

Some Behaviour Traits Observed on The Kıvırcık and Crossbred Lambs Raised in Intensive Conditions

Fevzi KARAAĞAÇ

Kadıköy Municipality, İstanbul - TURKEY

Mustafa ÖZCAN

Department of Animal Husbandry, Faculty of Veterinary Medicine, İstanbul University, 34320 Avclar, İstanbul - TURKEY

E-mail: muscan@istanbul.edu.tr

Türker SAVAŞ

Department of Animal Science, Faculty of Agriculture, Çanakkale Onsekiz Mart University, Çanakkale - TURKEY

Received: 16.02.2004

Abstract: In this study, the behaviour responses of the crossbred lambs [F_2 (German Black-Headed Mutton x Merino) x F_1 (Chios x Kıvırcık)] were compared with the Kıvırcık lambs in intensive conditions and the effects of genotype, sex and observation period on the behaviours displayed were investigated. The data were collected from 10 (5 male + 5 female) Kıvırcık and 10 (5 male + 5 female) crossbred lambs, which were weaned at the age of 2-2.5 months.

The effect of genotype was found significant on the behaviours of feed consumption ($P < 0.01$), activities towards the bedding material ($P < 0.05$), rumination ($P < 0.01$), lying ($P < 0.01$), oral stereotypic behaviours (OSB) ($P < 0.01$) and behaviours towards animal (BTA) ($P < 0.01$). Behaviours towards other animals and oral stereotypic behaviours in the crossbred lambs were 50% and 27% more than the Kıvırcık lambs, respectively. Significant differences in terms of the activities towards the bedding material ($P < 0.05$), rumination ($P < 0.01$) and lying ($P < 0.01$) behaviours were determined between the male and female lambs. It was seen that the male lambs were more active in the breeding area. The effects of observation period were found significant on feeding ($P < 0.01$), drinking ($P < 0.01$), rumination ($P < 0.01$), lying ($P < 0.01$), standing ($P < 0.01$), oral stereotypic behaviours ($P < 0.01$) and behaviours towards animals ($P < 0.05$).

Although the crossbred lambs were more superior for fattening program in terms of live weight gains, they showed more abnormal behaviours (OSB and BTA), which are the signs of stress, in the limited breeding area, depend on the lessening of the area by the rise in their live weights.

Key Words: Lamb, intensive conditions, fattening, behaviour

Entansif Koşullarda Yetiştirilen Kıvırcık ve Melez Kesim Kuzularında Gözlenen Bazı Davranış Özellikleri

Özet: Bu araştırmada, besiye alınan melez kesim kuzuları [F_2 (Siyah Başlı Alman Etçi x Merinos) x F_1 (Sakız x Kıvırcık)] ile Kıvırcık kuzuların entansif yetiştirme koşullarına verdikleri davranışsal tepkiler karşılaştırılmış, genotipin, cinsiyetin ve gözlem periyodunun sergilenen davranışlar üzerindeki etkisi araştırılmıştır. Gözlemler, 2-2,5 aylık yaşta süttten kesilmiş 10 baş (5 erkek + 5 dişi) Kıvırcık kuzu ile 10 baş (5 erkek + 5 dişi) melez kesim kuzusundan temin edilmiştir.

Genotipin yem tüketme ($P < 0.01$), altlığa yönelim ($P < 0.05$), ruminasyon ($P < 0.01$), yatma ($P < 0.01$), oral sterotipik davranışlar (OSD) ($P < 0.01$) ve hayvana yönelik davranışlar (HYD) ($P < 0.01$) üzerine etkisi önemli bulunmuştur. Melez kesim kuzularında hayvana yönelik ve oral sterotipik davranışlar Kıvırcık kuzulara göre sırasıyla % 50 ve % 27 oranında daha fazla gerçekleşmiştir. Erkek kuzularla dişi kuzular arasında altlığa yönelim ($P < 0.05$), ruminasyon ($P < 0.01$) ve yatma ($P < 0.01$) davranışları bakımından istatistiksel olarak önemli farklılıklar belirlenmiştir. Erkek kuzuların yetiştirme ortamında daha aktif oldukları saptanmıştır. Gözlem periyodunun, yem tüketme ($P < 0.01$), su içme ($P < 0.01$), ruminasyon ($P < 0.01$), yatma ($P < 0.01$), dikilme ($P < 0.01$), oral sterotipik davranışlar ($P < 0.01$) ve hayvana yönelik davranışlar ($P < 0.05$) üzerine etkisi önemli bulunmuştur.

Bu çalışma, melez kesim kuzularının, beside canlı ağırlık artışı bakımından daha üstün olmalarına rağmen, canlı ağırlıklarının artması ve buna bağlı olarak yaşama alanlarının azalması sonucu, stres belirtisi olan anormal davranışsal tepkileri (OSD ve HYD) daha yoğun olarak ortaya koyduklarını göstermektedir.

