Effect of Different Feeding Systems on Carcass and Non-Carcass Parameters of Black Bengal Goat

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ABSTRACT : The experiment was conducted to find out the effect of four feeding systems namely; stall feeding, tethering, restricted grazing and grazing on carcass characteristics of Black Bengal goat. Twenty four does of approximately 1 year of age were randomly selected for four treatments of feeding systems having 6 replications in each. Stall fed goats were kept into house all time and adequate amount of natural grass were supplied for *ad libitum* feeding. Goats of tethering group were tethered for eating natural grass from 8 a.m. to 4 p.m. and were transferred after one hour interval for changing the grazing place. Goats of restricted grazing group were allowed for grazing from 8 a.m. to 1 p.m. Goats of grazing group were grazed for 8 a.m. to 4 p.m. Concentrate supplement was given at the rate of 150 g per day per goat for all of the treatment groups. Goats were slaughtered after the experiment of 219 days. Body length and height at wither were significantly higher in stall feeding group than others. Average dressing percentage were 42.18, 39.0, 36.79 and 34.0 for stall feeding, tethering, restricted grazing and grazing groups, respectively. Dressing percentage varied significantly ($p<0.05$) among feeding groups. Caul fat and empty gut weight differed significantly ($p<0.05$) in all of the feeding systems but others non-carcass parameters did not differ significantly. Percentage of dry matter and ether extract were also significantly ($p<0.05$) higher in stall fed groups. In conclusion, among four treatment groups, performance of stall fed goats were most satisfactory and then tethering showed better performance than any other groups. ***(Asian-Aust. J. Anim. Sci. 2002. Vol 15, No. 1 : 61-65)***

Key Words : Carcass, Feeding Systems, Black Bengal Goat

INTRODUCTION

Goat population in the developing countries constitutes nearly 94.3% of the total world's population (FAO, 1990). Asia and africa accounted for 61 and 30 per cent of the total goat population of the world (FAO, 1997). Bangladesh accounted for 34.47 million heads (FAO, 1997) of goat ranks second in terms of meat, milk and skin production representing about 28.0, 23.0 and 28.0 per cent among the total contribution of livestock, respectively (FAO, 1997). It is estimated that more than 90 per cent of goat population in bangladesh comprised the black bengal goats. They contribute very nutritious and delicious meat for human consumption. More than 98 per cent of goats in bangladesh are currently reared in rural areas. In bangladesh goats are reared with different systems of feeding. Devendra and Mcleory (1982) mentioned that in tropical countries the system of goat production can be grouped into 5 categories, namely, extensive production, semi-intensive, tethering, intensive production and integration into crop agriculture. Information on the effect of these feeding systems on carcass characteristics of black bengal goat is yet scanty. With this in view, present experiment was carried out to study the effect of stall feeding, tethering, restricted grazing and grazing systems of feeding on dressing percentage, carcass and non-carcass parameters and body measurement of black bengal goat.

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MATERIALS AND METHODS

The experiment was conducted at the sheep, goat and horse farm under the Department of Animal Science, Bangladesh Agricultural University, Mymensingh, Bangladesh from June, 1999 to February, 2000. The experiment was conducted for 219 days with twenty four Black Bengal does of approximately 1 year of age. Average weight of goats were 7.69 kg. Goats were allowed for three weeks to adapt with the experimental conditions and diet. After adjustment period, 24 goats were randomly assigned for four treatment groups having 6 replication for each. They were stall feeding (T_1), tethering (T_2), restricted grazing (T_3) and grazing (T_4). Goats of T_1 (stall feeding) group were kept fully in intensive condition They were given natural grass for eating *ad-libitum*. The half of the total amount of grass was offered at 9 a.m. and remaining half was given at 2 p.m. In case of group T_2 the goats were tethered at 8 a.m. to 4 p.m. and the place of grazing was transferred at one hour interval upto 4 p.m. A peg and a piece of rope having 20 feet length was used for tethering. The goats of T_3 (restricted grazing) treatment group were allowed for grazing freely from 8 a.m. to 1 p.m. For these animals, concentrate feed mixture was given at 2.0 p.m. and natural grass at 4.0 p.m. The goats of T_4 (grazing) were allowed for grazing from 8 a.m. to 4 p.m.

Natural grass was collected from grazing land. It was a mixture of Carpet grass (*Axonopus compresus*), Ulu grass (*Imperata cylindrica*), Durba grass (*Cynodon dactylon*) and Mutha grass (*Cyperus rotundus*).

