RECENT PORK RESEARCH

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Pork carcass research was well covered in the 1953 Conference. Since that date, work has been published primarily on the effects of feeding on carcass characteristics and objective evaluations of carcass leanness. I would first like to cover the effects of feeding on carcass quality.

Bohman, Hunter and McCormick (6) and Kidwell and Hunter (20) reported that alfalfa, as 50 percent of the ration produced leaner carcasses with a higher cut-out value for lean cuts; this feeding regime, however, reduced dressing percentage. Feeding levels of 10 to 40 percent of alfalfa meal, Becker and coworkers (3) at Illinois also observed decreased dressing percentage.

Lately, there has been considerable interest in the effects of antibiotics on certain carcass characteristics. Kelly, Bray and Phillips (19) at Wisconsin reported an increase in backfat thickness as a result of aureomycin supplementation. Although Kline, Kastelic and Ashton (22) at Iowa noted an increase in backfat thickness and lower carcass specific gravity, carcass quality, as measured by length of body, thickness of backfat, specific gravity and percentage of lean cuts, was not appreciably affected by antibiotic feeding. Kropf and coworkers (23) at Wisconsin found that antibiotic feeding had no significant effect on dressing percentage or carcass length. Wallace and others (38) at Florida observed little effect of antibiotic feeding on physical carcass measurements. Clawson, Sheffy and Reid at Cornell (10), Ashton and coworkers (1) at Iowa and Hanson and other Minnesota workers failed to demonstrate any important effect of antibiotic feeding on carcass characteristics. It thus appears that if there are any effects of antibiotic feeding on carcass fatness, the magnitude of the effects are not great.

Other workers have studied the effect of adding fat to swine rations either to mask the effect of soft-pork producing feeds or as a feeding use for various surplus fats. In several experiments, Blumer and coworkers (5) using coconut oil as 10 percent of the ration, sufficiently hardened depot fat of soybean oil-fed pigs. Baird (2) working at Georgia, added 5 percent tallow to a swine ration and produced carcasses with a firmer fat than their controls.

In an attempt to produce leaner pork carcasses, several studies on the effects of high fiber rations were undertaken and are reported. In 1954, workers in Canada (13) and England (11) increased the fiber content of swine rations and thereby increased carcass leanness; however, Teague and Hanson (35) found no correlation between the level of fiber fed and carcass characteristics.

Recently, the effects of hormone treatment on pork carcass characteristics have been studied. Purdue workers (4, 37) administered diethylstilbestrol and methyl testosterone orally and anterior pituitary growth hormone intermuscularly to swine and reported that pigs orally receiving 20mg. of testosterone daily yielded carcasses with a higher percentage of lean cuts. Chemical analysis indicated that pigs receiving the testosterone had 5 percent less fat and 5 percent more lean. Growth hormone injected pigs had longer carcasses, less backfat, more protein and moisture than the control pigs. Bratzler and coworkers (8), however, found no significant differences in carcass characteristics when barrows were implanted with testosterone propionate.

Attempts have been made to regulate carcass composition and development by restricting nutrient intake. Merkel and coworkers (28) at Wisconsin produced carcasses with a slightly higher percentage of lean by limiting feed consumption. Similar results were obtained by Tribble and Pfander (36) of Missouri; Jordan, Beeson and Wiley (18) of Purdue; Lucas and Calder (27) of Great Britain; Wallace and others (38) at Florida and Crampton, Ashton and Lloyd (12) at McDonald College.

Other researchers have studied effects of level and quality of protein on carcass characteristics. Kropf and coworkers (23) in 1955 reported that a ration of 12 percent, low quality protein produced carcasses with a lower percentage of fat cuts and a higher percentage of picnic and Boston butt. Ashton and others (1) at Iowa, using levels of 10 to 20 percent protein, noted a tendency toward leaner carcasses with an increase in protein level. Tribble and Pfander (36) at Missouri observed a 1.6 percent increase in lean cuts and 4.6 percent less fat in carcasses of pigs fed a 16 percent protein ration compared with pigs fed a 12 percent ration. In 1955, Stevenson, Hiner and Ellis (34) obtained similar results using 14 and 16 percent protein rations.