Anahtar Sözcükler: Kuzu, entansif koşullar, besi, davranış

* This study was produced from the PhD Thesis of Fevzi KARAAĞAÇ

Introduction

The profitability in animal production is being improved due to the intensification in animal breeding. However, the use of modern breeding techniques is also causing some problems. Restrictions on animals brought by intensive breeding, are causing some abnormal behaviours, which are not or are very rarely observed in the natural behaviour patterns of animals.

The abnormal behavioural patterns observed in animals are reported to be connecting to five reasons. These are symptomatic, originating from central nerval system, originating from incapability, originating from the inside of the body and behaviours of reaction (1).

Odberg (2) explained the stereotypic behaviours as the whole of the movements, which are systematically repeated. Some motivational systems special to species are effective on the formation of stereotypic behaviours. In conditions, in which there are inadequate feed consumption or grazing opportunities, the feed consumption motivation plays a significant role in the formation of stereotypic behaviours (3).

Housing in a monotonous breeding condition limits the relations of the animals with their environment. Sheep, having inadequate space to move and environmental stimulation in their housing do not have the possibility to show normal behaviours specific to their species. As a result of this, the normal relation with the environment leaves its place to abnormal behaviours like stereotypic behaviours (4).

There are variations between sheep breeds in terms of some behavioural characteristics; although, there are not evident variations between some other characteristics. For instance, the variations between genotypes for living in groups and flock forming are very evident, whereas they are less evident for maternity ability and struggle behaviour. The instinct of living in groups in Merino is at a high level but it is weak in Scottish Blackface (5).

This study was carried out to investigate the frequencies of normal and abnormal behaviours observed in the Kivircik and crossbred lambs and to determine the effects of genotype, sex and observation period on these behaviours.

Materials and Methods

Materials

The material of the study was formed of 10 Kivircik and 10 crossbred [F_2 (German Black-Headed Mutton x Merino) x F_1 (Chios x Kivircik)] lambs, which were weaned at the age of 2-2.5 months.

The Kivircik and crossbred lambs were put in two separate paddocks, each having an area of 12 m². Wooden blocks separated the groups. In the paddocks straw was used as bedding material. In each genotype group, there were 5 male + 5 female lambs. To identify the lambs in each group, numbers from one to ten were painted on the hip region of lambs.

In each of the paddocks, there were bowls having fresh water all the time and mangers, which contained both the concentrated feed and grass together. The lambs were subjected to intensive feeding for 56 days. During the study, 10 kg/day dry grass hay was given to each of the groups and mineral stones were put in the mangers to satisfy the mineral needs of the lambs. The analysed chemical composition of lamb fattening ration, which was given to the lambs ad libitum all through the study, was presented in Table 1.

Table 1. Analysed chemical composition of lamb feed, kg DM.

Analysed chemical composition	Units
Crude protein	%16
Metabolic energy	2500 cal.
Crude cellulose	%10
Crude ash	%10
Dry matter	%88
Calcium	%0.8-2
Phosphorus	%0.5
Sodium	%0.1-0.4
NaCl	%0.6

Methods

As the behaviour characteristics of the lambs, feeding (the lamb's meeting its feed need), drinking (the lamb's meeting its water need), activities towards the bedding material (smelling or chewing the bedding material), rumination (chewing the rumen content, which comes to

the mouth), lying (lying without showing any other behaviours), standing (standing without showing any other behaviours), oral stereotypic behaviours - OSB (licking manger-bowl, gnawing manger-bowl, licking fences, gnawing fences, licking walls and gnawing walls) and behaviours towards other animals - BTA (wool eating, smelling and licking animals) were observed.

Two observers did the observations in one of the day of each week for eight weeks, at 11.00-12.00 in the mornings and at 13.30-15.30 in the afternoons. The total observation time was 24 hours. To eliminate the effect of observer, the observers changed places in the afternoon periods of each observation day. The observations were done by time-sampling method (6). Two observers entered the breeding units at least 15 minutes before the beginning of observations. The observed behaviours at the end of every five minutes were recorded on the individual charts.

The Statistical Analyses of Data

In the statistical analyses of all the behaviour characteristics of the lambs the model below was used:

$$\pi_{ijkl} = \Phi (I_i + C_j + G_k + P_l)$$

The symbols in this model are defined as; π_{ijkl} , the percentage of the animals expected to show the behaviour; Φ , the additive probability function for standard normal distribution; I_i , the fixed effect of genotype (Kıvırcık and crossbred); C_j , the fixed effect of sex (male and female); G_k , the fixed effect of observation day (the observation day in the 1, 2, ... and 8th weeks); and P_l , the fixed effect of observation period (morning

and afternoon). The effect of observation day on the behavioural characteristics of each group was eliminated by using contrast values. In the evaluation of the behaviour characteristics, the regression coefficients and odd percentages calculated from the segmented model were used. Odd percentages are defined as the proportion of the probability of the observation of a behaviour to the probability of that behaviour not being observed and odd percentages are calculated by the model of $\psi = e^b$. In this model, ψ is odds ratio, b is regression coefficient, and e is the exponential coefficient.

