

<http://www.pjbs.org>

**PJBS**

ISSN 1028-8880

**Pakistan  
Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Effect of Concentrated Feed Allowance on Behavioral Traits in Young Female Goats

<sup>1</sup>I. Yaman Yurtman, <sup>1</sup>Cem Goncu and <sup>1</sup>Türker Savas

<sup>1</sup>Çanakkale Onsekiz Mart Üniversitesi

Ziraat Fakültesi, Zootečni Bölümü, 17100, Çanakkale, Turkey

**Abstract:** This study was carried out to investigate the effect of different concentrate feed allowances on behavioral traits in young female goats. Concentrate feed was offered to control (C) group animals at 2% of live weight, whereas *ad libitum* (AL) group animals were offered *ad libitum* concentrate feed. Animals were allowed to graze for 4 h in the pasture and spent the rest of the time indoor. Behavioral observations were carried out once a week for 14 weeks via Time-Sampling Method. Feeding behaviors (grazing, rumination, roughage and concentrate feed intake) were significantly affected by the level of daily concentrate feed allowance ( $p < 0.001$ ).

**Key words:** Goat, pasture, supplementary feeding, grazing behavior

### INTRODUCTION

Efficient use of roughage and the control of production process, which puts pressure on natural resources, are considerably affected by knowledge on feeding behaviors and feed choice<sup>[1]</sup>. Behaviors, which are shaped by environmental factors, are biological parameters, which provide important clues about the adequacy of the breeding systems. Feeding behaviors are regarded as a consequence of the balance formed by an individual between physiological requirements and nutritionally oriented environmental conditions. These behaviors show important environment-dependent variations in extensive breeding conditions in which natural resources are largely used<sup>[2]</sup>. Feeding behaviors can vary among species. In addition, differences in behavioral traits among breeds of a specie are reported<sup>[3]</sup>. Supplementary feeding is often used in pasture based systems and is known as an important factor affecting feeding behaviors in pasture. Therefore generation of knowledge on the effect of supplementary feeding on behaviors, chiefly grazing activity and feed choice is of vital importance to the economy of production and efficient and sustainable use of natural resources. This study aimed at investigating the effects of concentrate feed allowance on behavioral traits of young female goats indoor and in pasture.

### MATERIALS AND METHODS

The present study was carried out between July-November 2003 at Yahya Cavus Research Unit of

Canakkale Onsekiz Mart University. In the study, 30 young female Turkish Saanen Goats at an average of 5.5 months of age were allocated to two concentrate feed treatment groups; C: control and AL: *ad libitum*. Goats in C group were given concentrate feed at 2% of their live weight and the amount of concentrate feed was adjusted every two weeks depending upon the change in the live weight of the C group. On the other hand, goats in AL group were offered concentrate feed at *ad libitum* level and the amount of concentrate feed was adjusted according to the consumption value of the previous day. The study lasted for 14 weeks. It involved the grazing of animals in a 15 de natural pasture and the feeding indoor where medium-quality oats hay and, concentrate feed (170 g kg<sup>-1</sup> CP; 2600 kcal ME kg<sup>-1</sup>) were offered. Goats were housed in semi-open barns and had free access to water and mineral block. Indoor roughage, concentrate and water consumptions were determined daily on group basis and animals with empty stomach were weighed weekly for live weight determinations. Animals were kept for 4 h in pasture and allowed to pasture together.

Behavioral observations were made weekly and involved a total of 8 h in a day at different observation intervals under indoor and pasture conditions (Table 1). A1, A2, A3, A4, M1 and M2 represent the order of observation time in a day.

