were thick and more densely arranged. In young and adult animals, the concentration of elastic fibres was lesser than the neonatal animals.

References

- Atlee, B.A., Stannard, A.A., Fowler, M.E., Willemse, T., Ihrke, P.J. and Olivry, T. (1997) *Vet. Dermatol.*, **8** : 165.
- Genkóvski, D. and Gerchev, G., (2007) *Biotechnol. Animal Husband.* **23** : 191.
- Lloyd, D.H. and Gathwaite, G., (1982) *Res. Vet. Sci.*, **33** : 99.
- Luna, I.G. (1968). *Manual of histological staining methods of the armed forces institute of pathology*, 3rd Edn., McGraw Hill Book Company, New York.
- Saxena, S.K., Malik, M.R. and Parekh, H.K.B. (1994) *Indian J. Anim. Sci.*, **64** : 446.
- Singh, I.P., Prasad, J. and Yadava, C.P. (1975) *Indian J. Anim. Hlth.*, **14** : 117.
- Starcher, B., Aycock, R.L. and Hill, C.H. (2005) *J. Histochem. Cytochem.*, **53** : 431.
- Yagci, A., Zik, B., Uguz, C. and Altunbas, K. (2006) *Indian Vet J.*, **83** : 876.

Indian Vet. J., July 2011, 88 (7) : 59 - 61

Growth of Female Crossbred Kids Under Different Housing Systems*

Chamapak Bhakat¹ and P.K. Nagpaul

National Dairy Research Institute, Karnal, Haryana 132 001

The knowledge of behavioral pattern of goat kids helps to create suitable housing environment for them. The reports about feeding behavior under zero grazing condition are very scant. Rokde and Tomer (2001) observed that housing had highly significant ($P < 0.01$) effect on body composition of crossbred calves. Housing for goat should be designed to enhance the overall performance of goat kids with better economic returns.

Materials and Methods

Thirty female crossbred (Alpine×Beetal) kids, around 4 month old were allotted randomly into 3 comparable groups (housing), so that the average body weight of all groups was similar. The 3 treatment groups comprised 3 types of housing. The three different types of housing structures were constructed with different materials to provide different micro environments to 3 groups. Group 1 was in concrete housing (concrete floor, roof, wall), Group 2 was in kucha floor, thatched roofed with wire fencing and

Group 3 was in raised slotted floor (height 1.65 ft) made of wooden planks (gap between two slots was 2.5cm), with thatched roof and wire fencing. Space requirement was given according to ISI standard, which was 5.44 sqft (covered area) and 10.89 sqft (open area) for each kid (4-16 months aged). Size of feeding manger provided in all 3 sheds was 11 ft (length) x 1.5 ft (breadth) x 2.5 ft (height). All kids were fed same fodder and concentrate as per feeding schedule followed at NDRI farm. Different behavioral patterns exhibited by kids were observed throughout the 24 h period. The observation on feeding behavior started at 6.00 A.M., immediately after offering the concentrates and completed at 5.59 A.M. on the subsequent days. A day was considered from 6.00 A.M. to 5.59 P.M. and a night from 6.00 P.M. to 5.59 A.M. of next day. The observations were recorded once in a month in each group for 12 months. Different behavioral patterns of animals were recorded at 5 min interval in a special type of score card developed for this purpose. Hour-wise

*Part of Ph.D. thesis submitted to NDRI (Deemed University) Karnal, Haryana, India.

¹Corresponding author : E-mail : Bhakat@scientist.com

observations were decoded with the help of decoding sheet. Total time spent for every activity in each hour was cumulated and frequency of defecation, urination, drinking and fighting were counted, according to Fraser (1988). Body weight of kids was recorded first before shifting kids to the respective treatments and, thereafter all the experimental animals were weighed at fortnightly intervals for 12 months. The average weight of 2 consecutive days was taken to represent fortnightly body weight. The weighing was done in morning before offering feed or water. The samples of fodder and concentrate mixtures were collected and analysed for DM and CP at fortnightly intervals. Dry matter intake of animals was recorded at fortnightly interval by weighing feed offered and residue left. The 2 way analysis of variance procedures (Snedecor and Cochran 1994) were applied for the analysis of experimental data.

Results and Discussion

The mean values of fodder intake time (min) of kids during 24 hours period was highest in groups 3 followed by group 2 and group 1, respectively. Intake during day was more as compared to night. At 4 months of age of kid, time spent on fodder intake was minimum (198.97 ± 1.72 min) in which gradually increased and at 15 months of age, it was maximum (267.77 ± 1.80 min). This was because with increase in age, the DM requirement was more. It was suggested that the green fodder supplied twice a day at 10.00 A.M. and 2.00 P.M. in sufficient quantity would be enough for their daily requirements of goats. There was no need to employ any labour after 3.00 P.M. for looking after the feeding job. The mean values of concentrate intake (min) of kids during 24 hours period was less in group 1, compared to group 2 and group 3. There was no concentrate intake at night time. A similar pattern of concentrate feeding of goats was reported by Gangyi *et al.* (1992). The minimum time spent (84.37 ± 2.35 min) for concentrate intake was at 4 months of age. Then it gradually increased and maximum (114.47 ± 7.47 min) was found in 15 months of age.

The mean values of rumination (min) (at standing posture) by kids during 24 h period was

more in group 3 followed by group 2 and group 1. Similar trend of observation was found in case of rumination in lying posture. The rumination time in min (standing and lying posture) during day time was minimum as compared to night time in all groups. It was the lowest (min) at 4 months of age being 20.93 ± 1.54 , and 268.47 ± 2.60 and it became the highest at 15 months of age, being 50.60 ± 1.55 , and 368.40 ± 1.82 in standing and lying posture, respectively. To fulfil the increasing feed requirement, with advancing age, kids consumed more DM which increased the rumination time. The mean values of sleeping time (min) during 24 h period was more in group 3, followed by group 2, and group 1. The results also indicated that nocturnal sleeping habit was more as compared to day sleeping. The highest sleeping time (75.70 ± 1.54 min) was observed at 4 months of age and then it gradually decreased and the lowest value (54.17 ± 1.51 min) was found at 15 months of age of the kids.

