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Effect of Sources of Nitrogen Supplementation on Growth and Reproductive Performance of Female Goats and Sheep under Grazing Condition

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Abstract: The effect of different sources of nitrogen supplementation on growth and reproductive performance of female goats and sheep under grazing condition. In addition to grazing, goats were allocated at random to three approximately iso-nitrogenous and iso-energetic supplemental diets. Average daily dry matter intake and live weight gain did not differ significantly both in goats and sheep received various sources of dietary N supplementation. The digestibility of all proximate components and nutritive value of supplemental diets was similar in goats and sheep. The results of the present studies showed that supplemental diets containing either soybean meal or till oil cake increased the growth rate of female goats and sheep. Therefore, feeding of goats and sheep with supplemental diet may be suggested under grazing condition.

Key words: Female goats and sheep, nitrogen supplementation, growth, reproductive performance, grazing

Introduction

Among domestic animals, goats and sheep play a significant role in the subsistence economy of Bangladesh. More than 80% of goats and sheep in Bangladesh are found in villages where they are generally raised by poor farmers and distressed women with very little capital inputs (FAO, 1991). According to BBS (1990) goats are reared by the small, marginal and landless farmers (55%) followed by medium (35%) and large farmers (10%). The country has 34.6 million goats and sheep representing 58.8% (96.8% goat alone) of total livestock population and yielding 129 thousand metric tons (97.7% goat meat) of meat annually (FAO, 1999). The goat ranks second in terms of meat, milk and skin production representing about 38, 25 and 28% among the total contribution of livestock, respectively in Bangladesh (FAO, 1997). Goat ranks the first position in terms of total livestock population in Bangladesh of which more than 90% comprises the Black Bengal goats (Husain *et al.*, 1988). Goats are mostly raised with tethering and free grazing systems of feeding and organized stall-feeding is practically nil in Bangladesh (Huq *et al.*, 1990). But during adverse climatic conditions, goats are housed providing stall-feeding with tree leaves, natural grasses and kitchen wastes (Husain, 1993). According to Saadullah (1990) due to shortage of grazing land, goats in our country are suffering from malnutrition and goat production in the villages by traditional husbandry system is often characterized by poor growth rates, high mortality and low reproductive rates. In village environments, the productivity of goat may be increased by improving the nutrition (Parawan and Ovalo, 1985; Pathasarathy, 1986; Pathasarathy *et al.*, 1984; Muri and Jordao, 1991). Sheep, another useful animal, can easily be maintained under rural conditions because of their ability to adapt to harsh environment, poor management and feeding practices. Bangladesh have glorious prospect of sheep production because of their certain favourable characteristics. As for example, they effectively utilize more arid type of grazing; frequently utilize feed materials what would otherwise be wasted; excellent scavengers for cleaning fields and destroying weeds. They produce more liberally in proportion what they consume; produce two products, lambs and wool. Most of the farmers rear their goats and sheep in extensive system in ranged condition without any supplementation. This system of production causes reduced growth rate and poor reproductive performance, which in turn results in severe economic loss. Some previous studies (Kochapakdee *et al.,* 1994) have reflected the importance of concentrate supplementation on growth and productivity of goats and sheep. These authors also reported that grazing alone might not be sufficient for optimizing the live weight gain and wool production. If scavenging type of rearing can be supplemented with minimum amount of concentrate then the level of production may be increased at the minimum cost. Little effort have been made for the overall improvement of goats and sheep rearing in the country. The present experiment was designed to investigate the effects of different sources of protein supplementation on the performance of female goats and sheep under grazing condition.

Materials and Methods

Location and climatic condition: The study was conducted at the Bangladesh Agricultural University, Animal Nutrition Field Laboratory, Mymensingh for a period of 142 days during August to December 2000. The region has a subtropical humid climate with an average annual rainfall of 238.4 cm and have a dry period extending from October to March with marked incidence of rainfall during July to September. Temperature varies from 12 to 33^{0}C with relative humidity of 71 to 90% (Weather yard, 1999, BAU station).