Behavioral observations were carried out by two persons and the animals were marked in different colors and numbers on group basis for the ease of the observation. Aggression, bipedal stance, urination and defecation behaviors were recorded continuously at observation time. Grazing, walking, rumination, standing,

**Corresponding Author:** Dr. I. Yaman Yurtman, Department of Animal Sciences Faculty of Agriculture, Cannakkale Onsekiz Mart University, 17100 Canakkale, Turkey

Table 1: Observation Location (OL) and Observation Order (OO)<sup>1</sup>, depending on Observation Time in a Day (OTD)

OL	OO	OTD (h)
Indoor	A1	07.30-08.30
	A2	11.30-12.30
	A3	15.30-16.30
	A4	19.30-20.30
Pasture	M1	09.00-11.00
	M2	17.00-19.00

<sup>1</sup>Roughage and concentrate feed were offered at two meals every day, 07.00 in the morning and 19.15 in the evening

lying, roughage intake, concentrate intake, water intake, playing, mineral block licking and abnormal oral activity behaviors were recorded in observations via Time Sampling Method<sup>[4]</sup>. No observation was made at 7th and 12th week of the study due to heavy rain. Therefore observation data from 12 weeks were analyzed.

The data were analyzed via SAS<sup>[5]</sup> Statistical Package Programme using a repeated threshold model, which took feeding type (CFA), Observation Time in a Day (OTD) and Observation Day (OD) as fixed effect. Continuously recorded traits were analyzed via the same package programme using a repeated linear model, which involved the same fixed effects.

## RESULTS AND DISCUSSION

Initial live weights for C and AL groups were 23.08±1.37 and 23.30±1.06 kg and daily live weight gains for C and AL groups were 0.082 and 0.134 kg, respectively. There was a significant difference between the final live weight values of C (32.58±1.52 kg) and AL (36.69±1.37 kg) groups ( $p<0.05$ ) at the end of the study. Daily total concentrate feed, roughage and water consumptions were determined as 8.60 kg day<sup>-1</sup>, 4.85 kg day<sup>-1</sup> and 2.05 L day<sup>-1</sup> and 17.82 kg day<sup>-1</sup>, 2.59 kg day<sup>-1</sup> and 2.16 L day<sup>-1</sup> for the C group and the AL group, respectively.

Though playing, mineral block licking and abnormal oral activities were the observed behavioral traits in the study they were not included in the statistical analysis due to their low frequency values. As can be seen from Table 2, concentrate feed allowance had a significant effect on all the behavioral traits ( $p<0.001$ ) except for water intake ( $p>0.05$ ). Similarly, observation time in a day and observation day resulted in significant differences in all the traits except for water intake behavior for OD between the groups.

*Ad libitum* concentrate feed allowance led to low grazing, rumination and roughage intake behaviors, but standing, lying, concentrate and water intakes behaviors were higher in AL group as compared to C group (Table 3). Concentrate feed allowance had no significant effect on bipedal stance, aggression, urination

Table 2: Significance levels of the main effects (p-values) on observed behavioral traits

Trait	CFA <sup>1</sup>	OTD	OD
Grazing	0.0002	0.0001	0.0070
Ruminating	0.0097	0.0001	0.0062
Standing	0.0050	0.0001	0.0136
Lying	0.0004	0.0001	0.0105
Roughage intake	0.0002	0.0001	0.0235
Concentrate intake	0.0001	0.0001	0.0060
Water intake	0.5910	0.0017	0.0829

<sup>1</sup>CFA: Concentrate Feed Allocation; OTD: Observation Time in a Day; OD: Observation Day

and defecation behaviors ( $p>0.05$ ), which were continuously monitored at observation intervals in a day. However, observation time in a day and observation day resulted in significant differences between both the groups in all these traits ( $p<0.001$ ).

Environmental factors such as intensity of flora, flora composition, vegetation stage, season and stocking density are the important determinants in determining the feeding potential of natural pastures. Karlı *et al.*<sup>[6]</sup> reported that the pastures of East Anatolia Region of Turkey can meet the nutrient requirements of fattening lambs in May and June, but supplementary feeding is required for later months.