Brady, Zobriskey and Mullins (7) studied the ratio of fat to lean in the ham of pigs at various weights. They observed striking increases in fat tissue and only slight increases in lean tissue of hams of pigs slaughtered at 100, 200 and 300 pounds compared with pigs killed weighing 50 pounds. In other work, Herbert and Crown (17) reported that gilt carcasses produced a higher percentage of ham and loin, larger loin areas and a higher percentage of separable lean in the ham than barrow carcasses. Lasley and Kline (25) noted that splitting and cutting errors may limit the reliability of estimates obtained by evaluation of one half of the carcass. They reported heavier ham, picnic, loin and Boston butt weights from the left half of the carcass and greater loin eye area at the 10th and last ribs for right loins.

Lately, many papers have been published on pork carcass evaluation techniques. Clawson, Sheffy and Reid (10) of Cornell found a high correlation between carcass specific gravity and carcass moisture using the antipyrine dilution method. They postulated that if the water content of the whole, empty body is known, the total composition of the body of swine may be accurately predicted. Based on correlations, Whiteman and Whatley (39) at Oklahoma stated that specific gravity, average backfat thickness and loin lean area are preferred measures of carcass evaluation. They later reported high correlations between carcass and ham specific gravities and that specific gravity was more closely associated with other measures of leanness than was

backfat thickness. These workers reported the following to be important in measuring specific gravity in water:

1. Water temperature is of no practical consequence if within a 20°F. range.

2. Weight in water must be read rapidly since specific gravity becomes less as the meat temperature increases.

3. The amount of exposed surface is not important.

4. Changes in water purity are important if it changes its density.

5. The longer the object is submerged, the less will be the density.

6. When weighing in water, weight to the nearest one hundredth of a pound is sufficient.

Price, Pearson and Benne (33) recently reported that specific gravity of the ham or carcass more nearly measures muscling per se than live probe or backfat thickness. Also, the loin lean area at the 10th rib more closely predicted carcass cut-out than area at the last rib. Pearson and coworkers (29) later reported that the single untrimmed ham, shoulder or loin can be used to estimate the specific gravity of the carcass, however, the ham is preferred due to the ease of handling. Specific gravity of either the carcass or the ham proved superior to backfat thickness as a measure of carcass leanness. The percentage of protein, moisture and ether extract of the ham was reported by Whiteman, Whatley and Hillier (40) to be highly correlated with specific gravity of the lean of the ham. Kline, Ashton and Kastelic (21) observed differences between specific gravity at time of slaughter, after 24, 48 and 72 hours of chilling. Therefore, changes in specific gravity during chilling indicates that carcasses must undergo a uniform chilling time. Liuzzo, Reineke and Pearson (26) have developed an air displacement method of determining specific gravity using two chambers. A highly significant correlation was noted between air displacement and water displacement techniques of determining specific gravity of guinea pigs.

In 1952, the live probe technique was developed and later the lean meter was perfected. In 1957, Pearson and coworkers (31) compared the lean meter and live probe methods on 99 hogs. They noted little difference between them in estimating backfat thickness or carcass cut-out; however, a higher correlation was reported for the live probe with specific gravity, both loin areas and fat trim. Zobriskey and others (42) at Missouri reported backfat measures to be the most accurate estimate of fat yield. The hip probe was the best indicator of carcass leanness. In 1956, Lasley, Hazel and Kline (24) observed a high correlation (0.88) between ham weight and the lean cuts. A squared multiple correlation coefficient of 0.91 for predicting lean cuts was reported for carcass weight, backfat, length, loin eye area and ham weight.

