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Feeding Different Forms of Ration Including Compound Pellet and Performance of Growing Black Bengal Goat

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Abstract*: The experiment was conducted at the Laboratory of Animal Nutrition Department in* Bangladesh Agricultural University, Mymensingh with growing male *Black Bengal goats. The aim of present study was to observe the effects of feeding different forms of diet on the performance of Black Bengal goat. A ration was prepared in three different forms such as A- green grass + concentrate mixture in conventional form, B- green grass + concentrate in pellet form and C- both grass and concentrate in compound pellet form according to NRC (1981) nutrient requirements. Twenty four Black Bengal goats were randomly divided into three groups (average body weight: A- 9.20 ± 0.56 kg, B- 9.14 ± 0.53 kg, C- 9.05 ± 0.45 kg). Three forms of diet were supplied to three different groups of goat for 100 days. Completely randomized design was followed in the experiment. Data were analyzed using the general linear model (GLM) procedure of statistical analysis software (SAS). The effects of feeding different forms of diet on performance of goat was different. Compound pellet group C showed highest ($p<0.05$) weight gain, total CPI, total MEI, daily MEI 100kg^{-1} body weight and kg^{-1} W$^{0.75}$, improved ($p<0.01$) PCR and DMI from grass, total DMI , DMI d^{-1}100kg^{-1}body weight, DMI d^{-1}kg^{-1}W$^{0.}$75 and also improved ($p>0.05$) FCR among the treatment groups where conventional dietary group A showed lowest performance. Processing of feed improved ($p<0.01$) CP, ($p<0.05$) EE and ($p>0.05$) DM, OM, CF, NFE, ADF, NDF digestibility in group C than other two groups and the lowest digestibility of the parameters was found in group A. Nutritive value of CP and EE was highest ($p<0.01$) and ($p<0.05$) in group B and in group C, respectively. Besides these, highest ($p>0.05$) nutritive value of CF, D value and TDN were observed in group C and NFE in group B. Intake and retention of nitrogen in group C and excretion of nitrogen through feces in group A was highest ($p>0.05$) but through urine in group B was highest ($p<0.05$) among the treatment groups. Highest ($p<0.01$) dressing percentage, ($p<0.05$) meat yield, price of meat, rearing cost and net profit were attained by group C and lowest by group A. From the above observation, it can be concluded that compound pellet feed is best for economic goat production in stall feeding.*

Keywords: *Goat, compound pellet, feeding system, performance*

I. Introduction

Goat is a valuable and promising livestock species used mainly for meat production around the world (Melanie *et al*, 2000) [1]. Goats form an integral component of farming systems in the tropics and subtropics. In Bangladesh goats are used primarily for meat production, but their skin is also a valuable by-product which earns an appreciable amount of foreign exchange. Goats of Bangladesh are generally reared in semi-intensive system. Women and children of rural area are mainly the caretaker of the goats and graze them freely or tethered over large areas of either in natural fellow or harvested fellow land and/or road side. Goats reared in the villages of Bangladesh solely depend on the grasses, which contain higher percentage of crude fibre (Ghosh and Maitra, 1983) [2]. Crude protein and soluble carbohydrates are also higher in young grasses and crude fibre increases as the plant matures. More than 90% of the goat population in Bangladesh is Black Bengal goat. They are well known for their prolificacy and quality meat and skins (Singh *et al.*, 1991 [3] and Singh and Purbey, 1994 [4]). Due to high demand of grain for increased population and urbanization, the fellow land for rearing goat is reducing day by day. The need of per capita meat is 120g/day with a per capita availability of only 21g/day which indicates a clear shortage of livestock product in Bangladesh for human consumption (MoFL, 2007) [5]. Hence, the major challenge for the livestock sector is to ensure a balanced diet through increasing the production of milk, meat and egg for the growing population. Goats can play a vital role to meet up the demand of protein for human consumption through establishing commercial goat farm and improving traditional system of feeding by using economic balanced diet. To popularize goat farming in Bangladesh it is necessary to find out the alternative feeding approach to rear goat in full confinement. Feeding system based on compound pellet feed is one of the promising methods to establish goat industry. The main principles of this system is that all feed