The mean values of idling time (min) (standing posture) kids during 24 hours period was more group 1, followed by group 2 and group 3. The idle time was more during day than night. At 4 months of age, it was maximum (355.43 ± 4.73 min) and gradually decreased at 15 months of age (262.10 ± 8.26 min). The highest idling time was observed during first few months. This was due to extreme summer season. As the mercury started to fall, the idling time was also reduced and with the advancement of age of kids, they became more active and idling time became less. The mean values of roaming (min) of kids during 24 h period was less in group 1 followed by group 2 and group 3. The roaming time during day was more as compared to nocturnal roaming. The roaming time was maximum (80.83 ± 1.39 min) at 4 months of age. It gradually reduced and it was minimum (54.00 ± 1.57 min) at 15 months of age.

The overall average values of defecation frequency during night hours was more as compared to day hours. As the animals ruminated mostly during night time, this also led to more defecation during the night. Defecation frequency increased with increase in age of animals. At 4 months of age of kids, it was the lowest

(8.57 ± 0.69) and it gradually increased and became highest (15.00 ± 0.34) at 15 months of age. This might be due to increment of DM intake. Highest frequency of defecation was found between 4.00 to 6.00 A.M. and the lowest found between 6.00 to 8.00 A.M. The overall average values of urination frequency during day hrs was less as compared to night hrs. It might be due to more sweating during day time than night. The urination frequency at 4 month of age was lowest (8.03 ± 0.35) and became highest at 15 months of age (15.00 ± 0.34), which might due to increase of water intake. Greaves *et al.* (1991) found that the grazing time for goats ranged from 34 to 63 percent of the day and major grazing period was during the afternoon.

Drinking frequency at 4 months of age was 10.03 ± 0.33 . It gradually increased upto 8 months of age, and again it decreased at 15 months of age. The frequency of drinking water depends upon the environmental temperature as well as type of feed. From 9 months of age onwards, temperature was further decreased in winter. Due to extreme cold conditions and supply of succulent lush green fodder, which was high in moisture content, the drinking frequency was reduced. Drinking frequency was maximum between 6.00 to 8.00 A.M., after taking concentrate and also between 1.00 to 5.00 P.M. after taking fodder and it was more during morning time and decreased with lapse of time. Fighting frequency at 4 month of age was the highest and then gradually decreased and lowest at 15 months of age. It was found that fighting frequency was maximum at the time of fodder intake. Naskar (1995) found the feeding of bypass protein to goat had significant effect on feeding behavior (intake of fodder, concentrate, urination, roaming).

At 4 months of age, average body weight of kids was almost similar in three groups. Group/housing system significantly ($P < 0.01$) affected growth of kids from 5th month age onwards. It was revealed that difference between three groups increased constantly up to 15 months of age. The highest body weight was observed in 3rd group which might be due to the fact that kids were in the most comfortable place (raised-slotted floor with thatched roof shelter) and suffered minimum environmental stress and got sufficient exercise. This also led to maxi-

mum consumption of DM and CP during experimental period. It was followed by 2nd group. The kids belonging to this group were also placed comfortably under thatched roof, but felt some discomfort due to kuccha floor which caused dampness specially during rainy season which resulted in more idling behavior. The kids under group 1 suffered from environmental stress during summer and winter season which was also reflected in behavioural pattern and lower body weight gain during this period. These results are in close agreement with Angami *et al.* (1992). Bhakat and Nagpaul (2005) reported that housing, season and age of animal significantly affected DMI per kg body weight gain. The overall body weight gain/kid during experiment of 12 months was highest in group 3 (33.17 kg), followed by group 2 (24.36 kg) and lowest in group 1 (17.69 kg). An economic analysis revealed that variable cost/kg body weight gain was found to be lowest in group 3 (Rs.33.96), followed by group 2 (Rs.45.28) and highest in group 1 (Rs.60.09). Maintenance cost (cleaning, labour etc) per kg body weight of group-3 and group 2 was less as compared to group 1. Total fixed cost was quite less in case of both group 3 (Rs.4079) and group 2 (Rs.3699) as compared to group 1 (Rs.4300). The study concludes that the raised-slotted floor with thatched roof house is the best suited for crossbred female kids.

References

- Angami, M., Baruah, K.K. and Saikia, B.N. (1992) *Indian Vet. J.* 69 : 707.
- Bhakat, C. and Nagpaul, P.K. (2005) *Ind J. Anim. Sci.*, 75 : 69
- Fraser, A.F. (1988) *Fam Animal Behavior*, 3rd edition, Macmillan publishing co. Inc. 63.
- Gangyi, X.J., Xiangmei, Liu, Jiabi, P.U. and Pelant, R.K. (1992) *Proc. of Papers presented at Vth International Conference on Goats*, p 977.
- Greaves, E.A., Wedderburn, R.L. and Pengelly, W.J. (1991) *Proc. of the New Zealand Society of Animal Production*, 51 : 173
- Naskar, S. (1995) Effect of certain management practices on behavior and sexual maturity of male kids. Ph.D. Thesis, NDRI, Karnal, Haryana 132901.
- Rokde, S.N. and Tomer, O.S. (2001) *Ind. J. Anim. Sci.* 71 : 468
- Snedecor, W.G. and Cochran, G.W. (1994) *Statistical Methods*, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi, India.