SOME COMPOSITION CHARACTERISTICS OF YOUNG MALE SOUTHDOWN SHEEP FROM LINES SELECTED FOR HIGH AND LOW BACKFAT DEPTH

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ABSTRACT

Thirty-six 6-8 month Southdown ram lambs, 18 each from the high and low-backfat selection lines established at Massey University in 1976, were used in this study to evaluate some carcass composition characteristics.

Animals were randomly allocated within lines within sire groups into three lots of 12 rams each and were housed in metabolism crates on a lucerne chaff diet (1.3 maintenance). After a 10-day adjustment period, an intravenous urea challenge was administered to the animals (120 mg/kg LW) and blood samples were collected before and after the infusion. Rams were slaughtered within 5-7 days of the urea challenge and half-carcasses were separated into soft-tissue and bone.

Differences in body composition between the selection lines were greatest for measures of fatness. They were found to a lesser extent in some other characteristics, especially those that have been reported previously to have positive or negative genetic correlations with backfat depth. Thus, carcasses from the high-backfat line, when compared at the same carcass weights had significantly greater fat depths at C, J, GR, S2 and L3, by 56.7%, 37.1%, 26.1%, 33.3% and 51%, respectively. The high-backfat line group also had significantly greater amounts of kidney fat, higher chemically analysed fat percentage in the carcass soft-tissue, larger intermuscular fat cell diameter, shorter carcasses, lighter heart and liver weights, deeper (B) and narrower (A) cross sections of M. longissimus, and slightly higher ($P < 0.10$) dressing-out percentages.

Moreover, at the same carcass weight, the results of the current study agree well with previous studies in showing that fatter lambs had a higher proportion of the fatter cuts (rack cuts) and a lower proportion of the leaner cuts (shoulder cuts). The high-backfat line animals also had lighter total side bone weight, and shorter lengths and smaller circumferences of the humerus, radius & ulna, femur and tibia bones in the carcasses, which agrees with the negative genetic or phenotypic correlations reported elsewhere between backfat thickness and bone weight, bone percentage or bone length in sheep.

At the same total side bone weight, line effects on bone distribution in the current study were less marked than the previous work with 17-month-old rams, with significantly higher weights of bone in the rack cut, lower weights of bone in the leg cut and lighter humerus and femur bone weights for the carcasses of the high-backfat line. Shoulder cut bone weight in the present study did not differ between selection lines and the difference was in the opposite direction for the total leg bone cut compared with older rams in the previous study.

At the same carcass weight, similar total weight of four muscle in the carcasses of both lines was found, but at the same fat-free soft tissue weight in the side there are few effect on the distribution of muscle. The ratio of muscle to bone weight and muscularity are higher in the high-backfat line when adjusted to the same fat-free soft tissue and total side fat-free soft tissue weight plus bone respectively. These results are consistent with previous studies in showing that the reduction in backfat thickness have little or no effect on total muscle weight, little effect on muscle distribution and lower ratio of muscle to bone weight and lower muscularity.

Line differences in muscle fibre type, proportion and area in the M. semitendinosus were not found in the present study. This result which differs from previous which showed higher proportions of (ßR) red fibres for the high-backfat line.

In general, all moisture measurements showed a slightly higher weight and percentage in the low-backfat line.

The prediction of empty body water percentage from the response to a urea challenge by measuring the rate of urea dilution in the plasma was not very successful. The best extrapolation estimates of zero-time were obtained using a simple exponential model after linear adjustments were made for increasing baseline values.

It is concluded that divergent selection for and against fatness on the basis of weight-adjusted ultrasonically-measured fat depth C in the present lines has led to line differences in 14 kg carcasses such that the fat line carcasses have more fat, less bone and a similar weight of muscle. The urea dilution method as used in this study was found to be unsatisfactory for the prediction of carcass composition.

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LIST OF ABBREVIATIONS

KKCF = Kidney knob and chanal fat
SCF = Subcutaneous fat
IMF = Intermuscular fat
IMFD = Intermuscular fat depot
ßR = Red muscle fibres
αR = Intermediate muscle fibres
αW = White muscle fibres
D_2O = Deuterium oxide
TOH = Tritiated water
LW = Liveweight
EBWT or EBW = Empty body weight
EBH2O = Empty body water weight
US = Urea space
EUCC = Estimated urea concentration change
RRW = Reticulo-ruminal water
H = High-backfat line of Southdown sheep
L = Low-backfat line of Southdown sheep
S_1, S_2, S_3, S_4 = Sires one, two, three and four
S = Standard deviation
d = diameter
v = volume
A = Area
RSD = Residual standard deviation
r = correlation coefficient between x and y
R^2 = coefficient of determination
NS = Not significant
S = $P < 0.10$
* = $P < 0.05$
** = $P < 0.01$
*** = $P < 0.001$