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Effect of Protein Supplementation to Grazing on Growth and Reproductive Performance in Female Goats and Sheep

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Abstract: The effect of protein supplementation was studied on growth and reproductive performance in female goats and sheep under grazing condition. Ten does and six ewes aged about 15 months and weighing on average 13.9 and 14.4 kg respectively were studied for 112 days. Animals were allocated to two feeding regimes [low protein (LP), 168g and high protein (HP), 208g per kg DM] according to live weight. Supplemental feed contained wheat bran, rice polish and soybean meal (LP-43: 43:14 & HP-35: 35:30, 300 g/d). HP diet non significantly ($P > 0.05$) decreased the DM intake in goats. Moreover, significantly ($P < 0.05$) increased live weight gain was observed in goats receiving HP diet. In contrast, sheep receiving the HP diet significantly ($P < 0.05$ to $P < 0.01$) improved DM intake and live weight gain compared with those given LP diet. Average birth weight of kids (0.85 vs. 0.75 kg) and lambs (1.10 vs. 0.83 kg) were higher in both species that received the HP diet than those given the LP diet. Subsequently daily average live weight gain in kids received the HP diet was higher (62.4 vs. 45.4 g/d) than those fed the LP diet up to weaning. These results showed that the effect of supplementing high protein to grazing improved the growth and reproductive performance of goats and sheep.

Key words: Goat, sheep, protein, supplement, grazing, growth, reproduction, birth weight and gestation length

Introduction

Goat ranks the first position in terms of total livestock population in Bangladesh of which more than 90 per cent comprises the Black Bengal goats (Husain, 1993). Moreover, goats are mainly raised by poor farmers who have no or very little land for their homestead only (FAO, 1990). They raise goats mostly with tethering and grazing systems of feeding. The country has 35.6 million goats and sheep representing 58.8% (96.7% goat alone) of total livestock population and yielding 119 thousand metric tons (97.5% goat meat) of meat annually, which accounts for 28.7% of total livestock meat (FAO, 1997). The production of meat from goats and sheep, play an important role to supply animal protein for the people of our country. Sheep can also be maintained easily under rural condition because of their ability to adapt in harsh environment, poor management and less feed consumption. 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. In village environments, the productivity of goat may be increased by controlling diseases through vaccination and anthelmintic drug (Lambourne, 1985) and improving nutrition by either concentrate feeding (Parawan and Ovalo, 1985) or provision of additional supplemental diet containing high protein. The present work was carried out to know the effect of supplementation of dietary protein on growth and reproductive performance in female goats and sheep raised under grazing condition.

Materials and Methods

The experiment was conducted at Bangladesh Agricultural University, Animal Nutrition Field Laboratory, Mymensingh for 112 days during the period from October 1999 to February 2000.

Pasture establishment and management: An area of 0.12 hectare was surrounded by fancy materials and this was developed to use as a grazing land. Pasture was established before the onset of the experiment. Legumes such as maticali (*Phaseolus mungo*) seeds at the rate of 46 kg/hectare were sown in the grazing field. Intercultural operations like irrigation, removal of undesirable plants and weeds had been accomplished and made the land ready for goats and sheep to graze during day.

Animals, diets and experimental design: Ten goats and six sheep aged about fifteen months and weighing on average 13.9 and 14.4 kg respectively were used in a 112-days study. The animals were ear tagged and allowed 7-days to adapt to the experimental conditions prior to the commencement of the study. Following adaptation, goats and sheep were housed individually. Based on live weight, does were blocked into five groups and ewes were blocked into three groups. The animals (goats and sheep) in each block were then allocated at random to two supplementary diets containing low protein (LP) and high protein (HP). Goats and sheep were allowed to graze 6.0 hours daily during day. Moreover, animals in each group received either a high protein (HP) or low protein (LP) diet (300 g/d) consisting of wheat bran, rice polish and soybean meal. The supplemental diets contained 208g (HP) and 168g (LP) CP per kg dry matter (DM). The supplemental diets were supplied daily at night, when animals were kept in individual. Each diet was supplied and adjusted according to live weight gain and feed consumption. Fresh water was available at all times.

Measurements and procedures: In addition to grazing, the supplemented groups (goats and sheep) were allowed to feed on measured amount of concentrate diet, when they were housed in individual pen at night. Dry matter (DM) intake by goats and sheep under grazing conditions were estimated by animal weight gain method. In addition to grazing, each species of animals (goats and sheep) were fed a concentrate diet containing LP and HP, when they were housed in individual pen at night. Every morning, feed refusals were collected and weighed to determine the daily feed intake of each animal. Goats and sheep were initially weighed for every 7-days interval throughout the experiment and finally average weight of individual animal was recorded at every 28-days interval. After completion of 112-days experimental period, the average weight gain of individual animal was also recorded. Reproductive parameters such as age at puberty, oestrus, date of service, gestation period, litter size, sex, birth weight of kids, lambs and dams weight were also recorded. Oestrus symptoms of female goats were identified by visual observation and mated by Black Bengal buck (24-36 hours later from the beginning of oestrus). A ram was always kept along with the ewes to allow them for natural service. Special attention was given to pregnant animals and gestation gain was recorded.