Goats and sheep give determinable responses via the changes in feeding behaviors to changes taking place in pastures throughout the year<sup>[1]</sup>. Increase in grazing activity of goats owing to inadequacy of pasture<sup>[7]</sup> and modification of browse species intake rates and diet selection<sup>[2,3]</sup> are the main the behavioral changes in small ruminants. Supplementary feeding that is to be applied to complement the inadequacy of pasture can also have impact on behaviors to be displayed by the animal. Milne *et al.*<sup>[8]</sup> reported that grazing activity in lactating ewes decreases as the level of supplementary feeding is increased. Cisse *et al.*<sup>[9]</sup> also indicated that goats provided no supplement ate more forage in the pasture than those that received supplement. A similar behavioral pattern was also found in the present study that goats in AL group showed 52% less grazing behavior than those in C group ( $p<0.001$ ; Table 3). The reduction in grazing activity in AL group could be associated with the substitution effect of the concentrate feed intake as pointed out by Orskov<sup>[10]</sup> and Bowman and Sowell<sup>[11]</sup>.

Higher concentrate intake (192%) and lower roughage intake (54%) behaviors in female goats of AL group can be explained as a consequence of continuous presence of concentrate feed in the banks. Water intake was the only behavior which was not affected by the treatments ( $p>0.05$ ; Table 3). However, water intake in AL group was 18% higher than in C group. The findings of the water intake are consistent with the reports that protein and dry matter intakes have an impact on water

Table 3: Odds ratio ( $\psi$ ) of behavioral traits associated with Concentrate Feed Allowance (CFA)<sup>1</sup> and Observation Time in a Day (OTD)

Trait	CFA AL	OTD					
		A1	A2	A3	A4	M1	M2
Grazing	0.48	-	-	-	-	0.07	1.00
Ruminating	0.76	2.69	118.87	219.44	20.04	20.75	1.00
Standing	1.39	41.30	16.60	38.44	109.21	5.35	1.00
Lying	1.96	86.04	1940.89	2016.87	130.97	822.13	1.00
Roughage intake	0.46	2.79	0.91	0.26	1.00	-	-
Concentrate intake	2.92	1.89	0.34	0.42	1.00	-	-
Water intake	1.18	1.80	0.34	0.51	1.00	-	-

<sup>1</sup>Odds ratio of C group for concentrate feed allowance factor is ( $\psi$ ) 1.00

intake<sup>[12]</sup>. On the other hand, the inconsistency between actual water intake and water intake behavior might possibly be due to the variation in water intake for each drinking activity and also the variation between individual animals in term of this trait.

The structural carbohydrate composition of feed materials<sup>[13]</sup> and changes in environmental conditions such as temperature<sup>[14]</sup> can affect rumination time and distribution of rumination behavior within a day time. In the present study, goats in the AL group who consumed more concentrate feed showed 24% less rumination behavior ( $p < 0.001$ ) and this behavior like lying were more intensive in the hot times of the day. These findings are in the favor of the approaches reported by Penning *et al.*<sup>[13]</sup> and Rook and Penning<sup>[14]</sup>. Lying behavior is influenced by physiological stage, group conditions and flooring type<sup>[15]</sup>. In this study, significant difference between the groups in lying behavior (Table 2) suggests that time allocated for lying can also be associated with the ease in reaching the nutrient resources in addition to other factors mentioned above.

Competition among individuals of a specie in the use of resources is the main reason for aggressive behaviors under wild conditions<sup>[16-18]</sup>. This behavioral trait provides advantage for aggressive individuals in a group to some extent<sup>[19]</sup>. Factors affecting this behavior and relationships between the factors can also be relevant to domestic animals. In fact reaching to the feed under restricted and inadequate environmental conditions, group change and similar environmental conditions lead to increases in the frequency of aggression behavior. In the present study, the intensification of aggressive behavior at the observation intervals when goats in both groups went to pasture together and in observations during the first concentrate feed allowance are worth noting in terms of the relations described above.

In conclusion, the results of the present study, which was carried out in a period (July-November 2003) when feeding value of pasture was very low indicate that supplementation of concentrate feed at *ad libitum* level to young female goats can cause considerable

differences in feeding behaviors both in indoor and in pasture as compared to the controlled supplementation of concentrate feed. From the point of view that behaviors are important traits determining the adequacy of environmental conditions, the success of supplementary feeding programmes in practice is dependent upon the results of similar studies concentrating on the interactions between concentrate feed allowance and pasture quality.

