

CARCASS AND MEAT TRAITS FROM MEAT GOATS OF DIFFERENT LIVE CONFORMATIONS, AGES, SEXES AND WEIGHTS

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Background

The major demand for goat meat in the U.S. is from ethnic populations, even though goats are raised for meat, milk, and fiber throughout the world. There is also increased interest in goat meat because it is a lean source of meat protein (Zygyiannis et al., 1992). Characterization of goat meat by the amount of potential palatability could provide economic incentives for ranchers and farmers to target specific animals for marketing into meat channels. A major difficulty is in the determination and then the measurement of the parameters related to palatability and cutability of meat (Sim et al., 1985). Hogg et al. (1992) and Johnson et al. (1995) indicated that meat from castrates was less tender than meat from females. Goat meat was judged to have less preferred flavor with increased age in feral goats (Kirtan, 1970). Goat meat was less satisfactory overall than beef, pork, or lamb (Smith et al., 1974). Smith et al. (1978) reported that juiciness of sirloin chops from Spanish-type yearling goats of low quality was less than in chops from goats four to six months of age. A brand identity to insure acceptable palatability of goat meat could be developed if the characteristics and palatability of meat from animals of different ages, weights, sexes, and body conformation were known. This would also stimulate additional supplies of goat meat for growing goat meat-consuming populations and allow introduction of goat meat to a larger portion of the U.S. population.

Objectives

The objectives were to measure live and carcass traits of Spanish-type goats of different ages, weights, sexes, and body conformation scores and to determine the goat meat palatability by consumers with previous goat meat consumption.

Methods

Over a period of three months, 137 Spanish-type goats were selected from ranches and farms in Texas to fit into specific groups for age (kid or yearling), live weight (<20 kg or >20 kg), sex (male or female), and body conformation score (low, medium, or high). Animals were allowed to rest overnight after being transported to the Southern University Meat Technology Laboratory for humane slaughter in accordance with religious Halal practices. Prior to sacrifice, a live subjective conformation score of the relative frame size, muscling, and shape was assigned, body dimensions (rump, loin, and chine length; heart girth; barrel circumference; width at shoulders; heights at withers and hip; chest width and depth) were measured, and a live weight was recorded for each goat. Hot carcass weights were recorded before chilling at 1°C. At 24 hours postmortem, carcasses were evaluated for carcass conformation, estimated kidney and pelvic fat, fatness in the flank (streaking), fatness between the ribs (feathering), and flank color by state meat graders. Relative fat over the ribs was judged by a subjective fat score and the carcass muscling estimated through measurement of the *M. longissimus thoracis* (ribeye) area at the 12th rib. Carcasses were weighed before fabrication into shoulder (split between 5th and 6th vertebra), rib (12th thoracic vertebra), loin (split at anterior edge of hip bone), leg, breast, and flank primal cuts. Primal cuts were vacuum packaged and frozen until analyses. Samples of shoulder chops, leg roasts, and loin chops were used for proximate analyses and sensory testing. Consumer panelists were selected in Plaisance, Baton Rouge, and New Orleans, Louisiana based upon their willingness to serve on a panel and if they had previously consumed goat meat. Meat from the leg was wrapped in foil and oven roasted to 75°C before serving to panel volunteers who ranked each sample for tenderness, juiciness, flavor, and overall acceptability. Data were analyzed by analyses of variance with least squares means separation when probabilities were $P < 0.05$.

Results and discussion

Differences in linear body measurements were small. Lighter weight goats had longer rump (17.6 cm) and loin (20.9 cm) lengths than heavier (12.8, 20.6 cm) goats. Heavier goats had increased heart girth (69.9 cm) and barrel circumference (75.9 cm) compared with lighter goats (64.0, 68.8 cm). Yearling goats had increased heart girth (69.7 cm) and barrel circumference (76.0 cm) compared with kid goats (64.1, 68.7 cm).