ingredients, both roughage and concentrate, are processed, mixed uniformly and supply to animal *ad libitum*. This system also ensures the supply of balanced nutrients, reduces feed wastage and cost, maximizes production by converting poor quality, non-edible by-products into palatable and highly nutritious feed. Shrinkage of grazing land and chronic feed deficits leaves no choice for farmers than to feed crop residues as such or after processing. Lack of pasture land and/or availability of abundant crop residues and agro-industrial by-products favours stall feeding system of goat. Under these circumstances the present experiment was conducted with Black Bengal goats feeding with three different forms of a diet viz. (i) green grass + concentrate mixture (conventional), (ii) Green grass + concentrate mixture in pellet form, and (iii) both green grass and concentrate mixture in compound pellet form to know the feasible feeding system which may help in developing stall feeding methods for commercial goat production as well as subsistence farming.

II. Materials And Methods

2.1 Selection, collection and processing of feed ingredients

Napier grass (*Pennisetum purpureum*), cultivated in fodder field of Animal Nutrition Department of Bangladesh Agricultural University, was selected as basal feed and cut, chopped and sun dried. The chopped grass was placed in electric drier for uniform drying, ground in electric grinder using 1mm diameter sieve. Maize, wheat, wheat bran, rice polish, mustard oil cake, soybean meal and molasses were purchased from local market with proper attention so that the they are free from dust, fungus and any other extraneous materials. The sample of grass and other ingredients were analyzed for proximate components before using for pellet preparation.

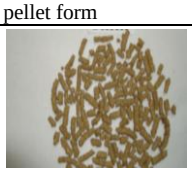
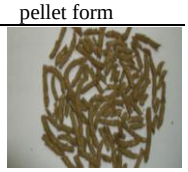
2.2 Preparation of compound pellet

Compound pellet was prepared with the ground grass and concentrate at the ratio of 60:40 (Table 2.1). Water was used @ 40% of the weight of mixed feed for preparation of pellet. The feed ingredients were well mixed and transferred into a pellet machine to prepare compound pellet. The prepared moist pellets were dried. Concentrate pellet was prepared in such way where water was added to the concentrate feed ingredients @ 30% of the weight of concentrates. Then the dried pellets were stored properly.

2.3 Selection and management of goat

Twenty four castrated male Black Bengal goats of six months of age were purchased from local farm. The goats were randomly divided into three equal groups, tagged and housed in a well ventilated pen and allowed two weeks to adapt with the housing condition and experimental diets. The goats were vaccinated against Peste des petits ruminants (PPR) after allowing seven days of quarantined and anthelmintic drug was administered to control gastrointestinal parasites. All diets were formulated following NRC (1981) [6] standard

Table 2.1 Feed ingredients (%) and different forms of experimental diet

Feed ingredients	**Amount** (kgDM)	**Forms of diet**		
		A	**B**	**C**
Napier grass	60	Both roughage and concentrate in conventional form	Roughage in conventional form and concentrate in pellet form	Both roughage and concentrate in compound pellet form
Wheat	4			
Wheat bran	8			
Maize	3			
Rice polish	7			
Mustard oil cake	6			
Soybean meal	9			
Molasses	1			
DCP	1			
Common salt	1			
Total	100	Concentrate in mixture form	concentrate in pellet form	Both roughage and conc. in pellet form
Grass : conc.	60 : 40			

containing 140g CP and 10.28 MJME/kg DM of feed. Goats of group A received green grass and concentrate mixture in conventional form, treated as control. Goats of group B intake concentrate mixture in pellet form and green grass in conventional form. Animals of group C received both grass and concentrate mixture in compound pellet form. The experimental goats were reared for 100 days with identical care and management and thereafter slaughtered to know the dressing percentage and economic assessment.

2.4 Feeding the goats

Napier grass for goats of group A and B was cut, carry and chopped into 10-12 cm immediately before supply at every 8:00 am and 4:00 pm. Concentrate mixture for group A, concentrate in pellet form for B and compound pellet for C were prepared at a time for 10 days. Feed supply was started @ 3kgDM/100kg live weight. Fifty percent of the allocated concentrates were supplied to the respective goats at every 8:00 am. After fifteen minutes fifty percent of green grass was supplied to goats of group A and B. Goats were allowed for grazing from 10:00 am to 12:00 pm, then confined in pen and the rest portion of roughage, concentrate and compound pellet were supplied at 4:00 pm. Grazing length was shortened and feed supply was increased gradually. After seven days, grazing was fully stopped and feed was supplied @ 5kgDM/100kg live weight**.** Every morning before supply of feed, leftover of roughage (green grass), concentrate mixture and compound pellet, if any, were collected from feeder and weighed. Feed intake was calculated by subtracting the leftover from supplied sample.