All the animals were given 150 g of concentrate mixture consisting of wheat bran, matikalai (*Phaseolus mungo*) bran. Calfostonic was supplied at the rate of 5 g per animal per day as a vitamin-mineral premix. One per cent common salt was added. Supplement allocation was adjusted fortnightly based on live weight gain. Chemical composition of the used feed ingredients is mentioned in the table 1.

Slaughtering procedure and measurements

Goats of each treatment were slaughtered to study the carcass and non-carcass parameters. Live weight, length of body, heart girth, circumference and length of neck, and height at wither of each goat were recorded prior to slaughter. Before slaughtering goats were fasted for whole night. The "Halal" method of slaughtering was followed. By this method goats were bled by cutting throat and then slaughtered by severing the head at its articulation on the occipito-atlantal space. The conventional procedure of flaying was followed. At the time of slaughtering blood was collected in a pail. For complete bleeding thorax of the goat was pressed sufficiently. Then weight of blood was recorded. Slaughtered goats were hoisted by the hocks. The head was removed and weighed. The weight, length, width, and thickness (at butt, belly and shoulder) of skin were recorded.

The entire digestive tract was removed and weighed. Again after removing gut fill, the empty gut was weighed and recorded. Liver, kidney, spleen, lung with trachea, caul fat and renal fat were removed and weighed separately. Warm carcass weight was recorded immediately after completing dressing and evisceration.

Table 1. Chemical composition of feed ingredients used in the experimental diet

Feed ingredients	DM	% DM basis			
		CP	CF	EE	Ash
Matikalai	89	21	7.0	3.0	4.1
Wheat bran	84	13.0	12.0	3.0	6.0
Natural grass	24	9	40.0	1.5	8.2

Chemical analyses

Twenty gram of meat samples collected from thigh region of each animal and were analysed for proximate composition (AOAC. 1984). On the other hand, samples of feed ingredients were also analysed by similar method.

Statistical analyses

All the experimental data were analysed using "MSTAT" statistical programme to compute analysis of variance (ANOVA) for CRD. Duncan's New Multiple Range Test (DMRT) was done to identify significance among the treatment means.

RESULTS AND DISCUSSION

Pre-slaughter body parameters

Effect of different systems of feeding on pre-slaughter body measurements of Black Bengal goats is shown in table 2. The average length of body of stall fed goats is significantly ($p<0.05$) higher than that of others. Hussain (1993) also reported the similar body length of Black Bengal goat valued ranging from 49.3 to 42.2 cm. Average height at wither of stall fed group of goat was significantly ($p<0.05$) higher that of others and lower height was obtained in case of goats reared by restricted grazing. Mean body weight of goats in the present experiment was slightly higher but heart girth and height at wither was lower than the findings of Singh et al. (1981).

Post-slaughter body parameters

Effect of different systems of feeding on carcass yield is shown in table 3. Significantly ($p<0.05$) higher carcass

Table 2. Effect of different systems of feeding on pre-slaughter body measurements of Black Bengal goat

Parameters	Treatments				LSD value and level of significance
	Stall feeding	Tethering	Restricted grazing	Grazing	
Slaughter weight (kg)	12.26±1.17	10.93±1.50	9.90±1.13	9.00±1.41	NS
Body length (cm)	49.50^{a}±0.50	44.33^{b}±1.15	40.50^{b}±4.95	43.25^{b}±2.47	4.741*
Height at wither (cm)	47.5^{a}±1.32	44.0^{b}±1.0	41.0^{c}±1.41	44.0^{b}±0.0	2.234**
Heart girth (cm)	50.83±2.84	50.67±3.06	48.50±2.12	49.0±1.41	NS
Circumfe rence of neck (cm)					
Apex	21.66±2.52	20.00±1.73	20.00±0.00	18.50±0.71	NS
Middle	23.33±2.89	21.67±1.53	21.00±0.00	20.50±0.71	NS
Base	27.66±2.31	24.33±2.52	25.00±1.41	23.50±0.71	NS
Length of neck (cm)	18.66±2.31	15.00±1.00	17.50±2.12	17.50±2.12	NS

Mean with uncommon superscripts at the same row are significantly different at ($p<0.05$)* and ($p<0.01$)**.