Pasture establishment and management: A grazing land of 0.13 ha (9 × 17 sq.m) was enclosed with fence and pasture was established between April and August 2000 for raising goats and sheep. Naturally grown grasses available in the grazing field were collected and then those were identified as *Axonopus compresus* (Carpet grass), *Panicum repens* (Banchina grass), *Imperata cylindrica* (Ulu grass), *Cynodon dactylon* (Durba grass) and *Cyperus rotundus* (Mutha grass). Legume such as (maticoli) *Phaseolus mungo* seeds were sown at the rate of 30 kg/ha during April 2000.

Animals and their Management: Twelve female goats aged about 12 months with an average weight of 13.1 kg and six female sheep aged about 10 months and weighing on average, 9.9 kg were used in this experiment. The animals were ear tagged and were allowed to adapt to the experimental conditions for two weeks prior to the commencement of the study. Faeces from each goat and sheep were examined for parasitic infestation and the affected animals were drenched to control intestinal parasites (Teramid, Ralnax and Deminth, Reneta Ltd.) during the preliminary period of the experiment. Thereafter, faeces were examined periodically and proper medication was given to the affected animals.

Animals were grazed for a specific period (7.0 h daily) during day and were housed overnight in individual pens in a well-ventilated house. A skilled shepherd was engaged to rear the animals throughout the experiment.

Table 1: Experimental design and dietary treatments

	Goats			Sheep	
Block	Diet A	Diet B	Diet C	Diet A	Diet B
I	17.5	17.2	16.7	17.5	13.5
II	14.5	16.0	15.4	7.3	11.2
III	13.5	11.8	12.0	6.5	5.3
IV	7.0	7.8	8.5	-	-
Mean	13.1	13.1	13.2	9.8	10.0

Diet A = Soybean meal containing supplemental diet
Diet B = Till oil cake containing supplemental diet
Diet C = Urea containing supplemental diet

Identical housing, health care and sanitary measures were provided to all the goats and sheep.

Experimental design: Twelve goats were blocked into four groups and six sheep were blocked into three groups based on initial live weight. In addition to grazing, goats in each block were then assigned at random to three feeding regimes (diet based on either soybean meal, till oil cake or urea) and sheep in each block were randomly assigned to two feeding regimes (diet based either soybean meal or till oil cake) shown in Table 1.

Experimental diet and method of feeding: Goats and sheep were allowed to graze a renovated grazing land for 7 h daily (08:00 to 12:00 and 14:00 to 17:00 h). Three supplemental diets were formulated using available feed ingredients and differed only in the sources of nitrogen supplementation such as soybean meal (diet A), till oil cake (diet B) and urea (diet C). The supplemental diets were approximately iso-nitrogenous and iso-energetic with an estimated ME concentration of 11.96 MJ and CP content of 203.6 g kg^{-1} dry matter. The ingredient composition and supplemental diets are shown in Tables 2 and 3, respectively. Supplemental diet was fed daily at night after placing animals in individual pens. Fresh water was available all the times.

Yield and chemical composition of pasture grass: Herbage yield and proportion of different grasses in the grazing land were estimated at two occasions (October 2000 and December 2000) during the experiment. In every case three patches of 0.25 sq.m were made randomly in the grazing land and grasses within the patches were harvested at the ground level using sickle and then weighed. The mixed grasses were then separated and weighed individually to estimate yield and proportion of each grass available in the grazing land. The collected grass samples were then subjected to chemical analysis following the methods of AOAC (1980).

Grazing intake: Dry matter (DM) and nutrient intake by goats and sheep under grazing condition were estimated by animal weight gain method. In this method animals of each species were weighed individually before access to grazing land. The animals were then allowed for grazing and weighed at 2 h intervals from 08:00 to 16:00 h and average weight of each animal after grazing was recorded. The difference between two weights before and after grazing (i.e. weight gain) was considered as the amount of herbage consumed by individual animals of each species.

