Herdabilities, Genetic, and Phenotypic Correlations Between Carcass and Live Animal Traits in Sheep (Project 583).

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This is part of the North-Central-50 Regional Sheep Breeding Project. The station's project was initiated to determine relationships between various carcass measurements and live animal traits, to estimate heritabilities of those traits and to determine how findings may be applied to selecting and breeding meat-type sheep.

Experimental Procedure

Seventy-six lambs of known breeding born in the fall of 1961 were used. These were sired by eight unrelated Suffolk rams and were on an original flock of 100 western ewes. Various measurements and measurements were obtained on the rams and lambs and several carcass estimations and requirements were obtained on the lambs. Data are being processed on those lambs. The fourth lamb crop from these ewes is being slaughtered now. Data similar to those on previous lamb crops will be reported.

Also during 1962, 12 Hampshire rams, 3-month-old lambs were obtained from eight breeders. The rams were sheared, adjusted to feed and individually fed. Average daily gain and feed conversion were calculated. These rams will be bred to the original flock of 100 western ewes in the winter of 1962. As in previous years, performance and carcass data will be obtained on lambs produced.

Data on the 124 crossbred lambs produced during the two previous years by mating 19 Hampshire rams to the original flock of 100 western ewes have been analyzed. Lambs were scored and classifications calculated between type ram and type ewe on carcass traits and carcass traits. Lambs were sheared, weighed and slaughtered when they weighed 95 or 100 pounds. Simple correlations and heritability estimates (paternal half-sib correlations) were computed on all lamb and carcass traits studied.

Results and Discussion

Performance data on Hampshire ram lambs to be used to breed ewe flock in 1963 and 1964 are reported in Table 16.

The relationship between lamb scores indicated that in selecting a general type of type ram, most evaluation was placed on number, size of lamb, size of leg, and weight of lamb. Size of rear leg was most closely correlated with estimated muscle, and shorter legged rams were believed to be heavier. They were crossbred, and weight of ram was significantly related to the length of the longissimus dorsi muscle of the live ram.

Only a few traits were significantly related with lamb carcass and production traits. Shorter legged rams were preferred to the longer legged rams. Length of the longissimus dorsi muscle in the ram was negatively related to market age of his lambs, and lamb carcass grade, 1 - 2.

The relationship between lamb production traits and their carcass characteristics indicated that lambs heavier at birth gained faster and reached market weight at an earlier age. The carcasses from younger lambs contained less feathering and marbling and consequently graded lower. Rate of gain was positively related to carcass traits indicating leanness in the loin and bone, and negatively related to carcass traits indicating fattiness, decreasing that up to 100 pounds, gain is primarily due to growth rather than to fat production.

Few correlations between lamb measurements and carcass characteristics, even those that were statistically significant, were large enough to be useful effectively in a selection program. However, length of ram was significantly correlated with weight of leg, and weight of leg was significantly correlated with live body weight area. A measure of 23.5, indicating fatness of the carcass, was used to represent the Federal Grading Service. The ram was dissected into fat, lean, bone, overfeed and intercostal muscle. The longissimus dorsi and intercostal muscles were removed for fat analyses by the

Meat

The Relation of Feathering and Overflow Fat of Lamb Carcasses to the Grade of the Lamb, Degree of Marbling, and Market Value of the Lamb (Project 580).

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A total of 279 crossbred lambs were slaughtered over a three-year period at an approximate live weight of 90 pounds. USDA carcass grade and the various muscle fat areas influencing grade were graded to be representative of the Federal Grading Service. The carcass was dissected into fat, lean, bone, overfeed and intercostal muscle. The longissimus dorsi and intercostal muscles were removed for fat analyses by the
Color was determined in the longissimus dorsi and rectus abdominis with a Photoelectric Reflectance Colorimeter. Lean samples were used for taste panel evaluations. Myoglobin concentration, by the Pool Cyano Method, pH, and expressible moisture, by the filter paper method, were also determined in the longissimus dorsi, rectus abdominis, and intercostal muscles.

Thirty-two crossbred lambs were randomly allotted to four treatments of eight lambs each in the color phase of the study. Lot 1 was the control; Lot 2 received 200 mg. sodium nitrite and 10 mg. copper sulfate per pound of creep ration; Lot 3, 10 cc. injections of 1:1000 solution of epinephrine hydrochloride in physiological saline 12 and again at two hours prior to slaughter; Lot 4, 15 cc. injections of the epinephrine solution 12 and two hours prior to slaughter. Lot 3, four lambs were exercised to near exhaustion immediately prior to slaughter on a treadmill; and in Lot 4, four lambs were exercised to near exhaustion with a sheep dor.

Feathered accounted for between 40 and 50% of the variation in USDA grade. Conformation, fat streaking in the flank steak, fat streaking in the other fluid muscles, quantity of external fat, color of lean in the flank steak, overflow fat, and kidney and pelvic fat were all significantly correlated with carcass grade. Marbling and percent fat in the longissimus dorsi muscle were both significantly correlated with grade.

Marbling was the best indicator of quality as evaluated by a taste panel. Feathering was not so good an indicator of quality, even though both the objective and subjective evaluations of marbling and feathering were significantly correlated. Carcass grade was more closely related to juiciness than to any other sensory factor.

Marbling and objective quality evaluations were significantly correlated, suggesting that the use of subjective methods in carcass quality evaluation may be justified. Subjective conformation score was more closely related to the amount and proportion of fat in the carcass than the amount and proportion of lean.

Thickness of fat over the longissimus dorsi muscle appears to be a better indicator of the percent fat, lean, and bone in the carcass, although longissimus dorsi area was highly significantly correlated with weight of lean in the rack. Longissimus dorsi area appears to be influenced more by slaughter weight and chilled carcass weight than any of the other factors studied. Thickness of fat was observed to be highly correlated with internal and external fat deposits in the carcass.

Data from the color phase of the study indicate that color and pH of muscle tissues can be influenced by pre-slaughter treatments, such as subcutaneous injections of high levels of adrenaline and exhaustive exercise. Also, the maturity class may be influenced by factors other than age and stress conditions prior to slaughter. Although the analyses did not indicate significant treatment differences in USDA grade, the final grade was influenced by color of the tissue in some carcasses.