PJN
ISSN 1680-5194

# PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 1(4): 191-193, 2002


# Effects of Concentrate Supplementation on Growth and Reproductive Performance of Female Sheep and Goats under Grazing Condition

H. M. Salim[1], M. Shahjalal, A. M. M. Tareque and F. Kabir[2]
[1]Department of Livestock Services, Dhaka, Bangladesh
[2]Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh
Department of Animal Nutrition, Bangladesh Agricultural University, Mymensingh, Bangladesh

**Abstract:** An experiment was conducted to study the effect of concentrate supplementation on growth and reproductive performance of female sheep and goats under grazing condition. Six females each of sheep and goats aged about 6 months and weighing on average 9.80 and 9.77 kg respectively were studied for 224 days. Goats and sheep were allocated to two feeding regimes in a 2x2 factorial experiment. Feeding of animals (sheep and goats) with concentrate supplement significantly ($P<0.01$) increased DM (477.7 vs. 253.0 g/d) intake compared with those of the control group. The higher intake of DM resulted in significantly ($P<0.01$) higher live weight gain in animals of supplemented group than those of control group. However, between sheep and goats significant difference was observed in live weight gain ($P<0.01$) and DM intake ($P<0.05$). The results showed that certain reproductive parameters such as age at puberty, gestation weight and kid birth weight may be improved by supplementary feeding of concentrate. Therefore, feeding of grazing goats and sheep with concentrate supplement may be suggested to optimize growth performance.

**Key words:** Sheep, goat, concentrate supplementation, growth, reproduction

## Introduction

Goats and sheep are economically important livestock to the poverty stricken village people in Bangladesh. 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). In Bangladesh government statistics (FAO, 1992) indicate a current intake of animal protein of 2.0 g per capita per day, which is far below the FAO recommendation of 28 g per day. As a result adult people face chronic under- nutrition and children suffer from protein deficiency. Therefore, priority has to be given to improve the productivity of goats and sheep in order to meet present protein requirements of the country. Black Bengal goats are highly prolific and reputed for quality meat and skin production throughout the world. The genetic potentialities of these goats are deteriorating day by day due to indiscriminate breeding, lack of improved feeding and management practices. 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. In our country, goats and sheep are mainly kept by the poor farmers and distressed women in extensive system under ranged condition without any supplementation. This system of production causes reduced growth rate and poor reproductive performance, which in turn results in severe economic losses. Previous studies (Kochapakdee *et al*., 1994a; Mahajan *et al*., 1976) have reflected the importance of concentrate supplementation on growth and productivity of goats and sheep. They also reported that grazing alone may not be sufficient for optimizing live weight gain and wool production. However, no comparative study has yet been done on the production characteristics of goats and sheep using available feed resources in our country. Therefore, the present experiment was designed to study the effects of supplementing concentrate on growth and reproductive performance of female goats and sheep raised under grazing condition.

## Materials and Methods

**Location and climatic condition:** The experiment was conducted at the Bangladesh Agricultural University Animal Nutrition Field Laboratory, Mymensingh, for the period of 224 days during September 1998 to April 1999. The region has a subtropical humid climate with an average annual rainfall of 238.4 cm. and having a dry period extending from October to March with marked incidence of rainfall during July to September (Weather Yard, 1998, BAU Station).

**Pasture establishment and management:** A grazing land of 0.3 hectare was surrounded by strong fancy materials and this area was developed and pasture was established for raising goats and sheep during day. Naturally growing grasses available in the grazing land were collected and identified as *Axonopus compresus* (Carpet grass), *Panicum repens* (Banchina grass), *Imperata cylindrica* (Ulu grass), *Cynodon dactylon* (Durba grass) and *Cyperus rotundus* (Mutha grass). Irrigation (when it was needed) and fertilizer (urea 50 kg/ha) was applied.