2.5 Body weight measurement

The initial live weight of each goat was taken at the beginning of the experiment for three consecutive days before offering feed at morning and the mean weight of individual goat was recorded as initial weight. Thereafter, goats were weighed individually at 6:30 am prior morning feeding in every 7 days interval. Final live weight of each goat was also taken for three consecutive days before the end of the experiment of 100 days feeding trial.

2.6 Metabolic trial

At 84^{th} day of experiment, the goats were placed in metabolic crate and allowed 7 days for adaptation. Then a conventional metabolic trial was performed for a period of 10 days to know the digestibility of feed nutrients and retention of nitrogen. Amount of daily feed intake (roughage and concentrate separately), voided feces and excretion of urine were recorded. At beginning of collection period the sample of concentrate mixture, concentrate pellet and compound pellet was collected and the sample of green grass from each group were collected daily for chemical analysis. Leftover from each group, if any, was collected, measured and sampled for proximate analysis. Urine was collected in a bucket containing 6 N H_2SO_4 solutions to protect N loss and total amount of voided urine and feces was collected and measured every morning. Sample from urine and feces were taken and preserved at 4^0c for the determination of total nitrogen.

2.7 Slaughtering and carcass weight

To know the carcass yield goats were slaughtered following Halal method and then allowed for proper bleeding. Warm carcass weight was recorded immediately after complete dressing and evisceration. The dressing percentage was calculated as the carcass weight divided by the slaughter weight then multiplied by 100 according to Devendra (1988) [7].

2.8 Chemical analysis

The samples of feed, leftover and feces were analyzed for nutrient content following the methods of AOAC (2012) [8]. Nutritional analyses were done for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), total ash (TA) and nitrogen free extract (NFE). Digestible crude protein (DCP) was calculated according to the methods of McDonald (1988) [9]. Acid detergent fibre (ADF) and neutral detergent fibre (NDF) content of samples were determined by Fibertec™ system system (VELP Scientifica, EU) following the procedure of Van Soest (1991) [10]. Energy value of whole diet was estimated from digestible organic matter (DOM) as ME (MJ/kg DM) = 0.16 × D value (MAFF, 1984) [11]. D value or the concentration of digestible organic matter in dry matter (DOMD) of the diets was calculated by the gm of digested OM in each kg DM of diet multiplied by 1000.

2.9 Statistical analysis of the data

Data were analyzed as a complete randomized design using the GLM procedure of SAS version 9.1 (SAS Institute Inc., Cary, N.C.) to determine the effects of feeding different forms of ration on growth performance of Black Bengal goat.

III. Results

3.1 Growth performance

As is shown in table 3.1, initial live weight was between 9.05 and 9.20 kg but final live weight of goats of three groups after 100 days of experiment ranged from 13.05 to 15.68 kg where significantly highest (*$p<0.05$)* body weight was attained by the goats of group C fed compound pellet diet and lowest by conventional group A (Table 3.1, Figure 1). Average daily live weight gain in both A and B group was higher (*$p<0.05$*) than

group C (Table 3.1). Dry matter intake from grass was highest in compound pellet group C followed by group B and lowest in group A (Table 3.1, Figure 2). The difference of dry matter intake from grass by group C from other two groups was significant (*p<0.01*) but from the concentrate among the groups was not significant *(p>0.05)*. Total crude protein intake of group C was significantly higher (*p<0.01*) than group A but no significant difference was observed between group A and B or B and C. Daily CPI (100^{-1}kg live and $kg^{-1}w^{0.75}$) among the groups did not differ significantly *(p>0.05)* though the difference between the group C and A was very high (101.6g). Goats of group C had higher (*p<0.05*) amount of total ME and daily ME intake (100^{-1}kg live and $kg^{-1}w^{0.75}$) than conventional group A. Goats of dietary group C showed best feed conversion ratio (FCR) and lowest in group A but the differences among the dietary group was not significant (*p>0.05)*. Protein conversion ratio (PCR) and intake of protein as a ratio of energy (CPI: MEI) was higher (*p< 0.05*) in group A than C.