## REFERENCES

- Baumont, R., S. Prache, M. Meuret and P. Morand-Fehr, 2000. How forage characteristics influence behaviour and intake in small ruminants: A Review. *Livestock Prod. Sci.*, 64: 15-28.
- Dziba, L.E., P.F. Scogings, I.J. Gordon and J.G. Raats, 2003. Effects of season and breed on browse species intake rates and diet selection by goats in the False Thornveld of the Eastern Cape, South Africa. *Small Ruminant Res.*, 47: 17-30.
- Odo, B.I., F.U. Omeje and J.N. Okwor, 2001. Forage species availability, food preference and grazing behaviour of goats in southeastern Nigeria. *Small Ruminant Res.*, 42: 163-168.
- Savaş, T. and H.E. Şamlı, 2000. Effects of aggression and social hierarchy on egg production and some behavior traits. *Tarım Bilimleri Dergisi*, 6: 11-15.
- SAS, 1996. SAS OnlineDoc®, Version 6.0, SAS Institute Inc., Cary, North Carolina, USA.
- Karlı, M.A., S. Deniz, H. Nursoy, N. Denek and H. Akdeniz, 2003. The effects of maturity on range quality and animal performance. *Turk. J. Vet. Anim. Sci.*, 27: 117-124.
- Provenza, F.D. and J.C. Malechek, 1986. A comparison of food selection and foraging behaviour in juvenile and adult goats. *Applied Anim. Behav. Sci.*, 16: 49-61.
- Milne, J.A., T.J. Maxwell and W.G. Souter, 1981. The effect of supplementary feeding and herbage mass on the intake and performance of grazing ewes in early lactation. *Anim. Prod.*, 32: 185-195.

9. Cisse, M., I. Ly, A.J. Nianogo, I. Sane, J.G. Sawadogo, M. N'Diaye, C. Awad and Y. Fall, 2002. Grazing behavior and milk yield of Senegalese Sahel goat. *Small Ruminant Res.*, 43: 85-95.
10. Orskov, E.R., 1999. Supplement strategies for ruminants and management of feeding to maximize utilization of roughages. *Preventive Veterinary Medicine*, 38: 179-185.
11. Bowman, J.G.P. and B. F. Sowell, 1997. Delivery method and supplement consumption by grazing ruminants: A Review. *J. Anim. Sci.*, 75: 543-550.
12. Yurtman, I.Y., E. Başpınar, Ş. Polatsü and M.M. Özkan and M.L. Özdüven, 1996. The relationship between the some environmental factors with water intake in fattening lambs. *Trakya Üniversitesi Ziraat Fakültesi Yayınları, Genel Yayın No. 253, Araştırma No. 98, Tekirdağ.*
13. Penning, P.D., A.J. Rook and R.J. Orr, 1991. Patterns of ingestive behaviour of sheep continuously stocked on monocultures of ryegrass or white clover. *Applied Anim. Behav. Sci.*, 31: 237-250.
14. Rook, A.J. and P.D. Penning, 1991. Synchronisation of eating, ruminating and idling activity by grazing sheep. *Applied Anim. Behav. Sci.*, 32: 157-166.
15. Miller, K. and D.G.M. Wood-Gush, 1991. Some effects of housing on the social behaviour of dairy cows. *Anim. Prod.*, 53: 271-278.
16. Immelmann, K., E. Prove and R. Sossinka, 1996. *Introduction to Behavioral Research. 4. Auflage. Berlin, Wien Blackwell Wiss.-Verl, pp: 287.*
17. Cote, S.D., 2000. Dominance hierarchies in female goats: stability, aggressiveness and determinants of rank. *Anim. Behav.*, 137: 1541-1566.
18. Barroso, F.G., C.L. Alados and J. Boza, 2000. Social hierarchy in the domestic goat: effect on food habits and production. *Applied Anim. Behav. Sci.*, 69: 35-53.
19. Krebs, J.R. and N.B. Davies, 1981. *Eco-Etiology. Übers. U. Bearb. Von Georg Klump. Verlag Paul Parey, Berlin, Hamburg, pp: 377.*