**Animals, diets and their management:** Twelve female animals were used in this experiment. Six animals, each of sheep and goats aged about 6 months and weighing, on average, 9.80 and 9.77 kg respectively. Animals were blocked into three groups according to live weight and then assigned at random to two feeding regimes (control and supplemented group) in a 2x2 factorial experiment. The animals were than allowed 3 weeks to adapt to the experimental conditions prior to the commencement of the study. A skilled shepherd was engaged to rear the animals throughout the experiment. Identical housing, health care and sanitary measures were provided to all goats and sheep. The drug Fasinex, Ralnax, Novartis (Bangladesh) Ltd. was administered to the animals as routine anthelmintic. Goats and sheep were allowed to graze for 7.0 hours daily (08:00 to 12:00 and 14:00 to 17:00 h). In addition to grazing, the animals in supplemented group received a measured quantity of concentrate mixture consisting of wheat bran, rice polish and soyabean meal. The supplemental diet was formulated to contain an estimated ME concentration of 10.8 MJ and CP content of 170 g per kg DM. Concentrate mixture was fed daily at night. Fresh water was freely available at all times. Feed ingredients used in formulating supplemented diets and grass samples collected from the grazing land were subjected to chemical analysis following the method of

Table 1: Chemical composition of different grasses available in the grazing land

| Parameter | Grass species | | | | | | SEM | Level of significance |
|---|---|---|---|---|---|---|---|---|
| | *Axonopus compressus* | *Panicum repens* | *Imperata cylindrica* | *Cynodon dactylon* | *Cyperus rotundus* | Mixed grass | | |
| DM (g/100g sample) | 18.83$^{c}$ | 21.73$^{bc}$ | 25.93$^{ab}$ | 28.27$^{a}$ | 20.40$^{c}$ | 20.70$^{bc}$ | 1.57 | * |
| Chemical composition (g/100gDM): | | | | | | | | |
| CP | 11.50 | 9.90 | 9.80 | 10.27 | 12.27 | 10.33 | 0.62 | NS |
| CF | 23.33$^{cd}$ | 29.80$^{ab}$ | 30.83$^{a}$ | 22.27$^{d}$ | 21.93$^{d}$ | 26.53$^{bc}$ | 1.19 | ** |
| EE | 1.70 | 1.10 | 3.30 | 1.01 | 1.85 | 1.25 | 0.56 | NS |
| NFE | 53.94$^{ab}$ | 51.80$^{abc}$ | 47.92$^{c}$ | 55.88$^{a}$ | 52.36$^{ab}$ | 50.13$^{bc}$ | 1.26 | * |
| OM | 89.37$^{bc}$ | 92.23$^{a}$ | 92.33$^{a}$ | 90.60$^{b}$ | 88.53$^{c}$ | 89.47$^{bc}$ | 0.44 | ** |
| Ash | 10.65$^{ab}$ | 7.74$^{c}$ | 7.66$^{c}$ | 9.41$^{b}$ | 11.46$^{a}$ | 10.56$^{ab}$ | 0.43 | ** |

$^{a,b,c,d}$Data having dissimilar superscripts differ significantly (P<0.05); NS= Not significant; *P<0.05; **P<0.01

Table 2: Effect of concentrate supplementation on live weight change and dry matter intake of sheep and goats during the experimental period

| Parameter | Sheep | | Goats | | SEM | Significance of contrast# | | |
|---|---|---|---|---|---|---|---|---|
| | Control group | Supplemented group | Control group | Supplemented group | | S | C | SC |
| Live weight gain (g/d): | | | | | | | | |
| 0-42 d | 9.11 | 2.78 | -6.34 | 31.33 | 7.81 | NS | NS | * |
| 43-84 d | 15.08 | 36.13 | -5.55 | 7.95 | 4.98 | ** | ** | NS |
| 85-126 d | -44.03 | -4.37 | -8.74 | 1.19 | 14.17 | NS | NS | NS |
| 127-168 d | -5.93 | 18.63 | 26.58 | -2.76 | 9.67 | NS | NS | * |
| 169-210 d | 29.77 | 39.67 | 26.58 | 39.70 | 11.98 | NS | NS | NS |
| 211-224 d | -9.53 | -5.93 | 26.20 | 21.43 | 14.3 | NS | NS | NS |
| Dry matter intake (g/d): | | | | | | | | |
| 0-42 d | 266.7 | 365.3 | 201.0 | 401.7 | 12.6 | NS | ** | * |
| 43-84 d | 283.3 | 447.7 | 206.7 | 427.3 | 16.7 | * | ** | NS |
| 85-126 d | 280.0 | 421.0 | 206.3 | 425.7 | 16.9 | NS | ** | NS |
| 127-168 d | 297.7 | 505.0 | 226.7 | 495.3 | 16.7 | * | ** | NS |
| 169-210 d | 299.7 | 507.3 | 239.7 | 526.3 | 14.9 | NS | ** | * |
| 211-224 d | 314.7 | 534.0 | 252.7 | 549.0 | 18.2 | NS | ** | NS |