Live weight and feed intake: The animals (sheep and goat) were weighed initially in two consecutive days and the average weight of individual animals was recorded and thereafter at 14 days intervals throughout the experimental period. During the time of kidding weights of individual kids and dam were also recorded. Final live weight of each animal was taken as an average weight of two consecutive days after completion of 126 days experiment. The animals were weighed at 07:30 h prior to access to the grazing land.

In addition to grazing a measured quantity (350 g) of supplemental diet was fed to each animal when they were housed in individual pens. Feed refusals were collected every morning before allowing them to grazing and then weighed to determine daily the total feed intake.

Digestibility of different diets: A conventional digestion trial was conducted for 5 days at the end of the experiment to assess the utilization of different dietary nutrients by goats and sheep. During this period, animals were kept in individual pens and were fed with a measured quantity of grass every morning collected from the grazing land in which animals were raised during growth trial. In addition, supplemental diets (350 g/animal/day) of different nitrogen sources were fed to animal. Daily feed refused and feces voided by each goat and sheep were collected and weighed. Feed intake of individual animals was also recorded. All possible precautions were taken to avoid mixing of faeces with urine. A representative sample of faeces (5%) from each goat and sheep was stored at -20^0C and fresh faeces sample were dried for 24 h in an oven to determine dry matter content. Representative feed, refusal and faeces samples collected over the period of 5 days were processed and subjected to chemical analysis (AOAC, 1980).

Reproductive performance: Adequate management was provided for grazing animals (in the grazing land and in the stall) to detect oestrus. The oestrus symptoms in goats were identified by visual observation and animals in oestrum were served by Black Bengal buck towards the end of estrus period. But in case of sheep, a ram was kept along with the ewes throughout the experiment to allow natural service, as it was difficult to detect oestrus in sheep. Age at puberty, date of service, gestation period litter size, sex and birth weight of kids/lambs were recorded in time.

Statistical analysis: Data for growth performance, dry matter intake, digestibility, herbage yield, proportion and chemical composition of grasses were analyzed (ANOVA) using 'MSTAT' statistical program to compute analysis of variance (ANOVA) for a randomized complete block design (RCBD) and significant differences tested using least significant difference (LSD).

Results and Discussion

Herbage yield: The results showed that the average yield of fresh grass, DM, OM and CP did not differ significantly ($P<0.05$) between October and December (Table 4). However yield of these (fresh grass, DM, OM and CP) recorded in October were tended to be higher than those observed in December. The probable reasons for higher yields in October than December indicated that the environment was suitable to uptake the nutrients from the soil resulting in the higher growth of herbage. Tareque and Saadullah (1988) reported that the yield of grasses was observed to vary in different seasons and their availability was not uniform all over the year. They also reported that the plant grew slowly in winter and comparatively rapid in summer. The variation of yields may be due to differences of soil fertility and other macro and micro environmental factors. It should be noted that herbage yield was not uniform in different locations of the grazing land. As a result, DM yield ranged from 0.55 to 0.48 kg/sq. m. and OM yield ranged from 0.40 to 0.42 kg/sq. m. and CP yield ranged from 60.5 to 49.9 g/sq. m. in the grazing land irrespectively of harvesting time between October and December.

Proportion of different grasses: The fresh grass yield of *Phaseolus mungo* was higher ($P<0.05$) than all other grass species. However, yield of *Cyperus rotundus, Axonopus compressus* and *Imperata cylindrica* almost same and higher than *Panicum repens* and *Cynodon dactylon.* It is evident that DM concentrations (weight/weight) of *Phaseolus mungo* was the highest (30.31%) in the grazing land followed by *Cyperus rotundus* (21.79%), *Imperata cylindrica* (17.17%), *Axonopus compressus* (16.79%) *Panicum repens* (8.62%) and then *Cynodon dactylon* (5.25%). The proportion of OM yield ran in parallel to DM yield (Table 5).