Table 3. Effect of different systems of feeding on carcass yield of Black Bengal goat

Parameters	Treatments				LSD value and level of significance
	Stall	Tethering	Restricted grazing	Grazing	
Initial live weight (kg)	7.95±1.25	7.87±1.58	7.3±1.19	7.65±1.22	
Live weight during slaughtering (kg)	12.26±1.17	10.93±1.50	9.90±1.13	9.00±1.41	NS
Carcass weight (kg)	5.17^{a}±0.55	4.27^{ab}±0.64	3.65^{b}±0.49	3.40^{b}±0.14	1.06*
Dressing percentage	42.18^{a}±3.31	39.0^{b}±1.73	36.79^{c}±0.83	34.0^{c}±1.41	4.51*

Mean with uncommon superscripts at the same row are significantly different at ($p<0.05$)* and ($p<0.01$)**.

weight was obtained from the goats of stall feeding group and the lowest was in grazing group. Restricted grazing and grazing group did not differ significantly for carcass weight. They were grazed on the same land. So they were exposed by similar grass and environmental factors except the time of grazing. Restricted grazing goats were allowed to graze 3 hours lesser than the grazing group. Probably this difference of grazing time has no effect on growth performance and finally on carcass weight. Significant ($p<0.05$) variation was observed in dressing percentage among the treatments. Highest dressing percentage (42.18%) was obtained in case of stall fed goats. Koyuncuet et al. (1996) obtained higher dressing percentage (42.2 vs 36.8%) from housed than extensively reared goats. Lower dressing percentage obtained in case of restricted grazing and grazing goats. This was probably due to the effect of management. Sun shine, rainfall and dirty pastures were the environmental factors which may causes several diseases resulting poor growth rate as well as lower dressing percentage.

Effect of different systems of feeding on edible organs is shown in table 4. Only caul fat differed significantly ($p<0.05$) in all of the feeding systems. Caul fat was significantly higher in stall fed group over others but in restricted grazing and grazing group did not differ significantly. For all feeding systems there were no significant difference for weight of head, heart, spleen, liver, kidney, lung+Trachea and renal fat.

Effect of different systems of feeding on non edible by products of Black Bengal goat is shown in table 5. Only empty gut was significantly ($p<0.05$) higher in case of grazing group of goats and significantly ($p<0.05$) lower in case of stall fed goats. Non-edible by products such as weight of blood and skin; length, width, thickness of skin, gut and gut fill did not differ significantly. Weight of gut was significantly higher in goats of tethering and grazing groups, which was another cause of decreasing dressing percentage. The amount of gut fill was higher in tethered and grazing goats. This is probably due to higher roughage intake of those groups of goats. According to Alam and Islam (1991), quality of natural grass supplied in the experiment was very poor and its poor digestibility was observed by Amin and Alam (1990). Moreover, the goats of tethering and grazing groups did not get enough time for rumination like others, therefore, higher amount of gut fill at slaughter might be caused by the slow movement of their digesta. This gut fill had a negative effect on dressing percentage of tethered and grazing goats. Weight of blood, skin, feet, head, pluck, lung and gut were higher in case of grazing and restricted grazing goat which had a contribution to lowering the dressing percentage.

Regression and correlation of different pre and post slaughter body parameters on live weight have been presented in table 6. Correlation (r) observed for body length, heart girth, circumference of neck, weight of skin, length of

Table 4. Effect of different systems of feeding on the edible by-products of Black Bengal goat

Parameters	Treatments				LSD value and level of significance
	Stall feeding	Tethering	Restricted grazing	Grazing	
Live weight during slaughtering (kg)	12.26±1.17	10.93±1.50	9.90±1.13	9.00±1.41	NS
Weight of head (g)	863.33±72.34	771.67±90.05	782.50±152.03	790.0±127.28	NS
Pluck (g)	703.33±83.86	676.67±105.99	630.0±254.56	867.50±95.46	NS
Heart (g)	73.33±11.55	40.0±5.00	30.0±0.00	57.50±38.89	NS
Spleen (g)	48.33±24.66	33.33±5.77	22.50±3.54	45.0±35.36	NS
Liver (g)	435.0±60.62	343.33±47.26	315.0±134.35	467.50±81.32	NS
Kidney (g)	55.00±27.84	50.00±10.0	30.00±14.14	47.50±38.89	NS
Lung+Trachea (g)	190.00±52.92	180.00±36.06	162.50±38.89	190.00±14.14	NS

Mean with uncommon superscripts at the same row are significantly different at ($p<0.05$)* and ($p<0.01$)**.