In the analyses of the behaviour characteristics of the lambs, SAS statistical program package was used (7).

Results

The live weight averages and the live weight per m² levels of the Kıvırcık and crossbred lambs in different periods of fattening were presented in Table 2. The initial and final fattening weights per m² paddock area for crossbred lambs were 25.46 kg and 34.17 kg and for the Kıvırcık lambs were 19.53 kg and 28.46 kg, respectively.

The frequencies of some of the behaviour characteristics of Kıvırcık and crossbred lambs were given in Table 3 and the chi-square values and significance controls of the factors affecting on these behaviour characteristics were presented in Table 4. The regression coefficients (b) and odd (ψ) percentages of genotype, sex and observation period in terms of behaviour characteristics of the lambs were given in Table 5.

Table 2. The live weight averages (kg) and the live weight per meter square levels (kg/m²) of the Kıvırcık and crossbred lambs in different periods of fattening

Fattening periods	Kıvırcık			Crossbred lambs		
	n	\bar{x}	$S_{\bar{x}}$	n	\bar{x}	$S_{\bar{x}}$
Initial	10	23.44	0.67	10	30.55	0.67
		19.53 kg/m ²			25.46 kg/m ²	
Middle (28 th day)	10	28.75	0.99	10	36.45	0.99
		23.96 kg/m ²			30.37 kg/m ²	
Final (56 th day)	10	34.15	1.07	10	41.00	1.07
		28.46 kg/m ²			34.17 kg/m ²	

Table 3. The frequencies of some of the behavioural characteristics of Kivircik and crossbred lambs (%)

Characteristics		Kivircik	Crossbred lambs
Feed	Feeding	22.05	24.79
	Drinking	1.42	1.04
	Rumination	13.88	18.88
	Activities towards bedding material	0.80	0.35
Individual	Lying	38.09	29.51
	Standing	19.13	20.52
Abnormal	Licking manger-bowl	0.00	0.10
	Gnawing manger-bowl	0.00	0.00
	Licking fences	0.07	0.1
	Gnawing fences	0.28	0.14
	Licking walls	0.07	0.45
	Gnawing walls	0.07	0.42
	Wool eating	0.07	0.35
Animal	Smelling	0.07	0.45
	Licking	0.00	0.11
Behaviours towards other animals (BTA)		0.07	0.56
Oral stereotypic behaviours (OSB)		0.49	1.22

Table 4. The chi-square (χ^2) values and significance controls of the factors affecting on some behavioural characteristics of lambs

Characteristics	Genotype		Sex		Observation period	
	χ^2	P	χ^2	P	χ^2	P
Feeding	7.62	**	2.85	-	289.04	**
Drinking	1.12	-	0.56	-	62.91	**
Activities towards the bedding material	4.28	*	4.42	*	2.61	-
Rumination	25.97	**	10.04	**	209.17	**
Lying	45.95	**	12.20	**	276.42	**
Standing	2.74	-	0.24	-	86.75	**
Behaviours towards other animals (BTA)	12.49	**	0.33	-	4.18	*
Oral stereotypic behaviours (OSB)	7.86	**	0.47	-	15.77	**

-Not significant

*P<0.05

**P<0.01

In the study, the effects of genotype on feeding ($P < 0.01$), activities towards the bedding material ($P < 0.05$), rumination ($P < 0.01$), lying ($P < 0.01$), behaviours towards animals (BTA) ($P < 0.01$) and oral stereotypic behaviours (OSB) ($P < 0.01$) were found to be statistically significant. In terms of drinking and standing

behaviours ($P > 0.05$) no significant differences were observed between the Kivircik and crossbred lambs.