The proportion of CP and NFE yields in *Phaseolus mungo* was higher ($P<0.05$) than all other grass species and this was followed by *Cyperus rotundus, Imperata cylindrica, Axonopus compressus, Panicum repens* and *Cynodon dactylon.*

Chemical composition of different grasses: The results showed that *Imperata cylindrica* and *Cynodon dactylon* contained significantly ($P<0.05$) higher DM than that of other grasses (Table 6). The average DM content of *Phaseolus mungo* was lower ($P<0.05$) than that recorded for other grasses. In contrast the mean value of CP content of *Phaseolus mungo* was significantly ($P<0.05$) higher than that observed in other grasses. However, *Axonopus compressus, Panicum repens, Imperata cylindrica, Cynodon dactylon Cyperus rotundus* and

Table 2: Chemical composition of feed ingredients used in formulating Supplemental diets

	Chemical composition (g/100g DM)						
Ingredients	CP	CF	EE	Ash	NFE	OM	*ME (MJ/kg DM)
Rice polish	11.3	9.67	17.8	9.67	41.9	80.8	13.8
Wheat bran	15.3	13.9	5.50	6.64	46.1	80.6	11.3
Soybean meal	46.0	7.95	0.56	8.20	25.5	80.0	12.8
Till oil cake	35.7	5.49	5.49	17.2	27.3	74.0	11.9
Urea	292	-	-	-	-	-	-

* = ME values of feed ingredients were taken from Ranjhan (1980)

Table 3: Ingredient compositions of different supplemental diets

	Supplemental diets (kg/100 kg diet)		
Ingredients	Diet A	Diet B	Diet C
Rice polish	20.0	18.3	24.6
Wheat bran	60.0	54.8	73.7
Soybean meal	20.0	-	-
Till oil cake	-	27.0	-
Urea	-	-	1.78
Composition:			
DM (g/100 g sample)	87.9	88.7	86.3
CP (g/100 g DM)	20.6	20.2	20.2
Estimated ME (MJ/kg DM)	12.1	11.9	11.9

Diet A= Soybean meal containing supplemental diet   Diet B = Till oil cake containing supplemental diet
Diet C = Urea containing supplemental diet   #ME values were estimated from the ME values of feed ingredients (Ranjhan, 1980)

Table 4: Average herbage yield during the experimental period

	Months			
Parameters	October	December	SED	Level of significance
Fresh grass (kg/sq.m)	2.58	2.12	0.22	NS
Dry matter yield (kg/sq.m)	0.55	0.48	0.09	NS
Organic matter (kg/sq.m)	0.48	0.42	0.04	NS
Crude protein (g/sq.m)	60.5	49.9	7.7	NS

Table 5: Proportion of different grasses (g/sq.m) in the grazing land

	Grass species							
Parameter	*Axonopus compressus*	*Panicum repens*	*Imperata cylindrica*	*Cynodon dactylon*	*Cyperus rotundus*	*Phaseolus mungo*	SED	Level of significant
Fresh grass	172.0b	75.0c	152.0b	39.0c	188.0b	370.0a	14.100	**
Dry matter (DM)	31.5c	16.2d	32.2c	9.86e	40.9b	56.9a	1.760	**
Organic matter (OM)	27.9d	14.7e	30.1c	8.99f	35.5b	52.8a	1.000	**
Crude protein (CP)	3.41bc	1.62d	3.00c	1.00d	4.51b	11.2a	0.428	**
Crude fibre (CF)	7.22c	4.69d	17.7a	2.28d	8.8bc	10.1b	0.953	**
Ether extract (EE)	0.57b	0.91ab	1.14a	0.11c	0.81b	1.05ab	0.112	**
Nitrogen free extract (NFE)	16.7c	8.20e	15.9d	5.59f	21.4b	24.4a	0.265	**
Ash	3.62b	1.48cd	2.23c	0.87b	5.36a	4.29b	0.905	**