Table 1: Effect of protein supplementation on live weight gain and DM intake in goats and sheep

Parameters	Goats		SEM	Level of significance	Sheep		SEM	Level of significance
	LP	HP			LP	HP		
Live weight gain (g/d):								
0 – 28 d	25.00	28.57	6.24	NS	7.14	41.67	2.23	**
29 – 56 d	15.00	32.86	4.66	*	10.71	33.33	3.04	*
57 – 84 d	29.29	31.43	6.32	*	9.52	40.47	3.04	*
85 – 112 d	31.43	39.29	3.87	NS	15.48	30.95	3.03	NS
Dry matter intake (g/d):								
0 – 28 d	471.78	448.57	21.89	NS	428.57	507.85	5.78	*
29 – 56 d	472.83	464.78	18.75	NS	427.50	509.76	5.96	**
57 – 84 d	473.86	466.14	18.24	NS	425.34	508.45	6.92	*
85 – 112 d	474.14	468.14	19.44	NS	423.33	510.71	7.12	*

SEM = Standard error of means; NS = Not significant; *P< 0.05; **< 0.01.

Table 2: Effect of protein supplementation on reproductive parameters in goats and sheep

Parameters	Goats		Sheep	
	LP	HP	LP	HP
No. of does or ewes per treatment	5.00	5.00	3.00	3.00
No. of pregnant animals	2.00	3.00	2.00	2.00
Gestation length (days)	144.93	141.00	-	-
Litter size	3.00	2.00	4.00	5.00
No. of kids/lambs died during birth	1.00	-	1.00	-
No. of kids/lambs died after birth	-	-	1.00	1.00
Percentage born alive	66.7	100.00	75.00	100.00
Survival rate (%)	100.0	100.00	66.70	80.00
Birth weight of kid/lamb (kg)	0.75	0.85	0.83	1.10
Average live weight gain of kid/lamb (g/d)	47.26	64.27	43.61	60.46
Sex of kids	2 Females 1 Male	2 Females 1 Male	All males	3 Females 2 Males

*Data presented here are not statistically analysed; LP- low protein, HP- high protein.

Statistical analysis: The experimental data related to growth performance and dry matter intakes were analyzed using "MSTAT" statistical program to compute ANOVA following Randomized Complete Block Design. In ANOVA, the treatment sum of square was partitioned into three components each with one degree of freedom.

Results and Discussion

Effect of protein supplementation on live weight gain and DM intake of goats and sheep: The mean values for live weight gain and dry matter intake of goats and sheep between 1 and 16 weeks of the experiment are shown in Table 1. It was observed that DM intakes were not significantly (P> 0.05) decreased in goats receiving the HP diet than those fed the LP diet. In contrast, DM intakes were significantly (P< 0.05 to P< 0.01) higher in sheep fed the HP diet in all stages of the trial compared with those receiving the LP diet. Huston *et al.* (1988) reported that, feed intake in goats and sheep was increased when an increased amount of supplemental protein was fed. The daily average live weight gain in goats fed the HP diet during the period, from 29-56 days (32.9 vs. 15.0 g/d) and 57-84 days (31.4 vs. 29.3 g/d) of the trial were significantly (P< 0.05) higher than those received the LP diet. Previous studies with goats (Lu and Potchoiba, 1990; Shahjalal *et al.*, 1992) have also shown increased growth performance with increasing protein concentration in diet. Shahjalal *et al.* (1997) reported that growth rate of grazing Black Bengal goats can be slightly improved under conditions of increased protein supplementation.

Similarly, sheep given the HP diet gained significantly (P< 0.05 to P< 0.01) higher live weight in all growth intervals from 0-84 days of experiment compared to those received the LP diet. Mazumder *et al.* (1998) reported that the local sheep grazing natural grasses can only grow 15.7 g/d and on grazing + 300 g concentrate can grow 40.5 g/d which is similar to the present study.

Reproductive performance: Reproductive traits of female goats and sheep raised under two feeding regimes (LP and HP diets) have been presented in Table 2. Average gestation length of goats recorded in this study was 142.5 days. This can be related with the report of Husain (1993) who indicated a gestation length of 144.93 ± 0.29 days for Black Bengal goats. Data for gestation length was not available for sheep, because it was difficult to detect heat/oestrus. Reproductive traits such as birth weight of kid (0.85 vs. 0.75kg) or lamb (1.10 vs. 0.83 kg) was higher in both species given the HP diet than the LP diet. Similarly, daily average live weight gain up to weaning was higher in kids (64.3 vs. 47.3 g/d) or lambs (60.5 vs. 43.6 g/d) received the HP diet than those fed the LP diet. A marked difference was observed in birth weight and subsequent growth rate in kids/lambs given the LP and HP diets. It is difficult to explain whether this effect was only due to protein supplementation or due to the size or weight of the dam. From an experiment, Robinson (1983) noted that the adverse effect on size at birth during late pregnancy is much more pronounced by low protein intakes.

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