Recently, loin eye areas at the 10th and last ribs, lean are of the ham and fat to lean ratio of the untrimmed loin have been studied as related to carcass leanness. Cahill, Sutton and Kunkle (9) at Ohio State obtained

high correlations between area of Longisimus dorsi at the 10th rib and weight and percentage of primal cuts. However, in 1955, Fredeen, Bowman and Stothart (15) comparing several techniques of estimating carcass leanness, reported a high association of loin eye area at the last rib with percent lean of the ham. They found the percentage of lean in the proximal face of the ham a superior measure of carcass leanness to the loin eye area measure. In 1956, Pearson and coworkers (30) indicated the area of lean at the last rib to have a slightly higher correlation with cut-out than area at the 10th rib.

Although only moderate correlations were found between the fat to lean ratio of the rough loin and carcass cut-out, the fat to lean ratio could be useful if carcass cut-out is unavailable. In 1954, Bratzler and others (8) obtained a correlation of 0.86 between cut-out and area of the rough loin. Working on ham leanness, Fredeen, Bowman and Stothart (14) used the percent lean of the open face of the ham, physical separation and specific gravity of the ham to obtain a reliable estimate of ham leanness. The percent lean in ham face was the most accurate with a predictability of 64 percent. Jordan, Beeson and Wiley (18) using chemical analysis as a criteria, reported the percent of lean cuts to be a more accurate estimate of carcass leanness than average backfat thickness.

In summary, it has been shown that an increase in ration fiber, limited feeding, increased protein levels and testosterone given orally and anterior pituitary growth hormone injected intermuscularly, tend to increase carcass leanness. The inclusion of coconut oil and tallow in rations produces a firmer fat. Differences in weights of cuts and areas of the loin eye have been noted between halves of carcasses.

The more promising and reliable techniques of carcass evaluation are: specific gravity of the carcass or certain cuts, the antipyrine dilution method of estimating carcass moisture, air displacement specific gravity, the live probe and lean meter for backfat thickness and the lean area of the loin at the 10th and last ribs.

Literature Cited

Ashton, G. C., J. Kastelic, D. C. Acker, A. H. Jensen, H. M. Maddock, E. A. Kline and D. V. Catron. 1955. Different Protein Levels With and Without Antibiotics for Growing-Finishing Swine: Effect on Carcass Leanness. J. Ani. Sci. 14:82.

Baird, D. M. 1955. Effect of Tallow, Lecithin and Antibiotics on Growth and Carcass Quality of Drylot Hogs. Proc. Am. Soc. Ani. Prod. 1955.

Becker, D. E., L. J. Hanson, A. H. Jensen, S. W. Terrill and H. W. Norton. 1956. Dehydrated Alfalfa Meal as a Dietary Ingredient for Swine. J. Ani. Sci. 15:820.

Beeson, W. M., F. N. Andrews, T. W. Perry and M. Stob. 1955. The Effect of Orally Administered Stilbesterol and Testosterone on Growth and Carcass Composition of Swine. 1955. J. Ani. Sci. 14:475.

Blumer, T. N., E. R. Barrick, W. L. Brown, F. H. Smith and W. W. G. Smart, Jr. 1957. Influence of Changing the Kind of Fat in the Diet at Various Weight Intervals on Carcass Fat Characteristics of Swine. J. Ani. Sci. 16:68.

Bohman, V. R., J. E. Hunter and J. A. McCormick. 1955. The Effect of Graded Levels of Alfalfa and Aureomycin Upon Growing-Fattening Swine. J. Ani. Sci. 14:499.

Brady, D. E., S. E. Zobriskey and A. M. Mullins. 1956. Differential Tissue Development in Hams During Growth of Swine. Proc. Am. Soc. Ani. Prod. 1956.

Bratzler, L. J., R. P. Soule, Jr., E. P. Reineke and P. Paul. 1954. The Effect of Testosterone and Castration on the Growth and Carcass Characteristics of Swine. J. Ani. Sci. 13:171.

Cahill, V. R., T. S. Sutton and L. Kunkle. 1953. Relationship of Area of Longisimus Dorsi Muscle to Other Carcass Characteristics. J. Ani. Sci. 12:899.