Table 6: Chemical composition of different grasses

	Grass species								
Parameters	*Axonopus compressus*	*Panicum repens*	*Imperata cylindrica*	*Cynodon dactylon*	*Cyperus rotundus*	*Phaseolus mungo*	Mixed grass	SED	Level of significant
DM (g/100g sample)	18.3c	21.6b	23.8a	25.3a	21.8b	15.4d	21.8b	0.592	**
Chemical composition (g/100 DM):									
CP	10.8b	9.55b	9.30b	8.71b	9.37b	21.0a	10.1b	1.655	**
CF	22.9b	29.0ab	31.1a	23.1d	21.5d	28.3b	25.9c	0.99	**
EE	1.80b	1.20b	3.54a	1.20b	1.98b	1.86b	1.25b	0.34	**
NFE	53.0b	50.7b	49.2c	56.7a	52.4b	42.5d	50.3b	1.42	**
Ash	11.5a	9.14b	6.91c	8.85bc	13.1a	7.53bc	11.9a	0.79	**
OM	88.5c	90.9b	93.1a	91.2b	86.9c	92.5ab	88.1c	0.72	**

abcdef = Data having dissimilar superscripts differ significantly (P<0.05)
SED = Standard error difference,   NS = Non significant

Table 7: Digestibility of different diets in goats and sheep under grazing condition

	Goats					Sheep			
Parameters	Diet A	Diet B	Diet C	SED	Level of significant	Diet A	Diet B	SED	Level of significant
Apparent digestibility (g/g)									
DM	0.74	0.76	0.67	0.05	NS	0.73	0.71	0.04	NS
CP	0.90	0.95	0.90	0.02	NS	0.88	0.90	0.03	NS
CF	0.69	0.69	0.64	0.08	NS	0.67	0.68	0.04	NS
EE	0.71	0.76	0.69	0.16	NS	0.70	0.68	0.13	NS
NFE	0.70	0.72	0.67	0.08	NS	0.74	0.73	0.04	NS
OM	0.84	0.80	0.73	0.06	NS	0.75	0.77	0.60	NS
Nutritive value (g/100 g DM)									
DCP	15.5	15.9	15.1	0.527	NS	14.59	15.50	0.50	NS
'D' value	76.4	70.4	64.8	5.47	NS	68.5	66.4	5.25	NS
ME (MJ/kg DM)	12.2	11.3	10.4	0.88	NS	11.0	10.57	0.839	NS

Table 8: Effect of sources of nitrogen supplementation on growth performance of goats and sheep

	Goats					Sheep			
Parameters	Diet A	Diet B	Diet C	SED	Level of significant	Diet A	Diet B	SED	Level of significant
Initial live weight (kg)	13.30	13.00	13.20	0.72	NS	10.30	10.40	1.21	NS
Final live weight (kg)	17.00	17.20	15.70	1.98	NS	15.50	14.60	2.54	NS
Total live weight gain (kg)	3.68	4.17	2.49	1.49	NS	5.17	4.17	0.64	NS
Average live weight gain (g/d)	29.20	33.10	19.70	11.80	NS	41.00	33.10	5.10	NS
Grass DM intake (g/d)	97.90	132.00	130.00	21.30	NS	148.00	139.00	22.1	NS
DM intake from supplemental diet (g/d)	280.00	272.00	269.00	5.76	NS	277.00	275.00	9.78	NS
Total DM intake (kg)	47.60	50.80	50.30	2.98	NS	53.40	52.20	3.84	NS
DM intake (g/d)	378.00	403.00	399.00	23.70	NS	424.00	414.00	13.5	NS
DM intake (g/kg075/d)	54.50	55.10	48.60	9.39	NS	67.90	64.80	6.14	NS
Feed conversion efficiency (DMI/weight gain)	12.90	12.20	20.30	10.40	NS	10.30	12.50	2.00	NS
Protein intake (g/d)	67.90	69.10	68.40	2.70	NS	73.00	70.80	4.30	NS
Protein conversion efficiency (CPI/LWG)	4.22	2.50	4.03	1.83	NS	1.89	2.20	0.31	NS