Table 3.1 Growth performance of Black Bengal goat fed different forms of diet

Parameters	Dietary groups			LS
	A	B	C	
Performance of kids				
Initial live weight (kg)	9.2±0.56	9.14±0.530	9.05±0.450	NS
Final live weight (kg)	13.05^{b}±1.090	14.08^{ab}±0.950	15.68^{a}±0.550	*
Live weight gain, LWG ($kg100^{-1}$)	3.85^{b} ±0.780	4.94^{ab}±0.570	6.63^{a}±0.390	*
LWG ($g\ d^{-1}$)	38.50^{b} ±7.84	49.40^{ab}±5.76	66.30^{a}±3.95	*
DM intake				
DM intake (DMI) from grass ($kg100^{-1}d$)	21.68^{b}±1.04	22.91^{b}±0.98	34.53^{a}±0.95	**
DM intake from concentrate ($kg100^{-1}d$)	20.26±0.58	23.81±0.49	23.02±0.21	NS
Roughage and concentrate ratio	1.07	0.96	1.50	-
Total DMI ($kg100^{-1}d$)	41.94^{b}±2.96	46.72^{b} ±2.91	57.56^{a}±2.43	**
DMI ($kg\ 100^{-1}kgLWd^{-1}$)	3.74^{b} ±0.21	4.05^{b} ±0.09	4.76^{a}±0.08	**
DMI ($g\ kg^{-1}W^{.75}\ d^{-1}$)	118.53^{b} ±6.80	128.34^{b} ±2.98	150.60^{a}±2.77	**
CP intake				
Total CP intake, CPI ($kg100^{-1}d$)	6.90^{b} ±0.48	7.88^{ab}±0.49	8.41^{a}±0.35	*
CPI ($kg\ 100^{-1}kgLWd^{-1}$)	0.610±0.059	0.685±0.015	0.712±0.026	NS
CPI ($g\ kg^{-1}W^{.75}\ d^{-1}$)	19.29±1.85	21.65±0.46	22.50±0.83	NS
ME intake				
Total ME intake ($MJ100^{-1}d$)	344.45^{b}±46.72	414.96^{ab}±43.54	517.23^{a}±42.43	*
ME intake ($MJ\ 100^{-1}LWd^{-1}$)	30.38^{b} ±3.02	35.83^{ab}±2.69	42.52^{a}±1.87	*
ME intake ($MJ\ kg^{-1}W^{.75}d^{-1}$)	0.96^{b} ±0.09	1.13^{ab}±.08	1.34^{a}±0.05	*
Nutrient efficiency for gain				
Feed conversion ratio (FCR)	12.93±2.48	9.83±0.85	8.76±0.47	NS
Protein conversion ratio (PCR)	2.12^{a}±0.40	1.65^{ab}±0.34	1.28^{b}±0.06	*
CPI/MEI (kg/MJ)	0.02^{a} ±0.001	0.019^{ab}±0.001	0.016^{b}±0.0006	*

NS = Non significant, ** *p<0.01*, **p<0.05*, $^{a, b, ab}$ mean values having different superscripts in a row differ significantly, LS = Level of significance

3.2 Apparent digestibility

Digestibility of dry matter and organic matter was insignificantly different *(p>0.05)* among the treatment groups where highest values were observed in group C and lowest in group A (Table 3.2). Crude protein digestibility in compound pellet group C was insignificantly higher *(p>0.05)* than concentrate pellet group B but significantly higher (*p<0.01*) than conventional group A. Ether Extract digestibility in three groups was dissimilar and group C showed higher (*p<0.05*) value than group A.

3.3 Nutritive value

Percent of digestible crude protein (DCP) varied among the dietary groups where significantly highest (*p<0.01*) value was observed in group B and lowest in group A. On the other hand, digestibility of crude fibre among the groups were not differ significantly *(p>0.05)*. Goats of group C showed higher (*p<0.05*) digestible ether extract concentration than conventional group A. There was a variation on digestible NFE, TDN and D value among the treatment groups but the differences was not-significant (*p>0.05*).