Clawson, A. J., B. E. Sheffy and J. T. Reid. 1955. Some Effects of Feeding Chlortetracycline Upon the Carcass Characteristics and the Body Composition of Swine and a Scheme for the Resolution of the Body Composition. J. Ani. Sci. 14:1122.

Coey, W. E. and K. L. Robinson. 1954. Some Effects of Dietary Crude Fiber on Livestock Gains and Carcass Conformation of Pigs. J. Agric. Sci. 45:41.

Crampton, W. E., G. C. Ashton and L. E. Lloyd. 1954. The Effect of Restricting Feed Intake of Market Hogs During the Finishing Period on the Quality of the Bacon Carcass. J. Ani. Sci. 13:321.

Crampton, E. W., G. C. Ashton and L. E. Lloyd. 1954. Improvement of Bacon Carcass Quality by the Introduction of Fibrous Feeds Into the Hog Finishing Ration. J. Ani. Sci. 13:327.

Fredeen, H. T., G. H. Bowman and J. G. Stothart. 1955. Appraisal of Certain Methods for Evaluation of Ham Quality. Can. J. Agric. Sci. 35:91.

Fredeen, H. T., G. H. Bowman and J. G. Stothart. 1955. Relationships Between Certain Measurements of Ham and Carcass Quality. Can. J. Agric. Sci. 35:95.

Hanson, L. E., E. F. Ferrin, P. A. Anderson and W. J. Aunan. 1955. Growth and Carcass Characteristics of Pigs Fed Antibiotics for Part or All of the Growing-Fattening Period. J. Ani. Sci. 14:30.

Herbert, O. J. and R. M. Crown. 1956. Carcass Quality Characteristics of Market Barrows and Gilts. Proc. Am. Soc. Ani. Prod. 1956.

Jordan, C. E., W. M. Beeson and J. R. Wiley. 1956. Producing Leaner Market Hogs by Different Feed Combinations and Controlled Corn Intake. J. Ani. Sci. 15:869.

Kelly, R. F., R. W. Bray and P. H. Phillips. 1957. The Influence of Chlortetracycline Supplementation of the Ration on Distribution, Quantity and Quality of Fat Deposited in Swine. I. Metabolic Effects in Relation to Carcass Composition. J. Ani. Sci. 16:74.

Kidwell, J. F. and J. E. Hunter. 1956. The Utilization of a High Level of Alfalfa by Growing-Fattening Swine. J. Ani. Sci. 15:1067.

Kline, E. A., G. C. Ashton and J. Kastelic. 1955. Effect of Chilling Time on the Specific Gravity of Hog Carcasses and Upon the Correlation Between Specific Gravity and Measures of Fatness. Proc. Am. Soc. Ani. Prod. 1955.

Kline, E. A., J. Kastelic and G. C. Ashton. 1955. Effect of B_{12}, Cobalt and Antibiotic Feeding on the Composition of Pork Tissue of 100 lb. Pigs. J. Nutr. 56:321.

Kropf, D. H., P. K. Lewis, Jr., R. H. Grummer, R. W. Bray and P. H. Phillips. 1955. Effect of Protein Level, Protein Quality and Chlortetracycline (Aureomycin) Upon Growth, Feed Efficiency and Carcass Composition of Swine. Proc. Am. Soc. Ani. Prod. 1955.

Lasley, E. L., L. N. Hazel and E. A. Kline. 1956. Predicting Lean Cuts From Live Hog and Easily Measured Carcass Traits. Proc. Am. Soc. Ani. Prod. 1956.

Lasley, E. L. and E. A. Kline. 1956. Splitting and Cutting Errors in Swine Carcass Evaluations. Proc. Am. Soc. Ani. Prod. 1956.

Liuzzo, J. A., E. P. Reineke and A. M. Pearson. 1956. An Air Displacement Method for Determining Specific Gravity. Proc. Am. Soc. Ani. Prod. 1956.

Lucas, I. A. M. and A. F. C. Calder. 1956. Response of Different Types of Pigs to Various Levels of Feeding from Weaning to Bacon Weight, with Particular Reference to Carcass Quality. J. Agric. Sci. 47:287.