Table 9: Effect of sources of nitrogen supplementation on live weight gain and DM intake goats and sheep

	Goats					Sheep			
Parameters	Diet A	Diet B	Diet C	SED	Level of significant	Diet A	Diet B	SED	Level of significant
Live weight grain (g/d)									
0-28 d	29.5	10.7	12.1	10.70	NS	18.4	26.2	16.4	NS
29-56 d	27.2	33.9	26.8	9.80	NS	59.5	13.1	19.1	NS
57-84 d	30.8	29.5	27.7	12.40	NS	58.9	47.6	19.0	NS
85-112 d	24.1	58.0	45.5	23.90	NS	32.1	46.4	0.98	NS
113-126 d	19.6	17.0	-15.2	17.30	NS	15.5	15.5	12.9	NS
Dry matter intake (g/d)									
0-28 d	179.0	189.0	180.0	12.20	NS	191.0	182.0	16.4	NS
29-56 d	171.0	193.0	187.0	12.20	NS	197.0	198.0	22.2	NS
57-84 d	189.0	207.0	202.0	12.70	NS	227.0	217.0	23.4	NS
85-112 d	204.0	214.0	208.0	13.70	NS	234.0	207.0	30.0	NS
113-126 d	207.0	217.0	220.0	8.51	NS	233.0	224.0	25.7	NS

Table 10: Effect of different protein source on reproductive performance of goats and sheep

	Goat			sheep	
Parameters	Diet A	Diet B	Diet C	Diet A	Diet B
No. of does or ewes per treatment	4	4	4	3	3
No. of pregnant animals	1	-	1	1	1
Gestation period	144	-	142	-	-
Litter size	2	-	2	2	1
No. of kids/ lamb died after birth	-	-	-	-	-
Percentage born alive	100	-	100	100	100
Survival rate %	100	-	100	100	100
Average birth weight of each kid/lamb	0.65	-	0.6	0.58	0.65
Average live weight gain of kid/lamb g/day	78.52	-	68.02	55.00	61.00
Sex of kid/lamb	2 female	-	1 male 1 female	2 male	1 female

SED = Standard error of difference

NS = Not-significant

Diet A = Soybean meal containing supplemental diet

Diet B = Till oil cake containing supplemental diet

Diet C = Urea containing supplemental diet mixed grass contained similar amount of CP. These values are higher than those reported by Ranjhan (1980) who observed that *Cyperus rotundus* and *Imperata cylindrica* contained 8.9 and 3.8% CP, respectively. The CF content in *Panicum repens* (29.0%) and *Imperata cylindrica* (31.1%) was significantly (P<0.05) higher than that observed in other grasses. However, in an Indian report, Ranjhan (1980) indicated that *Imperata cylindrica* contained 39.7% CF which is higher than the present report. The CF content of *Axonopus compressus, Cynodon dactylon, Cyperus rotundus* was almost similar and had the lowest amount of CF than other grasses. The EE content of *Imperata cylindrica* was higher (P<0.05) than that of other grasses. However, *Axonopus compressus, Panicum repens, Cynodon dactylon, Cyperus rotundus, Phaseolus mungo* and mixed grass contained similar amount of EE. *Cynodon dactylon* contained higher (P>0.01) amount of NFE than that reported for other grasses. *Phaseolus mungo* contained the lowest amount of NFE than all other grasses. *Axonopus compressus, Cyperus rotundus* and mixed grass contained significantly (P<0.05) higher mineral matter than that of other grasses. However, ash content among *Axonopus compressus, Cyperus rotundus* and mixed grass was similar. The OM content of *Imperata cylindrica* and *Phaseolus mungo* was significantly higher (P<0.05) than that of other grasses. However OM content between *Imperata cylindrica* and *Phaseolus mungo* did not differ significantly. *Axonopus compressus, Cyperus rondus* and mixed grasses contained almost similar amount of OM. Norton, (1984) reported that the nutritive value of browse varied considerably, not so much with season, mainly with species which is similar to the present findings.

