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PROPERTIES OF MINCE RECOVERED BY MECHANICAL SEPARATION OF GOAT CARCASSES AND FRAMES

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Background:

The demand for goat meat is increasing in the U.S. because it is a lean source of meat protein (Zygoyiannis et al., 1992). Processed products such as patties and sausage have been successfully manufactured from goat meat (Dawkins et al., 1997; Dawkins et al., 1998; Yakubu et al., 1997). However, manufacture of boneless products requires separation of lean and fat from bone. The hand deboning of meat from the carcasses of smaller meat species is labor intensive compared to the amount of meat obtained by deboning of larger species. Also, hand deboning has contributed to the development of repetitive motion disorders that may afflict personnel. Mechanical deboning or separation is commonplace in the U.S. poultry industry and for red meats in many countries to recover mince from carcass frames or parts that are difficult to debone by hand. Variations in mince from mechanical separation have been attributed to many factors, including the raw material source, deboner type, and deboner settings (Froning, 1976). Auger and sieve deboners have an auger to feed the tissue past a drum where the mince is recovered from microgrooves (Newman, 1981). A belt and drum deboner has a power driven belt which turns against a counter-rotating perforated drum. The raw materials are forced between the drum and belt and the soft tissue is extruded through the perforations or holes into the center of the drum. Salman et al. (1994b) compared mince from chicken leg quarters with auger/sieve and belt and drum mechanical deboners. Color values of mince from chicken leg quarters were higher with sieve deboning than belt/drum separation and mince texture was coarser with larger drum openings. Mince recovered from mechanical separation of chicken is often used in emulsified or processed meat products. The mince from mechanical separation of goat carcasses could be incorporated into processed goat meat products if the properties are suitable for processing.

Objectives:

This study was conducted to determine the influence of specific parts from goat carcasses and drum perforation size on the composition and properties of the resulting mince.

Methods:

Goats (n=267) from four breeds (Angora, Boer-cross, dairy, and Spanish) from three ages (kid, yearling, adult) were selected from ranches and farms in Texas and Louisiana. Animals were allowed to rest overnight after being transported to the Southern University Meat Technology Laboratory for humane slaughter in accordance with standard inspection practices. Carcasses were chilled at 1°C overnight before evaluation of carcass traits. Ten carcasses weighing less than 13.5 kg and ten carcasses weighing more than 13.6 kg were vacuum packaged and frozen at -24°C for approximately 2 months. Carcasses were thawed at 1°C overnight and split into left and right sides with a power bandsaw. The sides within each weight class were randomly assigned to a carcass or frame group. The intact shoulders were removed from half of the carcasses in each weight group by cutting through the *Pectorales superficiales* muscle and underneath the *Teres major*, *Latissimus dorsi*, and *Pectorales profundus* muscles to give carcass frames. The carcass frames and remaining carcass halves were cut lengthwise into 7.5-cm wide strips with a power bandsaw before mechanical deboning. Half of the frame strips and shoulders were deboned through a Baader 693 separator with a drum having 2-mm perforations and the other half separated through a drum with 5-mm perforations. The carcass strips from the two weight groups were combined and were mechanically separated through the 5-mm drum. The color of the mince was immediately measured for L* (lightness), a* (red/green) and b* (yellow/blue) on a HunterLab LabScan-2 0/45. Samples were vacuum packaged and stored at 3°C for one week before repeating the color measurements. Proximate analyses were determined by AOAC (1990) procedures for moisture, protein, crude fat, and ash. Oxidative stability was determined by thiobarbituric acid reactive substance assays (Guzman et al., 1985). Each treatment was replicated twice. Data were analyzed by analyses of variance with least squares means separation for probabilities of $P<0.05$.

Results and discussion:

Moisture was higher and protein and crude fat were lower in mince from frames deboned through a 2-mm drum compared with 5-mm drum. This difference was not observed with drum opening size with shoulders or carcass halves. Ash in shoulders deboned through 5-mm drum was higher than for mince from other sources. TBARS were higher in mince from frames deboned through 5-mm drum, which corresponded to a higher crude fat content than in other treatments except for shoulders from carcasses weighing more than 13.6-kg separated through 2-mm drum. Color of mince was not different among treatments initially after mechanical separation. After 7 days of refrigerated storage, mince from frames of carcasses weighing less than 13.5-kg tended to be have higher L* values (lighter) and b* values (more yellow) than mince from frames of heavier carcasses. Mince from shoulders had slightly higher b* values (more yellow) than mince from frames. These results would be anticipated since leg muscles contain higher levels of pigment than muscles on the carcass body.

Conclusions:

Mince from different parts of goat carcasses or carcasses of different weights did not have large differences in composition, color initially or after refrigerated storage, or lipid stability when mechanically recovered through 2 or 5-mm drum openings. Other factors such as yield with deboner type and age of goat may be more important factors in determining the properties of mechanically separated goat meat mince.

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Table 1. Proximate composition and lipid stability of mince from different carcass parts and drum perforation sizes.

Cut	Carcass Weight	Drum opening	Moisture, %	Protein, %	Crude fat, %	Ash, %	TBARS, mg/kg
Carcass halves	All	5	71.09	18.71	9.00	1.69	0.54
Frames	< 13.5 kg	5	68.89	17.20	13.85	1.71	1.12
	> 13.6 kg	5	69.08	16.28	14.35	1.57	1.09
Frames	< 13.5 kg	2	74.21	15.03	9.98	1.55	0.46
	> 13.6 kg	2	75.22	15.00	8.70	1.31	0.86
Shoulders	< 13.5 kg	5	67.99	18.22	12.73	1.94	0.37
	> 13.6 kg	5	69.09	16.26	11.97	2.21	0.81
Shoulders	< 13.5 kg	2	67.86	16.30	16.80	1.59	0.29
	> 13.6 kg	2	74.68	17.91	6.57	1.60	0.96
Standard deviation			0.75	0.88	1.07	0.19	0.20

Table 2. Color of refrigerated mince on day 0 and day 7 after mince recovery.

Cut	Carcass Weight	Drum opening	Day 0 L*	Day 0 a*	Day 0 b*	Day 7 L*	Day 7 a*	Day 7 b*
Carcass halves	Both	5	35.59	6.64	6.59	33.74	6.03	6.26
Frames	< 13.5 kg	5	35.46	6.13	7.63	36.02	6.11	7.01
	> 13.6 kg	5	35.87	5.78	7.43	33.17	7.50	6.75
Frames	< 13.5 kg	2	34.59	6.86	7.00	37.81	6.49	7.16
	> 13.6 kg	2	34.62	6.39	7.54	34.81	8.32	6.72
Shoulders	< 13.5 kg	5	35.67	5.94	7.39	35.35	5.45	7.60
	> 13.6 kg	5	36.08	6.51	7.25	39.39	5.64	7.82
Shoulders	< 13.5 kg	2	38.72	8.14	9.18	38.80	6.18	7.79
	> 13.6 kg	2	27.49	6.37	5.10	33.77	6.55	5.45
Standard deviation			1.05	0.77	0.42	1.83	0.59	0.73