#Contrast: S= Main effects between sheep and goats; C = Main effects between control and supplemented group,
SC= Interaction between main effects; NS= Not significant; *P<0.05; **P<0.01

Table 3: Effect of concentrate supplementation on reproductive parameters of sheep and goats*

| Parameter | Sheep | | Goats | |
|---|---|---|---|---|
| | Control group | Supplemented group | Control group | Supplemented group |
| Number of pregnant animals | 1 | 2 | 1 | 2 |
| Gestation length (days) | - | - | 143 | 144 |
| Litter size* | 2 | - | 1 | 1 |
| Percentage born alive | 50 | - | 100 | 100 |
| Birth weight of kids (kg) | 1.15 | - | 0.55 | 1.45 |
| Sex of kids | 1 male +1 female | - | Female | Female |

*Data presented here were not statistically analysed.

AOAC (1980).

**Measurement of live weight and reproductive parameter:** Live weight of sheep and goats was recorded initially and thereafter at 14-day intervals throughout the experimental period. During the time of kidding, weights of individual kids and dam were also recorded. The animals were weighed at 7:30 hours prior to access to the grazing land. Adequate management was provided for experimental animals to detect oestrus. The oestrus symptoms in goats were identified by visual observation and animals in oestrum were served by Balack Bengal buck towards the end of oestrus period. But in case of sheep, a ram was kept along with the ewes to allow natural service, as it was difficult to detect oestrus in sheep. Care was taken for pregnant animals and gestation weight gain was recorded. Age at puberty, date of service, gestation period, litter size, sex and birth weight of kids were also recorded.

**Statistical Analysis:** The experimental data related to growth performance were analysed using "MSTAT" statistical programme to compute analysis of variance (ANOVA) for a 2X2 factorial experiment. Data for herbage yield and chemical composition of

grasses were analysed following Randomized Block Design (RBD) and Duncans New Multiple Range Test (DMRT) was done to identify significant difference among the treatment means.

## Results and Discussion

**Chemical composition of grasses:** The chemical composition of different grasses available in the grazing land is shown in Table 1. It is revealed that *Cynodon dactylon* and *Imperata cylindrica* contained significantly (P<0.05) higher DM than the other grasses. However, difference between *Cynodon dactylon* and *Imperata cylindrical* was not significant. The CP content of different gasses did not vary significantly (P<0.05). The highest CP content was observed in *Cyperus rotundus* (12.27%) and lowest in *Imperata cylindrical* (9.8%). Reza and Zaharaby (1994) reported that CP content of *Cyperus rotundus* collected from mustard field was 12.53%, which is similar to the present findings. Significantly (P<0.05) variable quantity of soluble carbohydrate (NFE) was recorded in different grasses. *Cynodon dactylon* (55.88%) contained significantly (P<0.05) higher amount of NFE compared with *Imperata cylindrica* (47.92%) but similar amount of NFE content was reported for other grass species. Among the proximate components, there were significant (P<0.01) differences in CF, OM and ash contents of different grasses. The result indicated that except *Panicum repens*, CF and OM contents in *Imperata cylindrica* were significantly (P<0.01) higher than the other grasses. In an Indian report, Ranjhan (1980) indicated that *Imperata cylindrica* contained similar amount of OM (92.2%) but higher CF content (39.7%) than that recorded in the present study. The variation in chemical composition reported in the literature for the same species of grass may be due to differences in soil fertility, stage of maturity, light intensity, season and other macro and micro environmental factors (Ranjhan, 1980).

