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ORIGINAL ARTICLE

Comparison of carcass and meat quality of Black Bengal goat and Indigenous sheep of Bangladesh

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Abstract

The experiment was conducted in Goat and Sheep farm under the dept. of Animal Science, Bangladesh Agricultural University. Body characteristics, carcass composition, proximate meat composition, lipid oxidation and sensory characteristics of Black Bengal goats (n=6) and Indigenous sheep (n=6) on semi intensive management system were analyzed. Carcass characteristics were taken just after slaughtering of sheep and goat. Meat and fat were minced together and sampled for proximate analysis, lipid oxidation. The remaining meat was cooked for descriptive sensory evaluation of color, odor, tenderness, juiciness and overall acceptability by a trained panel. Goat and sheep meat had nearly similar meat qualities. Goats had proportionally smaller carcasses. Sheep yielded more meat as dressing percentage of sheep (sheep=39.85%, goat=37.22%) were higher. Moisture content of goat carcass was higher than sheep. Lipid oxidation was higher in sheep. Sheep meat was tenderer, juicy but goat meat was found to have more acceptable due to its characteristic flavor. It is recommended that sheep meat can be valued as a similar type compared to goat.

Keywords: Meat quality, Black Bengal goat, Indigenous sheep, carcass, sensory.

Introduction

Goat and sheep both are significant to the world economy, where the demand of sheep is slightly more today. Development of small ruminants such as sheep and goats plays a vital role in the rural economy of many developing countries in ASEAN and Asia (MARD, 2010). They contribute as a source of farmers' income significantly and ensure livelihoods security. They also serve as an insurance that minimize crop failures particularly for rural landless, small-scale and marginal farmers of rural community and form a valuable livestock resource that continues to increase through time. Goat and sheep farming require low initial capital and guarantee a high return in two years at earliest; hence, it is an attractive undertaking for rural households. The greatest advantage of rearing of sheep and goats is significant supply of animal protein in the form of milk and meat.

World goat and sheep population is 1005.603 million and 1172.833 million respectively (FAOSTAT, 2013), while sheep population is 1.9 million and goat population 55.6 million in Bangladesh (FAOSTAT, 2013). From this statistics we see a huge population difference between goat and sheep but sheep can easily be maintained under rural conditions because of their ability to adapt to harsh environment, poor management and feeding practices (Sultana *et al.*, 2011).

In Bangladesh goat meat is preferred more. A clear price difference prevails in sheep and goat meat. Compared to goat, lamb meat has higher levels of saturated fatty acids-SFA, monounsaturated fatty acids-MUFA and polyunsaturated fatty acids-PUFA and similar levels of sugars and free amino acids, except for lysine and glycine, which were higher in goat (*Marta et al.*, 2013). Lamb meat had 4 % lower ($p< 0.05$) proteins and 13% higher ($p<0.05$) fat content than goat meats. Sensory panelists scored lamb meat fattier, juicier and tendered than goat meats (Mushi, 2008). Also some studies compared the quality of goat meat and lamb meat to evaluate the organoleptic characteristics and the physical-chemical quality of goat and sheep meats (Sen *et al.*, 2004; Tshabalala *et al.*, 2003; Sheridan *et al.*, 2003). From these studies it is obtained that lamb meat is superior in certain parameters. Goat meat is preferred due to its

characteristic aroma, higher protein and lower fat percentage. In these parameters lamb meat is about similar to goat meat. The objective of the study is to compare sheep and goat meat with a view of increasing sheep production in Bangladesh.

Materials and Method

Study location

"Goat, Sheep and Horse Farm", Department of Animal Science, Bangladesh Agricultural University, Mymensingh-2202

Animal and feeding management

Six sheep and six goats were reared under semi-intensive condition up to two years. Same ration were supplied to both group of animals. The ration was composed of 250 g. concentrate mixture (15.7% CP, 13.2 Mcal energy) and adlibitum grass. The animals were allowed to graze for 6 hours every day.