Digestibility and nutritive value: The digestibility of all proximate components of supplemental diets was similar (P>0.05) in goats and sheep (Table 7). It is evident that the source of N-supplementation did not difference the nutrients digestibility in goats and sheep. The results indicated that either DM and OM digestibility was lower for diet C than that for diet A or diet B. Similar report for DM digestibility was reported by Alam and Akbar (1989). They indicated that DM and CP digestibility (g/g) of native grasses were 0.72 and 0.64, respectively in goats. The average digestibility (g/g) of DM (0.75) and OM (0.82) in goats were apparently higher than those reported for DM (0.72) and OM (0.76) in sheep. Previous studies (Salim, 1999) indicated that the digestibility (g/g) of herbage DM and OM were 0.61 and 0.71 in goats and 0.56 and 0.70 in sheep. The results of the present experiment showed that the digestibility of DM and OM of herbage increased both in goats and sheep due to N supplementation. The results also showed that CF digestibility (g/g) tended to be higher in goats (0.75) than in sheep (0.72) irrespective of feeding different sources of protein supplementation. This appears to be a general agreement that goats digest cellulose more efficiently than sheep and cattle, particularly when low quality diets are fed (Norton, 1984). This physiological adoption to low quality diets may be explained by the capacity of goats to retain feed particles in the rumen longer than sheep or cattle and to maintain higher levels of ruminal ammonia, essential for the effective breakdown of cellulose by micro-organisms in the rumen. Nutritionally, goats are usually treated as being the same as sheep, on the assumption that the digestion of herbage diets is similar in both species (Doyle *et al.*, 1984). Similar to digestibility, nutritive value of different diets was almost similar (P>0.05) in goats and sheep and there was no difference between two species (Table 7). The digestible organic matter ('D' value) for diets A, B and C were 77, 70 and 65%, respectively in goats and that for diets A and B were 69 and 68% in sheep. The results showed that the average 'D' value for diets A and diet B was 74% in goats and 69% in sheep which indicated that 'D' value is tended to higher in goats than sheep. In the present study ME contents (MJ/kg DM) of diets A, B and C were 12.3, 11.2 and 10.4, respectively in goats and that for diets A and B were 11.0 and 11.9 in sheep. Salim (1999) reported that the ME contents of grass were 9.96 and 9.76 in goats and sheep, respectively. Similarly, Shahjalal (1997) reported that 'D' value and DCP contents of roadside grasses were 55.8 and 5.4%, respectively and that of ME concentration was 8.9 MJ/kg DM. The present results also showed that ME of herbage increased both in goats and sheep due to N supplementation.