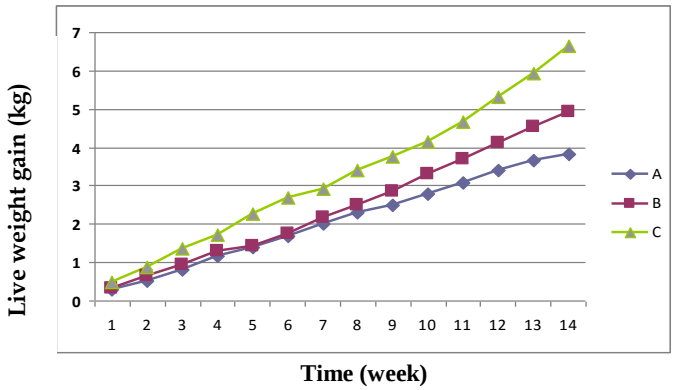


Figure 1 Cumulative live weight gain (kg)

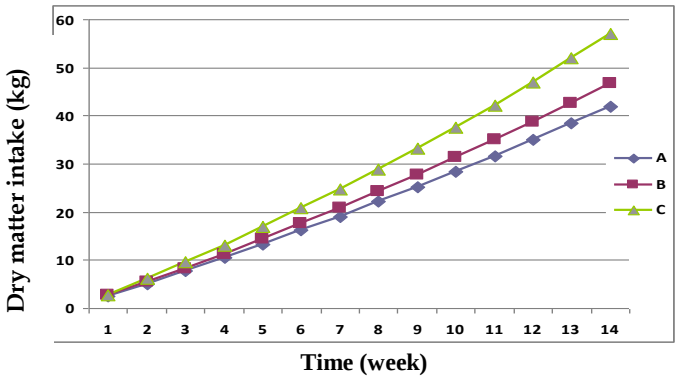


Figure 2 Cumulative dry matter intake by three dietary groups (kg)

3.4 Nitrogen balance

Nitrogen intake (g/d) by goat of three treatment groups was different where group C showed insignificantly highest *(p>0.05)* value and lowest in group A. Insignificantly highest nitrogen outgo in feces was observed in group B and lowest in group C. Significantly highest (*p<0.05*) nitrogen excretion through urine was observed in group B than group A and C. The lowest nitrogen retention was observed in group A and insignificantly highest *(p>0.05)* in group C.

Table 3.2 Apparent digestibility of nutrients and nutritive value of the diets

Nutrients	Dietary groups			LS
	A	B	C	
Digestibility (%)				
Dry matter (DM)	50.45±4.854	55.30±4.441	58.65±2.851	NS
Organic matter (OM)	56.44±4.190	61.34±3.764	63.85±2.496	NS
Crude Protein (CP)	59.15^{b}±3.019	68.78^{a}±2.504	74.93^{a}±1.73	**
Crude Fibre (CF)		50.00±6.344	58.52±2.860	NS
Ether Extract (EE)	52.01^{b} ±4.202	61.79^{ab}±3.795	66.45^{a}±2.31	*
Nitrogen Free Extract (NFE)	58.24±3.871	62.23±3.546	62.53±2.584	NS
Acid Detergent Fibre (ADF)	49.87±6.483	51.41±6.069	58.53±2.861	NS
Neutral Detergent Fibre (NDF)	47.45±6.878	50.00±6.335	56.06±3.030	NS
Nutritive value				
Crude Protein (CP)	9.79^{b}±0.318	12.05^{a}±0.521	10.95^{ab}±0.253	**
Crude Fibre (CF)	8.50±1.466	8.30±1.282	11.76±8.574	NS
Ether Extract (EE)	1.68^{b}±0.120	1.93^{ab}±0.120	2.08^{a}±0.072	*
Nitrogen Free Extract (NFE)	30.46±4.207	32.81±1.675	31.54±1.303	NS
TDN	52.76±3.956	57.52±3.673	58.94±7.373	NS
D value	50.46±36.75	55.03±32.53	55.83±23.95	NS
N balance (g/d)				
N intake	9.49±1.034	12.06±0.721	12.30±3.429	NS
Fecal N excretion	3.59±0345	3.74±0.332	2.99±0.565	NS
Urinary N excretion	2.47^{b}±0.355	3.73^{a}±0.326	2.91^{ab}±0.824	*
Nitrogen retention	3.43±1.100	4.59±0.883	6.40±0.155	NS

NS=Non significance; ** *p<0.01; *p<0.05*, $^{a, b, ab}$ mean values having different superscripts in a row differ significantly, LS= Level of significance

