

GROWTH OF ORGAN AND BODY COMPONENTS OF GRAZING GOATS

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SUMMARY

This paper presents a study of body and carcass components of wether goats slaughtered over a liveweight range of 17 to 74 kg. Linear regressions and allometric growth equations are presented describing the growth of body components and organs relative to fasted live weight. Regressions indicate that the carcass makes up 50.4%, carcass fat 14.8%, skin 5.3%, head 6.8%, channel and caul fat 7.8% of each kg increase in fasted live weight. Prediction of body components at 36 kg is compared with published data relating to wild caught feral goats. Relative growth coefficients indicate that fat deposits grew more than twice as fast as live weight. The dressing percentages of grazing goats were similar to those of lambs at live weights of 34 to 54 kg but carcass fat content was lower in the goats.

INTRODUCTION

Within the expanding Australian goat industries increasing emphasis is being placed on the importance of chevon (meat) production in the overall economic viability of the industries. The economics of meat production from goats depends on the yield of saleable products coupled with prices received for each product. Little is known about the yield of saleable products from goats, particularly Australian goats.

Many carcass and organ development studies have been undertaken with meat sheep. We know that the various components of a sheep's body develop at different rates and at different ages and that the development of the lamb can be affected by nutritional regimes (Black 1974; Wardrop and Coombe 1960). In recent years growth studies have focused on the total body in terms of the basic constituents of fat, water and protein (Searle and Griffiths 1976). Detailed accounts of the development of other farm animals have been published e.g. Richmond and Berg (1971) on the pig and Leeson and Summers (1980) on broiler chickens, but relatively little is known about development of the goat. Kirton (1970) has investigated the body components and carcass composition of wild caught male and female New Zealand feral goats while Owen et al. (1978), Devendra (1966) and Wilson (1960) have studied the indigenous goats of Botswana, Malaysia and East Africa respectively.

McGregor (1980) described the growth rates and carcass development of milk fed and pasture fed goats slaughtered between 17 and 46 kg. This paper reports on the growth of internal organs and body components of grazing wether goats slaughtered between 17 and 70 kg fasted live weight.

MATERIALS AND METHODS

Fourteen Saanen wether goats were hand reared to weaning at 14 kg live weight (McGregor 1980) and then grazed at pasture until slaughtered. The goats were slaughtered over a range of live weights from 17 to 70 kg.

Animals were weighed directly off feed and fasted for 24 hrs. They were weighed directly before slaughter and all organs were weighed to the nearest gram in the following order: head, hooves and pasterns (H & P), skin, liver heart, lings and trachea (L & T), diaphragm, spleen, pancreas, caul fat, abomasum

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and omasum (A.O.), rumen-reticulum and oesophagus (R.R.), small intestine, large intestine and caecum, fat and lymph nodes, and carcass. Following chilling overnight at 4°C the kidneys and channel fat were removed and weighed but were retained with the carcass for mincing and analysis. Carcasses were sampled and analysed as described by McGregor (1980).

Data were analysed by regression analysis. The linear regressions have been used to predict organ weights at 36 kg fasted live weight. Relative growth coefficients (RGC) have been estimated using the allometric growth equation $\log y = \log a + b \log x$ where x is the fasted live weight at slaughter, y is the fresh organ weight and b represents the RGC of the organ relative to the fasted body.

RESULTS AND DISCUSSION

Regression constants relating organ growth and carcass components to fasted live weight (FLW) of grazing goats are given in Table 1. All regressions shown are significant at the 1% level of probability. The regression constants indicate that for each kg growth in FLW the carcass increased 504 g, the skin 53 g, the head 68 g, and the total of heart, lungs and liver 31 g. Carcass fat increased 148 g, caul fat 53 g and channel fat 25 g for each kg growth in FLW.

TABLE 1 Regression constants (with SE) relating carcass components to fasted live weight (kg) of pasture fed goats and predicted values of carcass components (kg) at 36 kg fasted live weight.

