

Comparison of Serial Ultrasonic Measurements of Loin Muscle Area, Backfat, and Intramuscular Fat Percentage Between Pigs Sired by Boars from Two Different Time Periods

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Summary and Implications

Results of this study demonstrate that significant progress toward the enhancement of carcass composition has been realized within the Duroc breed since the mid 1980's; however, this improvement has been at the expense of meat quality traits such as intramuscular fat. This report also suggests that the deposition rates and growth patterns of loin muscle area, tenth-rib backfat, and intramuscular fat percentage have not been significantly affected by long-term selection for increased carcass leanness.

Introduction

Prior to 1985, 90 percent of hogs marketed were sold as traditional 'commodity pork', where price was determined on a live weight basis (Hayenga, 1985). The utilization of incentive-based marketing systems became increasingly important to producers seeking added value to the hogs they produced, resulting in increased selection for lean percentage. As a result, the percentage of hogs sold on a carcass merit basis rose to 28 percent in 1988 and to 78 percent in 1997 (Brorsen et al., 1998).

The objectives of this study were two-fold: 1) to evaluate the effects that long-term selection for increased carcass leanness has had on deposition rates and growth patterns of loin muscle area, tenth-rib backfat, and intramuscular fat percentage, and 2) to compare pigs sired by boars currently available and pigs sired by boars from the mid 1980's for differences in each of the ultrasonically measured traits listed above.

Materials and Methods

Serial ultrasonic measurements of 10th rib loin muscle area (LMA), off-midline backfat (BF), and intramuscular fat percentage (IMF) were used to assess deposition rates and growth patterns of purebred Duroc pigs sired by boars currently available and by boars from the mid 1980's. Two lines were formed by randomly allocating littermate and _ sib pairs of females to matings by current (CTP) or old (OTP) time period boars. Matings by CTP boars were made using fresh semen and matings by OTP boars were via frozen semen. A total of 298 pigs by 16 sires in the CTP line and 124 pigs by 10 sires in the OTP line were

evaluated. Boars, gilts, and barrows in each line were weighed and scanned for LMA, BF, and IMF every two weeks. Serial ultrasonic images were collected with an Aloka 500V SSD ultrasound machine fitted with a 3.5 MHz, 5-in. linear-array transducer. Off-midline backfat and loin muscle area were measured from a cross-sectional image taken at the 10th rib. A sound transmitting guide conforming to the pigs' back was attached to the ultrasound probe and vegetable oil was used as conducting material between the probe and skin. A minimum of four longitudinal images were collected 3 in. off-midline across the 10th - 13th ribs. A trained technician used texture analysis software (Amin et al., 1997) to estimate final IMF parameters. Mean live weights for each of the respective scans for the CTP and OTP were, respectively: Scan 1: 132.0 lbs, 138.9 lbs; Scan 2: 156.9 lbs, 164.8 lbs; Scan 3: 182.7 lbs, 191.3 lbs; Scan 4: 209.6 lbs, 218.0 lbs; Scan 5: 230.3 lbs, 233.9 lbs; Scan 6: 243.1 lbs, 242.3 lbs. Deposition rates were calculated for dependent scan variables (LMA, BF, and IMF) using intra-pig linear and quadratic regressions for the independent variable live weight. Intra-pig linear and quadratic regression coefficients and y-intercepts were analyzed as dependent variables in a mixed model that included fixed effects of line, sex, contemporary group, and the interaction of sex by line. Sire and dam nested within line were included as random effects. Least squares means were evaluated with a mixed model to assess differences of LMA, BF, and IMF between the time periods at each of the six scan periods.

Results and Discussion

A graphic representation of the growth patterns for LMA, BF and IMF are illustrated in Tables 1, 2, and 3. Also, a summary of the time period means for all three traits evaluated are presented in Table 4. Mean deposition rates for LMA, BF, and IMF were not significantly different between the two lines. Pigs sired by CTP boars had more LMA ($P < .05$) than those sired by OTP boars at each of the six scans. Likewise, CTP pigs had less backfat ($P < .05$) than OTP pigs at each scan evaluated. Time period differences for ultrasonically measured IMF percentage were not significant at scan 1; however, pigs sired by CTP boars deposited less IMF ($P < .05$) than pigs sired by OTP boars at the following five scans.

References

Amin, V., D. Wilson, and G. Rouse. 1997. USOFT: An ultrasound image analysis software for beef quality research. A. S. Leaflet R1437. Iowa State University, Ames, IA.