The dressing percentages were constant at 48 to 52% and were not influenced by live animal traits. Heavier carcasses and carcasses from females had more kidney and pelvic fat, flank streaking, and rib feathering than lighter carcasses or those from male goats (table 1). Flank color was darker in meat from heavy goats compared with lighter goats and in carcasses from yearlings compared with those from kid goats. Ribeye areas were less in carcasses from goats with low conformation scores compared with goats judged to have medium and high live conformation scores. Live goat and carcass conformation scores were related with a simple correlation of 0.48.



The percentages of each primal cut were more influenced by fabrication method than by animal grouping. The carcasses generally yielded 20-22% shoulder, 7-9% rib, 6.5-8% loin, and 23-26% leg primal cuts. Moisture, protein, ash, and cholesterol in raw and cooked meat showed only minor variations with source. Moisture was 57-64%, protein was 30-35%, ash was 1.3-1.4%, and cholesterol was 47-60 mg/100 g meat in roasted shoulder chops.

Meat from yearling goats was less tender compared with meat from kid goats. Objective measurements of tenderness as shear force were higher and as consumer sensory scores (table 1) were lower in meat from older males of low or medium conformation than meat from goats in the other groupings. Meat from these animals was also less acceptable than meat from younger and higher conformation goats. The sensory panelists did not find differences in juiciness. However, meat from yearling males of low conformation was less flavorful compared with meat from goats of high conformation.

Conclusions

The findings of this study indicated that Spanish-type goats of medium or high conformation resulted in meat with more desirable palatability characteristics. Additional classification of live goats by age, weight, or sex would facilitate marketing, but differences in meat palatability and acceptance were not sufficient for development of branded meat specifications.

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Pertinent literature

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Table 1. Selected carcass and palatability characteristics of goat meat of different sexes, ages, and live conformation scores.

Sex	Age	Live Conform.	Kidney fat, %	Flank streak.	Rib feathering	Flank color	Ribeye area	Shear force	Sensory tenderness	Flavor
Male	Kid	Low	0.47 d	239 c	335 e	167 e	6.12 b	3.43 c	6.13 b	6.48 ab
		Medium	1.14 cd	262 bc	375 de	159 e	6.55 b	3.39 c	6.82 a	6.72 a
		High	1.11 cd	294 b	377 de	153 e	6.49 b	3.44 c	6.23 a	6.31 ab
	Yearling	Low	0.46 d	371 a	530 a	242 a	7.37 ab	4.44 a	5.35 c	5.96 b
		Medium	1.02 cd	337 ab	428 bcd	236 a	7.70 a	4.77 a	5.81 bc	6.25 ab
		High	0.69 d	339 ab	368 de	176 de	7.52 ab	3.17 cd	7.22 a	6.92 a
Female	Kid	Low	1.82 bc	320 b	419 cd	173 e	6.88 ab	3.29 cd	6.32 ab	6.43 ab
		Medium	2.41 ab	355 a	482 abc	170 e	7.23 ab	2.88 d	6.31 ab	6.47 ab
		High	1.94 abc	360 a	442 bc	176 e	7.23 ab	2.67 d	6.80 ab	6.66 ab
	Yearling	Low	1.87 bc	331 ab	454 abc	224 ab	6.58 ab	4.26 ab	6.24 ab	6.25 ab
		Medium	1.57 bc	310 b	386 cde	196 cd	6.72 ab	3.57 bc	6.10 bc	6.54 ab
		High	3.06 a	273 bc	381 cde	199 bc	7.03 ab	3.42 c	6.31 ab	6.46 ab
	s.e.m.		0.48	12	18	6	0.28	0.27	0.27	0.29

a,b,c,d,e Means in the same column with different letters are different ($P<0.05$).

Flank streaking and rib feathering: 300=traces, 400=slight; flank color: 100=A, 200=B maturity; ribeye area: cm^2 ; shear force: kg/cm ; sensory tenderness and flavor: 9=extremely tender, like extremely, 1=extremely tough, extremely dislike.

Means in the same row with different superscripts differ significantly ($P<0.01$).

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