Component	C	m(SE)	R ²	Predicted values	
				Saanens	Ferals
Carcass ⁺	-1.420	0.504(0.025)	0.97	16.72	16.29
Skin	0.409	0.053(0.006)	0.86	2.32	3.99
Head	-0.080	0.068(0.005)	0.95	2.37	3.29
H & P	0.158	0.021(0.001)	0.98	0.91	
L & T	0.061	0.011(0.002)	0.81	0.46	0.61
Liver	0.197	0.013(0.002)	0.73	0.67	0.74
Heart	0.013	0.007(0.001)	0.82	0.27	
Diaphragm	-0.049	0.0047(0.0005)	0.90	0.120	
RR	0.135	0.019(0.004)	0.67	0.82)	1.27
AO	0.021	0.009(0.001)	0.93	0.34)	
Spleen	0.0108	0.0018(0.0002)	0.78	0.076	0.056
Pancreas	0.0119	0.0011(0.0002)	0.87	0.052	
Kidney	0.047	0.0018(0.0003)	0.83	0.112	0.060
Channel fat	-0.262	0.025(0.005)	0.75	0.64	0.046
Caul fat	-0.739	0.053(0.007)	0.82	1.17	0.11
Carcass fat ⁺	-1.769	0.148(0.025)	0.77	3.56	
Carcass protein	0.170	0.074(0.003)	0.98	2.83	
Carcass fat* ⁺	-1.50	0.304(0.040)	0.84	3.58	0.98
Carcass protein*	0.435	0.144(0.008)	0.96	2.84	3.16

C = linear regression constant, m = linear regression coefficient.

* - these regressions relate the component to carcass weight.

+ - including channel fat.

The predicted value of each component at 36 kg FLW is given in Table 1 'together with estimates for feral bucks from the data of Kirton (1970). The predicted values indicate a slightly higher dressing percentage for the grazing goats of 46.4% compared to 45.3% for the feral bucks and carcass fat contents of 21.3 and 6.0% respectively. Feral animals had heavier skin, head, lungs and liver, and stomachs but smaller kidneys, channel, caul and carcass fat. The higher dressing percentage of the Saanens is probably related to their heavier carcass fat deposits and the greater gut contents of the ferals (probably a result of browsing herbage of low digestibility). Kirton reported feral females as having lower dressing percentages but higher carcass fat contents than males (41.1% and 10% respectively at 36 kg FLW).

Thompson et al. (1979) and Atkins and Thompson (1979) studied the carcass characteristics of over 500 typical pasture fed first and second cross lambs slaughtered at 34, 44 and 54 kg fasted live weight. The lambs dressed out at 43.9, 45.6 and 46% respectively (carcasses excluding channel fat) and the carcasses had 22.7, 29.5 and 34.4% fat. On the same carcass weight basis (excluding channel fat) the goats reported in this paper would dress out at 44.2, 45.0 and 45.5% with carcass fat compositions of 17.8, 19.9 and 21.3% respectively. On a fat free carcass basis these goats had carcasses which were 7.1, 12.3 and 19.3% heavier than the lambs at the respective live weights. In markets where lean meat is required for processing purposes and fat trimming an expensive procedure it is apparent that goat carcasses are more valuable than heavy weight lambs.

Allometric growth equations relating selected body components to FLW are presented in Table 2. Fat deposits and the carcass (probably due to increasing fat deposition) have all grown relative to the fasted body. Indeed channel and caul fat grew 2.6 times faster than FLW. Owen et al. (1978) reported a RGC for carcass fat of 1.99 in wether Botswana goats, which is similar to the 2.28 reported here.

TABLE 2 Allometric growth equations relating selected organs to fasted live weight of pasture fed goats

Component	a	b(SE)	R ²
Carcass ⁺	-0.543	1.132(0.045)	0.98
Carcass fat ⁺	-3.067	2.280(0.278)	0.86
Carcass*	-0.498	1.098(0.032)	0.99
Carcass fat*	-2.920	2.155(0.310)	0.86
Carcass protein	-0.993	0.930(0.038)	0.98
Channel fat	-4.515	2.665(0.401)	0.83
Caul fat	-4.147	2.620(0.307)	0.86

+ including channel fat

* excluding channel fat

It has been suggested (Searle and Graham 1972) that in order to obtain heavy lean lamb carcasses, sheep of large mature weight need to be used. Whether this principle applies to goats remains to be seen. Goats fed high energy diets indoors have produced carcasses with 25.1% fat at 27 kg FLW (McGregor unpublished) so it may be possible by nutritional means to produce fatter goat carcasses to suit particular market requirements.

CONCLUSION

The grazing Saanen wether goats in this study produced heavier and fatter carcasses and larger internal fat deposits but smaller skins and internal organs than the feral male goats studied by Kirton. The dressing percentages were similar to, and carcass fat contents lower than similar sized lambs reported by Thompson *et al.* (1979) and Atkins and Thompson (1979). This resulted in goats having larger fat free carcasses compared to lambs at live weights ranging from 34 to 54 kg live weight. The regressions reported provide a basis for estimating carcass and organ yields from grazing goats but further research is needed to clearly document the growth and development of all types of farmed goats so that a better evaluation of the meat production potential of these animals can be made.

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