Table 5. Effect of different systems of feeding on non-edible by products of Black Bengal goat

Parameters	Treatments				LSD value and level of significance
	Stall feeding	Tethering	Restricted grazing	Grazing	
Weight of blood (g)	541.66±38.12	475.00±43.30	500.00±70.71	475.00±35.36	NS
Weight of skin (g)	1223.3±329.29	830±70.00	750±70.71	820±98	NS
Length of skin (cm)	68.00±3.0	65.00±6.0	61.5±2.12	62.50±3.54	NS
Width of skin (cm)	53.66±4.16	51.67±3.79	57.50±14.85	51.00±2.83	NS
Skin thickness (mm)					
Butt	2.32±0.33	2.20±0.20	2.55±0.00	2.08±0.46	NS
Shoulder	1.85±0.66	1.70±0.35	1.60±0.21	1.625±0.11	NS
Belly	1.433±0.28	1.15±0.05	1.175±0.04	1.125±0.11	NS
Weight of feet (g)	278.33±20.21	315.0±50.74	250.0±14.14	317.50±60.10	NS
Gut (kg)	2.767±0.12	3.300±0.90	3.500±0.42	3.100±0.57	NS
Empty gut (kg)	1.10^{b}±0.17	2.10^{a}±0.61	1.75^{ab}±0.35	2.5^{a}±0.35	0.8358*
Gut fill (kg)	1.200±0.20	1.800±0.53	1.750±0.07	1.600±0.21	NS

Mean with uncommon superscripts at the same row are significantly different at ($p<0.05$)* and ($p<0.01$)**.

Table 6. Regression of body parameters on live weight

Parameters	r	a	b
Body length	0.62*	29.52	1.404
Height	0.566^{NS}	34.78	0.903
Heart girth	0.82*	37.02	1.207
Circumference of neck	0.838*	11.10	0.999
Weight of skin	0.736*	-345.29	119.075
Length of skin	0.685*	45.03	1.836
Width of skin	0.349^{NS}	39.0	1.335
Head	0.784*	313.63	45.879
Feet	0.146^{NS}	249.9	3.884
Carcass	0.856*	-0.51	0.443
Heart	0.238*	15.79	3.334
Spleen	0.134^{NS}	20.47	1.636
Liver	0.089^{NS}	337.01	4.947
Kidney	-0.105^{NS}	62.04	-1.404
Lung	0.625*	37.10	13.483
Fat	0.752*	-587.56	68.679
Gut	0.354^{NS}	1.93	0.102
Empty gut	0.096^{NS}	1.49	0.015
Gut fill	0.422^{NS}	0.35	0.094

skin, weight of skin, weight of head, carcass weight, weight of heart, weight of lung, weight of abdominal fat with pre-slaughter body weight were significant ($p<0.05$) where height at wither, width of skin, weight of spleen, weight of liver, weight of kidney, weight of gut, weight of empty gut, weight of gut fill were found non significant (0.05). Live weight increased 1 kg for 1.0404 cm increases of body length. Body length and hearth girth correlates positively with the live weight. Correlation between body weight and body length was approximately similar to the findings of Khan et al. (1992) but the correlation between body weight and heart girth (0.82) is higher than the findings of Khan et al. (1992) who obtained the value, 0.75.

Table 7 shows the effect of different systems of feeding on the meat composition of black bengal goat. Significant ($p<0.05$) variation was observed of feeding system on dm percentage. There was a significant ($p<0.01$) variation on percentage of ether extract due to feeding systems. Shahjalal et al. (2000) reported 28.20 to 33.58% dm of goat meat on different level of protein in diet under grazing management. Here, this experiment indicates the highest dm proportion of meat obtained from stall fed goat. Adverse weather such as raining, fog, acute sun shine etc. During the experiment causes fluctuation of feed intake due

Table 7. Effect of different systems of feeding on meat composition of Black Bengal goat

Parameters	Treatments				LSD value and level of significance
	Stall feeding	Tethering	Restricted grazing	Grazing	
% Dry matter	34.40^{a}±1.74	29.77^{b}±1.81	27.75^{b}±0.64	26.80^{b}±0.85	4.59*
% Crude protein	22.00±0.30	21.43±1.16	20.80±0.57	22.35±0.35	NS
% Ether extract	9.20^{a}±0.7	7.63^{a}±0.84	5.30^{b}±0.28	4.90^{b}±0.57	2.06**
% Ash	0.80±0.2	0.80±0.1	0.65±0.07	0.75±0.07	NS

Mean with uncommon superscripts at the same row are significantly different at ($p<0.05$)* and ($p<0.01$)**.

to irregularities in grazing schedule. In the winter season, the availability and digestibility of natural grass was poor and ultimately the goats could not achieve optimum growth rate. Similarly, stall fed goat had less susceptibility to diseases. Most of them were suffering from pneumonia and fascioliosis. They had to loss a minimum amount of energy for grazing which increases their quality of meat accordingly. The experiment showed that the carcass characteristics was better in case of stall fed goats than tethering, restricted grazing and grazing group of goats. Stall feeding system may be recommended for the farmers involved in rearing of goats in large scale for meat production.

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