Table 3.3 Economics of feeding different forms of diet to Black Bengal goat

Attribute	Dietary groups			L S
	A	B	C	
Carcass traits				
Weight gain (kg)	3.85^{b}±0.78	4.94^{ab}±0.57	6.63^{a} ±0.39	*
Dressing %	49.3^{b}±0.37	49.98^{b}±0.146	51.92^{a}±0.257	**
Meat yield (kg)	1.89^{b}±0.381	2.46^{b}±0.291	3.44^{a}±0.099	*
Economics of feeding				
Price of meat (@ Tk. 430/kg)	812.96^{b}±164.03	1059.78^{b}±125.64	1478.59^{a}±85.713	*
Price of skin, head, GI tract	300	300	300	-
Total return (Tk.)	1112.96^{b}±164.03	1359.78^{b}±125.64	1779.59^{a}±85.713	*
Price of feed (Tk./kg)	11.88	12.13	12.38	-
Total feed cost (Tk.)	618.11±37.830	718.04±47.013	734.20±33.377	NS
Labour cost (Tk.)	200	200	200	-
Other cost (Tk.)	25	25	25	-
Pellet preparation cost (Tk./kg)	-	0.25	0.50	-
Total rearing cost (Tk.)	843.11^{b}±37.830	949.43^{ab}±47.434	990.35^{a}±34.782	*
Cost/ kg weight gain (Tk.)	226.08^{a}±57.855	200.64^{ab}±18.165	150.93^{b}±8.109	*
Cost /kg meat yield (Tk.)	446.08^{a}±116.400	385.94^{ab}±36.457	287.81^{b}±15.186	*
Net profit (Tk.)	**269.63^{b}±134.269**	**410.34^{b}±95.250**	**789.48^{a}±79.522**	*

NS=Non significant ** *p<0.01; *p<0.05,* $^{a, b, ab}$ mean values having different superscripts in a row differ significantly, LS= Level of significance

3.5 Economic assessment

Goats of compound pellet group C showed significantly higher (*p<0.01*) dressing percentage than other two groups (Table 3.3). Meat yield in group C was higher (*p<0.05*) than group A and B. Total price of meat was also higher (*p<0.05*) in group C than other two groups. Average feed cost and total rearing cost of three treatment groups significantly differed (*p<0.05*) and the cost tended to increase in goats received compound pellet. Cost of per kg weight gain and meat production was statistically significant (*p<0.05*) among the groups. Net profit in three different dietary groups was dissimilar and significantly highest (*p<0.05*) net profit was observed in group C and lowest in group A.

IV. Discussion

There is very limited information on the performance of Black Bengal goats fed different forms of diet, particularly comparison of compound pellet diet with conventional one under stall feeding system. In this experiment ingredients as well as nutrients composition of the ration was same but the difference was on diet preparation and the form of supply. The roughage portion of diet A and B was supplied to the goats daily as green grass but in compound pellet group C grass was supplied as dried and ground form in pellet. Same amount of feed was supplied to the goats of three groups (@ 5% of live weight on DM basis). Goats of group A and B refused daily a portion of supplied grass and group A also refused a portion of concentrate mixture. So, intake of total DM and DM from roughage and concentrate by goats of three groups was different and the highest amount of intake was observed in group C (Table 3.1) which resulted highest amount of nutrient intake by group C followed by group B and A. Dry matter intake (kg/100 kg live weight and g/kg$W^{0.75}$) by goats of dietary group C was highest which may be due to grinding of grass, well mixing with concentrate and supplied in the form of pellet. This finding agreed well with the findings of Reddy and Raghavan (1987) [12]. Researchers (Sharma and Singhal, 1986 [13]; Reddy, 1988 [14] and Reddy and Reddy, 1989 [15]) reported that grinding and pelleting of low quality roughages and other agro-industrial by-products helps in increasing the palatability of the feed. Grinding reduces refusal and wastage of more unpalatable portion of roughages (Reddy, 1988) [14]. Knaus *et al*. (1999) [16] observed average daily forage DMI was increased from 12.8 to 18.6kg when grass clover and whole plant maize were fed in the pellet form. Crude protein and ME intake was increased in compound pellet group C and concentrate pellet group B with the increase of DM intake (Table 3.1). Processing of feed ingredients resulted highest *(p<0.01)* dry matter intake consequently highest (*p< 0.05*) total CP and ME intake in compound pellet group C. Daily intake of CP and ME by goat per 100kg live weight and per kg$W^{0.75}$ was also enhanced by processing of feed. So highest CP and ME intake was observed in compound pellet group C followed by concentrate pellet group B and lastly in group A. As a result highest weight gain was attained in compound pellet group C and lowest in conventional group A. Similar result was found from a trial conducted by Dahlan *et al*. (2000) [17] on growth rate of goats fed processed oil palm frond (OPF) based three diet; fresh, ensiled and pellet. The trial indicated that DM, nutrient intake and digestibility increased (*p<0.05*) in pelleted diet resulting live weight gain of goats than other diets. Pelleting of mash ration improved daily weight gain and reduced feed per kg gain in lambs and kids compared to conventional ration (Reddy and Reddy, 1991a [18]; Reddy and