Growth performance of goats and sheep: The average live weight gain of goats given diets containing soybean meal (A), till oil cake (B) and urea © was 29.2, 33.1 and 19.7 g day^{-1}, respectively. The feeding of protein (soybean meal or till oil cake) supplemented diet resulted in faster growth rate than non-protein nitrogen (urea) supplemented diet (Table 8). This can be explained by the fact that SOM or TOC provided amino acids that are essential for synthetic process and there by live weight gain. In a previous study, Hadjipanayiotou *et al.* (1991) suggested that urea fed goats tended to grow faster than goats fed groundnut meal. The average live weight gain in sheep fed diets A and B was 41.0 and 33.1 g day^{-1}, respectively which indicated that growth rate on soybean meal supplemented diet (A) was non-significantly higher than that of till oil cake supplemented diet (B). This may be due to presence of higher amount of undegradable dietary protein (UDP) in the soybean meal than that in till oil cake. The results showed that the average live weight gain of goats and sheep received supplemental diets containing different sources of nitrogen did not differ significantly (p>0.05). Previous studies with British Angora goats (Shahjalal *et al.,* 1992) also indicated that the source of nitrogen supplementation had no effect on live weight gain. The average live weight gain in goats and sheep given protein supplemented diets was 31.2 and 37.0 g day^{-1}, respectively which indicated that there was a trend to increase growth rate in sheep than that in goats. In contrast, Hadjipanayiotou ***et al.*** (1991) reported that protein sources (fish meal vs soybean meal) resulted in different gain responses in Damascus kids than in Chios lambs. Male kids in contrast to lambs grew faster and had better feed conversion efficiency on the fish meal supplemented diet.

Average daily dry matter intake (DMI) was 378, 403 and 399 g for goats given diets A, B and C, respectively and that for sheep was 424 and 414 g on diets A and B, respectively. Similarly, feed conversion efficiency (DMI/LWG) and protein conversion efficiency (CPI/LWG) recorded for goats and sheep were not significantly different for dietary nitrogen supplements (Table 8). These results are in agreement with the previous report of Shahjalal ***et al.*** (1992). They found that the source of nitrogen supplementation (urea + sulphur, white fish meal or soybean meal) had no effect on DMI, feed and protein conversion efficiencies in British Angora goats. Concentrate DM intake, by goats and sheep was similar for diets containing different protein supplements. However, herbage DM intake under grazing condition was higher in sheep than goats. As a result, sheep consumed higher amount of total DM (concentrate + grazing) than goats and consequently higher amount of nutrient became available to sheep that may have reflected towards growth performance of sheep.

The mean values for live weight gain and dry matter intake (DMI) of goats and sheep at different growth intervals between 1 and 18 weeks (Table 8) did not differ significantly (P>0.05) at different growth intervals of the experiment. The live weight gain was the highest between 85 and 112 days of the experiment in goats given different sources of nitrogen supplement but in sheep the highest growth rate was recorded between 57 and 84 days (Table 8). The dry matter intake g/day was gradually increased with the advancement of the experimental period in both species on different protein supplementation (Table 9).

Reproductive performance: Reproductive traits of female goats under three feeding regimes and those of sheep raised under two feeding regimes have been presented in Table 10. Average gestation length recorded in this study was 143 days for goats. This is in agreement with the report of Husain (1993) who indicated a gestation length of 144.9±0.29 days for Black Bengal goat. Data for gestation length was not available for sheep because it was difficult to detect their estrus symptoms. Similarly goats fed till oilcake supplemented diet did not show any estrus symptom and consequently no reproductive parameter was available. Soybean meal supplemented diet (A) resulted in higher birth weight of kid (0.65 kg) than that for urea supplemented diet C (0.60 kg). In contrast sheep fed soybean meal supplemented diet (A) gave lower birth weight of lamb (0.575 kg) than till oil cake diet (B) (0.65 kg). In general, average birth weight of kid (0.63 kg) recorded in the experiment was lower than that of previous report (0.93 kg) of Husain ***et al.*** (1988). The reason for this variation may be due to difference in dam weight, number of kids born, health and nutritional status. Average live weight gain was influenced by birth weight of kids and lams reflected in Table 10. But kids of group A gained highest live weight due to supplementation of soybean meal. So, live weight of mother had effect on the birth weight of kids and lambs, which enhanced for kids supplemented by soybean meal.

It may be concluded that concentrate supplementation (either soybean meal or till oil cake) increases the growth rate of female goats and sheep under grazing condition. So to increase the productivity of female goats and sheep, supplemental diet might be suggested in the rural areas of Bangladesh.

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