Merkel, R. A., R. W. Bray, R. H. Grummer, P. H. Phillips and G. Bohstedt. 1953. Influence of Limited Feeding, by Use of High-Fiber Rations, Upon Growth, Fattening and Carcass Characteristics of Swine. J. Ani. Sci. 12:903.

Pearson, A. M., L. J. Bratzler, R. J. Deans, J. F. Price, J. A. Hoefer, E. P. Reineke and R. W. Luecke. 1956. The Use of Specific Gravity of Certain Untrimmed Pork Cuts as a Measure of Carcass Value. J. Ani. Sci. 15:86.

Pearson, A. M., L. J. Bratzler, J. A. Hoefer, J. F. Price, W. T. Magee and R. J. Deans. 1956. The Fat-Lean Ration in the Rough Loin as a Tool in Evaluation of Pork Carcasses. J. Ani. Sci. 15:896.

Pearson, A. M., J. F. Price, L. J. Bratzler, W. T. Magee and J. A. Hoefer. 1957. A Comparison of the Live Probe and the Lean Meter for Predicting Carcass Measurements of Swine. J. Ani. Sci. 16:481.

Pierce, E. A. 1954. The Effects of Rations Containing Antibiotics and Trace Mineral Salt on the Chemical Composition and Physical Characteristics of Pork Carcasses. J. Ani. Sci. 13:338.

Price, J. F., A. M. Pearson and E. J. Benne. 1957. Specific Gravity and Chemical Composition of the Untrimmed Ham as Related to Leanness of Pork Carcasses. J. Ani. Sci. 16:85.

Stevenson, J. W., R. L. Hiner and N. R. Ellis. 1955. Some Effect of Different Levels of Protein and Fiber, and Antibiotic Supplementation on Growth and Carcass Characteristics of Swine. Proc. Am. Soc. Ani. Prod. 1955.

Teague, H. S. and L. E. Hanson. 1954. The Effect of Feeding Different Levels of a Cellulosic Material to Swine. J. Ani. Sci. 13:206.

Tribble, L. F. and W. H. Pfander. 1955. Growth, Feed Efficiency, and Carcass Desirability of Swine as Affected by Level of Protein, Chlortetracycline(Aureomycin) and Feed Intake. Proc. Am. Soc. Ani. Prod. 1955.

Turman, E. J. and F. N. Andrews. 1955. Some Effects of Purified Anterior Pituitary Growth Hormone on Swine. J. Ani. Sci. 14:7.

Wallace, H. D., J. I. McKigney, A. M. Pearson and T. J. Cunha. 1955. Influence of Chlortetracycline on the Growth and Carcass Characteristics of Swine Fed Restricted Rations. J. Ani. Sci. 14:1095.

Whiteman, J. V. and J. A. Whatley. 1953. An Evaluation of Some Swine Carcass Measurements. J. Ani. Sci. 12:591.

Whiteman, J. V., J. A. Whatley and J. C. Hillier. 1953. A Further Investigation of Specific Gravity as a Measure of Pork Carcass Value. J. Ani. Sci. 12:859.

Wingert, F. C., W. J. Aunan, E. F. Ferrin and L. E. Hanson. 1955. A Method of Determining the Composition of Swine Carcasses; and the Effects of Chlortetracycline (Aureomycin) Feeding on Swine Carcass Quality. Proc. Am. Soc. Ani. Prod. 1955.

Zobrisky, S. E., J. F. Lasley, D. E. Brady and L. A. Weaver. 1954. Pork Carcass Evaluation. Mo. Ag. Expt. Stat. Res. Bull. 554.

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DR. STRONG: Thank you, Dick. We appreciate your efforts in bringing together into one spot these results of recent research and the good list of references accompanying your paper.

I would probably be the last one in the room to tell embarrassing stories on the next speaker. (Laughter) We are not exactly ahead of schedule; so to take time to extol his virtues, might not be popular. So let's just consider grading as an evaluation tool.

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