Body characteristics

Data on conformation traits were generated by taking measurements for body length, height at withers, heart girth, paunch girth, head length, head width, ear length and tail length. The measurements were taken in the morning hours before the animals were taken for grazing. The measurement of morphometric traits were taken as per the procedure followed by Patro *et al.* (2006). Body length was measured from pin bone to point of shoulder of same side, height was measured from lateral edge of the fore claw to the point of wither in standing position, hearth girth was taken as the body circumference around the chest behind the point of elbow, Paunch girth was taken as the body circumference in front of sacrum, head length was measured from the midpoint of pole to point of nose, head width is taken as the distance between two poles and tail length from root of the tail to the tip of tail.

Measurement of carcass and soft organs

After slaughtering, complete bleeding was practiced. Following skinning head, hooves, soft organs, offal were removed. Then carcass weight was taken with an electronic balance. Dressing percentage was measured using the formula; Dressing Percentage (DP) = (Carcass Weight / Live Weight) x 100. Weight of Heart, Liver, Lung, Kidney, and Spleen were taken with an electronic balance and the percentage of these organs to the carcass weight, were measured.

Proximate analysis

Proximate analysis was done to find out dry matter, moisture, crude protein, ether extract and ash according to AOAC (2005).

Measurement of lipid oxidation

The lipid oxidation value of meat was determined as per methods outlined by Buege and Aust (1978) and Ahn *et al.* (1998). Samples (5 g) were homogenized in 15 ml of distilled water using a blender for 1 min. Sample solutions (1 ml) were then transferred into a disposable test tube and 2 ml of 20 mM 2-thiobarbituric acid/15% trichloroacetic acid (TBA/TCA) solution was added. The mixture was vortexed and boiled in a water bath for 15 min and cooled at room temperature for 10 min. After centrifugation for 15 min at 2000 × g, the absorbance of resulting supernatant solution was determined at 531 nm. TBARS values were calculated from a standard curve and expressed as mg malonaldehyde/kg sample (MA/kg).

Sensory analysis

Cooked samples were analyzed for their color, texture, odor, tenderness, juiciness and overall acceptability by 10 trained and untrained panelists. Panelists were selected among department staff and students and trained according to the American Meat Science Association guidelines (AMSA, 1995). Sensory evaluation was carried out in individual booths under controlled conditions of light, temperature and humidity. Sensory qualities of the samples were evaluated after cook using a 5-point scoring method. Sensory scores were 5 for excellent, 4 for very good, 3 for good, 2 for fair and 1 for poor (Rahman *et al.*, 2012).

Statistical analysis

Data were analyzed using SPSS 17 for windows. Parameters were given as mean, standard error, p-value and significance level. We studied differences in parameters between sheep and goat using t tests.

Results and Discussion

Body characteristics

In Table 1, body weight, body length, heart girth, paunch girth, head length, ear length were found non- significant ($p>0.05$) but height at wither, head width, tail length were found significant ($p<0.05$). Here most of the body characteristics are similar.

Measurement of carcass and soft organs

Table 1: Body Characteristics

Parameter	Goat		Sheep		P Value	Significance Level
	Mean	SEM	Mean	SEM		
Body length (cm)	54.66	0.67	56.33	2.18	0.550	NS
Height at Wither(cm)	60.58	2.24	49.25	0.47	0.003	**
Heart girth (cm)	59.66	0.44	60.33	0.51	0.158	NS
Paunch girth (cm)	73.66	0.44	74.08	0.37	0.529	NS
Head length (cm)	19.00	0.70	19.20	0.58	0.704	NS
Head width (cm)	36.08	0.58	42.50	0.42	0.001	**
Ear length (cm)	13.25	0.38	13.85	0.67	0.384	NS
Tail length (cm)	17.00	0.53	14.00	0.29	0.003	**
Body weight (kg)	19.03	0.26	19.35	0.30	0.348	NS

Table 2: Average Carcass weight (kg), Dressing percentage (%), Blood (g), Head (kg)

Parameter	Goat		Sheep		P Value	Significance Lev
	Mean	SEM	Mean	SEM		
Carcass weight	7.48	0.13	7.95	0.19	0.126	NS
Dressing %	37.22	0.88	39.85	0.54	0.024	*
Blood	589.50	17.00	674.67	19.01	0.054	*
Head	1.24	0.02	1.58	0.06	0.004	**