Reddy, 2003 [19]). Comparatively higher weight gain was the cause of better *(p>0.05)* conversion of DM *(p<0.05)*, CP and ME in group C than group B and A. Increased palatability and digestibility of pellet rations together with efficient utilization of absorbed nitrogen may be responsible for increased average daily gain and feed efficiency in pellet fed animals (Nicholson *et al*. 1996 [20]; Reddy and Reddy, 1999 [21]; Reddy *et al.*, 2002 [22]). Pelletization of complete feed improved digestibility of nutrients (Reddy and Reddy 1984 [23], 1994 [24]; Reddy and Reddy, 2003 [19]). It is established that as roughage : concentrate ratio increase, the digestibility of roughage declines and hence its intake (Hango *et al*., 2007) [25].

Higher percent *(p<0.01)* of digestible crude protein in group B might be due to higher proportion of concentrate intake than roughage (Table 3.1) which introduced higher percent of protein in diet and higher *(p>0.05)* digestible NFE in group B was also obtained due to higher concentrate in diet of the group that contained higher percent of NFE. Other digestible nutrients such as CF, EE, and TDN and D value were highest in group C where digestible coefficient of those nutrients was higher. In similar studies pelleting significantly increased the DCP and TDN content (Ibrahim *et al*, 1998 [26]; Reddy *et al*., 2002 [22]; Reddy and Reddy, 2003 [19]). From the nitrogen balance study it is indicated that the grinding of grass and mixed with concentrate in pellet had positive effect *(p>0.05)* on nitrogen retention in the body of goats as well as higher (*p<0.05*) growth rate of goats of group C. Higher amount of nitrogen intake in group C resulted from higher amount of DM intake. Lowest excretion of nitrogen through feces of goats in group C than that of other groups was the effect of processing of feed which helped for maximum digestion of feed and resulted higher *(p>0.05)* nitrogen retention in the group C. Increased nitrogen retention due to pelleting was reported (Ibrahim *et al.*, 1998 [26]; Reddy *et al.*, 2002 [22]) and this was attributed to processing effect (Reddy and Reddy, 1983 [27]) and another reason being the availability of matching supply of energy to rumen microbes on the ration. Similar result was also found by Reddy and Raghavan (1987) [12].

Goats reared on compound pellet diet had, on average, significantly better performance in economic point of view. From the study it implied that higher slaughter weight results higher dressing percentage. So goats of compound pellet group C produced highest amount of meat consequence highest amount of sale price from meat was obtained in group C which is in agreement with the findings of Utley *et al*. (1973) [28] and Bush *et al*. (1978) [29]. Cost for preparation of pellet and higher *(p<0.01)* feed intake resulted insignificantly higher *(p>0.05)* feed cost and significantly higher *(p<0.05)* total rearing cost in compound pellet group C than conventional groups A. Comparatively better feed conversion ratio resulted lower *(p<0.05)* meat production cost in compound pellet group C consequently highest *(p<0.05)* profit was obtained in compound pellet group C followed by concentrate pellet group B then conventional group A.

V. Conclusion

Examination of the economic efficiency of compound pellet on growth performance in comparison to conventional feeding system showed best performance in weight gain, feed conversion, protein conversion, digestibility of nutrients, carcass weight and lean meat production in stall feeding system followed by goats fed diet where concentrate portion was supplied in pellet form. Net profit, which is the main consideration for any commercial enterprise was highest in group C. Goat rearing with complete compound pellet feeding will make the farm as a successful commercial enterprise in stall feeding system.

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