.0	2.89
Loin eye area, sq. in.	4.02	.39
Carcass backfat, in.	1.37	.12

Table 2. Heritability Estimates and Standard Errors for Traits Studied.

	$h^2 \pm$ S.E.
Percent of slaughter weight:	
Ham	0.58 \pm .17
Loin	0.64 \pm .18
Ham + loin	0.75 \pm .19
Ham + loin + shoulder	0.62 \pm .18
Percent of carcass weight:	
Ham	0.57 \pm .17
Loin	0.65 \pm .18
Ham + loin	0.82 \pm .20
Ham + loin + shoulder	0.64 \pm .18
Ham-loin index	0.69 \pm .18
Lean cut weight	0.68 \pm .18
Loin eye area	0.47 \pm .15
Carcass backfat	0.53 \pm .16

Table 3. Correlations Among Various Measures of Meatiness.¹

	Total lean cut weight	Percent lean cuts of:		Ham-loin index
		slaughter wt.	carcass wt.	
Percent of slaughter weight:				
Ham	0.70	0.83	0.67	0.91
Loin	0.68	0.78	0.65	0.56
Ham + loin	0.81	0.94	0.77	0.87
Ham + loin + shoulder	0.85	—	0.83	0.84
Percent of carcass weight:				
Ham	0.58	0.67	0.78	0.78
Loin	0.54	0.60	0.73	0.38
Ham + loin	0.68	0.78	0.93	0.72
Ham + loin + shoulder	0.72	0.83	—	0.68
Ham-loin index	0.74	0.84	0.68	—
Loin eye area	0.54	0.56	0.47	0.78
Carcass backfat	— .27	— .36	— .49	— .23

¹ All correlations significant at $P \leq .01$

tion present in slaughter and/or carcass weights of the animals used in the study.

The heritability of 0.69 for ham-loin index was similar to those obtained for the other measures of carcass meatiness. The heritabilities for loin eye area (0.47) and carcass backfat (0.53) found in this study were in close agreement with those previously reported in the literature.

Phenotypic Correlations:

Table 3 shows the phenotypic correlations among the different measures of meatiness. Percent loin had lower phenotypic correlations with total lean-cut weight and percent lean-cuts than did percent ham or per-

cent ham + loin. Ham + loin percentage was more closely correlated with the other traits than was percent ham alone. Loin eye area was less closely associated with total lean-cut weight and percent lean cuts than was the other measures of meatiness. Carcass backfat thickness accounted for only a small percentage of the variation in total lean weight or percent lean cuts.

Ham-loin index accounted for 71 percent of the variation in percent lean cuts of slaughter weight, while percent ham of slaughter weight accounted for 69 percent of the variation in the percent lean cuts of slaughter weight. However, loin eye area accounted for only 31 percent of the variation in percent lean cuts of slaughter weight. Ham-loin index was also more closely correlated with total lean cut weight than was either percent ham or loin eye area.

Some Genetic Aspects of Pork Quality¹

I. T. Omtvedt, V. G. Arganosa and L. E. Walters

Story in Brief

Data from 650 pigs sired by 89 sires from seven lines of breeding were used to estimate heritabilities and to calculate genetic and phenotypic correlations among various measurements of carcass quality. Backfat thickness, carcass length, loin eye area, lean cut yield, ether extract, and total moisture were highly heritable ($h^2 \geq .40$) while marbling score, firmness determinations, and shear value were moderately heritable ($.20 \leq h^2 \leq .45$). In these data color score was lowly heritable ($h^2 = .20$).

Based on genetic relationships obtained, it was concluded that backfat thickness can be decreased and muscling increased and still have an acceptable degree of marbling and firmness through proper selection procedures. The results indicated that selection for less backfat thickness would increase percent lean cuts without significant effects on loin eye area, color, firmness or moisture content. Selection for larger loin area would tend to increase lean cut yields, but would decrease color score

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