Table 3: Proximate composition of Goat and Sheep meat

Proximate components	Goat (%)		Sheep (%)		P Value	Significance Lev
	Mean	SEM	Mean	SEM		
Dry Matter	23.34	0.02	27.99	0.22	0.031	*
Crude Protein	24.54	0.22	23.65	0.38	0.841	NS
Ether Extract	4.14	0.27	4.03	0.34	0.807	NS
Ash	0.95	0.005	0.90	0.005	1.00	NS

Carcass weight of the two groups were found non-significant (p>0.05) but dressing percentage, blood, head were found significant (p<0.05). Carcass weight was non-significant but dressing percentage was significantly more in sheep. Data in Table 2 showed greater meat yield in sheep. Tshabalala *et al.* (2003) found higher dressing percentages of sheep, associated with significantly heavier carcasses (p<0.05) compared to the goats. Warmington and Kirton (1990) observed similar differences in dressing percentages.

Proximate analysis

In Table 3, dry matter percentage was significantly more in sheep (p<0.05). Goat meat contained little fat and therefore relatively higher proportions of protein and minerals. Crude protein, ether extract and ash percentage were found non-significant between sheep and goat. Tshabalala *et al.* (2003) found that soft tissue (fat and muscle) of goats contained more moisture, crude protein and ash than sheep while sheep had more fat. The same trend was reported by Rowe *et al.* (1999). But the values were significant at p<0.01. At p<0.05 these were insignificant. Therefore it can be said that the nutritional composition of these animals are similar.

Measurement of lipid oxidation

In Fig 1 it is found that the lipid oxidation in the first day of sheep and goat was 0.10 mg MA/kg and 0.08 mg MA/kg respectively, which is non-significant. At day seven the value increases to 1.21 mg MA/kg and 3.40 mg MA/kg kg respectively. But at day seven significant difference were found between the two groups. It is as because sheep meat is higher in fat percentage.

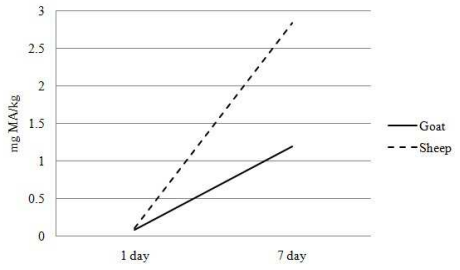

Fig 1: Lipid oxidation

Sensory analysis

Color and odor were found better in goat meat as goat meat has characteristic flavor but sheep meat

was tendered and juicier. Schonfeldt (1989) found the aroma of sheep cuts to be significantly more intense than those of goat cuts. Maximum scientific articles have shown similar results. Sheep patties were more tender, more juicy and greasy and were found to be less chewy (less connective tissue) than goat patties (Tshabalala *et al.*, 2003).

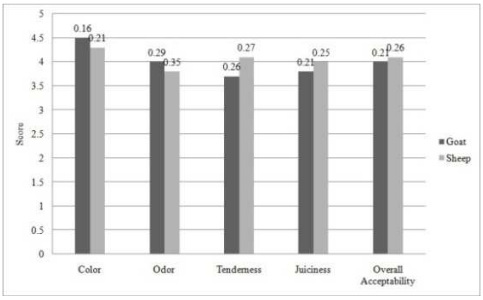

Fig 2: Sensory analysis of goat and sheep meat

Overall acceptability of sheep and goat meat was - similar. But Sheep meat was found to be more juicy, tender and contained less connective tissue residue. Griffin *et al.* (1992) also reported that sheep were more juicy, tender and more palatable compared to goats. No significant differences in the acceptance and preference for goat meat from animals with 2-6 permanent incisors compared to mutton from sheep with similar dentition (Bosman *et al.*, 2002; Simela *et al.*, 2002). In Fig 2 the bar diagram shows that the sensory properties of sheep and goat meat not varied much. Therefore it can be said that sheep meat can be treated similarly as goat meat.

Conclusion

Sheep and goat meat were found nearly similar in meat characteristics and quality. In Bangladesh the value of sheep meat is lower than goat and less popular. From this experiment, analyzing the carcass and meat characteristics it can be concluded that sheep meat can be valued and popularized as goat meat.

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