**Growth performance of sheep and goats:** The mean values for live weight gain and dry matter intake of sheep and goats between 1 and 32 weeks of the experiment are shown in Table 2. It is evident that DM intakes were significantly (P<0.05) higher in sheep than that in goats only during the period between 43-84 days and 127-168 days of the experiment. Huston *et al.* (1988) reported that, with low quality forage, intake was lower and digestibility of potentially digestible DM was higher in goats compared with sheep. The average daily live weight gain recorded in the supplemented group during 43-84 days of the trial was significantly (P<0.01) higher (22.0 vs. 4.76 g/d) than that observed in the control group. Similarly, during that period sheep gained significantly (P<0.01) higher live weight (25.7 vs. 1.2 g/d) than that of goats irrespective of feeding regime. There were significant interactions between animal species and feeding regimes for live weight gain and dry matter intake during 0-42, 127-168 and 169-210 days of growth trial. These results suggest that the effect of supplementing concentrate on DM intake was higher in goats than that in sheep.

**Reproductive parameters:** Some reproductive traits of female sheep and goats raised under two feeding regimes (control or supplemented group) have been presented in Table 3. During the experimental period the average gestation length recorded in this study for goats was 143.5 days. In a study with Black Bengal goats, Husain (1993) reported a gestation length of 144.93 ± 0.29 days, which is similar to the present finding. Data for gestation length was not available for sheep because it was difficult to detect their oestrus symptoms. Average birth weight of kids (1.45 vs. 0.85 kg) was higher in supplemented group than control group and sheep produced lambs of higher birth weight (1.15 vs.1.00) than goats. A marked difference was observed in kids of control and supplemented group. However, Kochapakdee *et al.* (1994b) reported that supplementary feeding did not significantly affect either kid birth weight or weight gain in the first 6 weeks after birth. As the study suffers from adequate information, it is difficult to draw a precise conclusion on reproductive traits.

**Conclusion:** The results showed that concentrate supplementation improved growth rate of goats and sheep under grazing condition. However, animals lost live weight without supplementation under the same feeding regime. Therefore, feeding of grazing goats and sheep with concentrate supplement may be suggested to optimize growth performance. Further studies with different levels of concentrate supplementation may be conducted using large number of animals for a longer period to get more detailed information related to reproductive performance.

**Acknowledgement:** The authors are indebted to the National Science and Technology (NST) Division, Dhaka, Bangladesh for financial support to conduct this research. Thanks and appreciation to all staffs of the Animal Nutrition Field Laboratory, BAU, Mymensingh for their assistance in feeding of animals and performing laboratory analyses.

## References

AOAC., 1980. Official Methods of Analysis (13th edn.). Association of Official Analytical Chemists. Washington, D. C.

FAO., 1992. Production Year Book, Rome, Italy, 51: 150-155.

FAO., 1997. Production Year Book, Rome, Italy, 51:189-228.

Husain, S .S., 1993. A study on the productive performance and genetic potentials of Black Bengal goats. A Ph.D. Thesis, Bangladesh Agricultural University, Mymensingh.

Huston, J. E., B. S. Engdahl and K. W. Bales, 1988. Intake and digestibility in sheep and goats fed three forage with different levels of supplemental protein. Small Rumin. Res., 1: 81-82.

Kochapakdee, S., W. Pralomkarn, S. Saithanoo, A. Lawpetchara and B. W. Norton, 1994a. Grazing management studies with Thai goats: 1. Productivity of female goats grazing newly established pasture with varying levels of supplementary feeding. Asian-Aus. J. Anim. Sci., 7: 289-293.

Kochapakdee, S., W. Pralomkan, S. Saithanoo, A. Lawpetchara and B. W. Norton, 1994b. Grazing management studies with Thai goats: 2. Reproductive performance of different genotypes of does grazing improved pasture with or without concentrate supplementation. Asian-Aus. J. Anim. Sci., 7: 289-294.

Mahajan, J. M., D. S. Chauhan and V. P. S. Tomar, 1976. Effect of supplementary feeding to grazing on growth and wool production sheep. Ind. J. Anim. Res., 10: 90-92.

Ranjhan, S. K., 1980. Animal Nutrition in the Tropics. Vikash publishing house Pvt. Ltd. Vikash house, Ghajiabad V. P. (India). pp: 163-167.

Reza, A. and A. K. M. Zaharaby, 1994. Composition and Utilization of Weeds in Three Agro-ecological Zones. Bangladesh Agricultural University Research System. Annual Research Report. Bangladesh Agricultural University, Mymensingh, Bangladesh.