Brorsen, B. W., J. T. Akridge, M. A. Boland, S. Mauney, and J. C. Forrest. 1998. Performance of alternative component pricing systems for pork. J. Agric. Appl. Econ. 302:313-324.

Hayenga, M. L., B. S. Grisdale, R. G. Kauffman, H. R. Cross, and L. L. Christian. 1985. A Carcass merit pricing system for the pork industry. Am. J. Agric. Econ. 67:315-319.

Table 1. Growth patterns of loin muscle area.

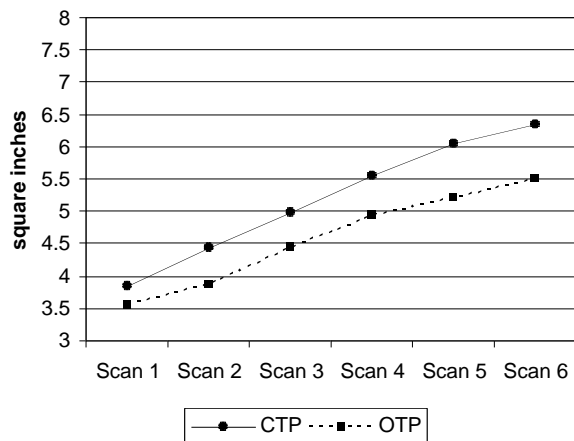


Table 2. Growth Patterns of tenth-rib backfat.

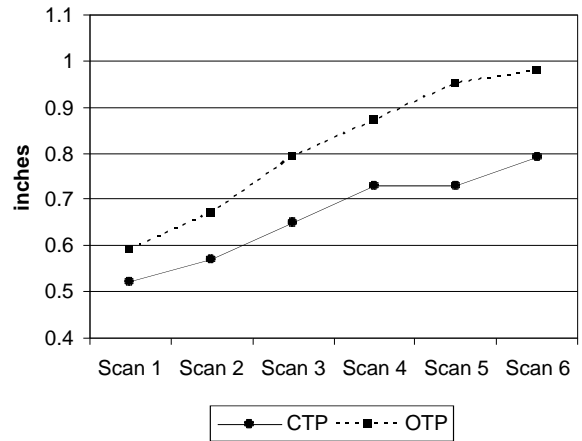


Table 3. Growth patterns of intramuscular fat percentage.

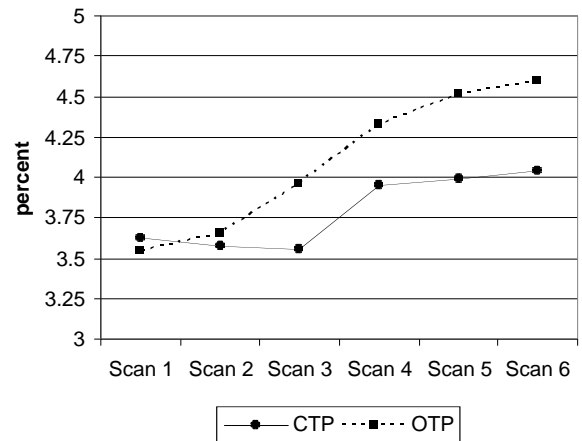


Table 4. Least squares means and standard errors of LMA, BF, and IMF for all six scans.

	Scan 1	Scan 2	Scan 3	Scan 4	Scan 5	Scan 6
LMA, in²						
CTP	3.83 ± .06	4.44 ± .06	4.98 ± .07	5.54 ± .09	6.04 ± .10	6.34 ± .18
OTP	3.55 ± .08	3.87 ± .08	4.44 ± .09	4.95 ± .12	5.21 ± .12	5.51 ± .16
BF, in						
CTP	0.52 ± .01	0.57 ± .02	0.65 ± .02	0.72 ± .02	0.72 ± .02	0.79 ± .04
OTP	0.59 ± .02	0.67 ± .02	0.79 ± .02	0.87 ± .03	0.95 ± .02	0.98 ± .04
IMF, %						
CTP	3.62 ± .07	3.56 ± .08	3.55 ± .08	3.95 ± .10	3.99 ± .10	4.04 ± .20
OTP	3.54 ± .10	3.64 ± .11	3.96 ± .10	4.33 ± .14	4.51 ± .12	4.59 ± .17