The differences between male and female lambs with regard to feeding, drinking, standing, BTA and OSB were not significant ($P > 0.05$). However, the differences for activities towards bedding material ($P < 0.05$),

Table 5. The regression coefficients (b) and odd (ψ) percentages of genotype, sex and observation period in terms of behavioural characteristics of lambs

Characteristics	Genotype*		Sex*		Observation period*	
	Kıvırcık		Female		Afternoon	
	b	ψ	b	ψ	b	ψ
Feeding	-0.10	0.90	-0.06	0.94	-0.66	0.52
Drinking	0.10	1.11	0.07	1.07	-0.78	0.46
Activities towards the bedding material	0.27	1.31	0.28	1.32	-0.21	0.81
Rumination	-0.21	0.81	-0.13	0.88	0.70	2.01
Lying	0.24	1.27	0.12	1.13	0.64	1.90
Standing	-0.06	0.94	0.02	1.02	-0.38	0.68
Behaviours towards other animals (BTA)	-0.70	0.50	-0.10	0.90	-0.35	0.70
Oral stereotypic behaviours (OSB)	-0.32	0.73	0.08	1.08	-0.44	0.64

* The regression coefficients (b) and odd (ψ) percentages of crossbred lambs, male lambs and morning period were assumed to be 0.00 and 1.00, respectively

rumination ($P < 0.01$) and lying ($P < 0.01$) were statistically significant.

The differences between observation periods in terms of activities towards bedding material was not significant ($P > 0.05$), whereas significant differences for feeding ($P < 0.01$), drinking ($P < 0.01$), rumination ($P < 0.01$), lying ($P < 0.01$), standing ($P < 0.01$), BTA ($P < 0.05$) and OSB ($P < 0.01$) between the morning and afternoon observation periods were observed.

Discussion

In the present study, the differences between the genotypes for all of the behaviours other than drinking and standing were found to be statistically significant. The breeding area for crossbred lambs was found to be more limited than the Kıvırcık lambs (Table 1). One of the reasons causing abnormal behaviours in animals is the limitation of movements (8). By taking this as a criterion, the observation of more frequent BTA ($\Psi = 0,50$) and OSB ($\Psi = 0,73$) in the crossbred lambs than the Kıvırcık lambs could partially be explained by the body weight differences between the two genotypes.

In the studies on fattening lambs, it was reported that there were close relationships between the OSB with the inadequate nutrient content (energy, protein) of feed consumed (9-11) and the inadequate consumption of carbohydrates (12). On the other hand, there are results showing that feed consumption motivation might have an important role in the formation of stereotypic behaviours

(3,13,14). In the present study, the lambs were given ad libitum lamb grower feed and good quality grass hay. When the feeding conditions are evaluated, it can be seen that the basic nutrient materials and carbohydrates were not inadequate and there was not continuous feed consumption motivation. So, it can be declared that in the ethological formation of the OSB in the present study, the feeding method should not have a high proportion.

Activities towards bedding material of the Kıvırcık lambs were 31% ($\psi = 1.31$) more than the crossbred lambs. OSB was 27% ($\psi = 0.73$) less observed in the Kıvırcık lambs than the crossbred lambs. When these two behaviour characteristics are evaluated together, it can be seen that as a result of the better adaptation of the Kıvırcık lambs to the breeding conditions of the present study than the crossbred lambs, the Kıvırcık lambs showed more activities like smelling and gnawing towards bedding material rather than OSB.

The female lambs showed 13% ($\psi = 1.13$) more lying behaviour than male lambs. This result shows that male lambs had a more active role in environments that the both sexes are bred together. Similar to this result, Savaş et al. (15) on Türkgeldi lambs found that male lambs were more active. Inactive behaviours also change in different genotypes (16). The effect of genotype on lying behaviour was found significant in the present study ($P < 0.01$). Lying behaviour is generally accepted as a sign of welfare. The Kıvırcık lambs, which showed less OSB (27%), displaying more lying (27%) behaviour than the crossbred lambs is supporting this idea.

The effects of sex, genotype and observation period were found significant ($P < 0.01$) on rumination behaviour. It is reported that the total rumination time in a day in sheep is 5.5-10 hours. Rumination is done in 8-15 periods and the time of periods can differ from 1 minute to 2 hours (17). The rumination behaviour differences between observation periods could be explained by the concentration of rumination in some periods of the day as a result of the natural physiology of rumination. It was determined that the lambs spent a significant proportion of their time in feeding in the morning periods and showed concentrated rumination behaviours in the afternoons. As a result of the digestion physiology of sheep, there is a strong relationship between rumination behaviour and feeding. The higher percentage of rumination behaviours of the crossbred lambs than the Kivircik lambs in the present study is parallel to the ability of higher percentages of feed consumption of the crossbred lambs (15).

In the Kivircik lambs, oral stereotypic behaviours was 27% ($\psi = 0.73$) less and behaviours towards other animals were 50% ($\psi = 0.50$) less than the crossbred lambs. Behaviours like these are reported as abnormal

behaviours, which could be eliminated by optimum breeding intensity and the presence of grass hay (18). The similar results for these two abnormal behaviours, which can be regarded as stress indicators, support the idea that the Kivircik lambs were more adaptable to the breeding conditions used in the study.

In this study, it was determined that the Kivircik lambs tolerated the present environmental conditions of the study better than the crossbred lambs. OSB and BTA were observed more intensively in the crossbred lambs. Although the crossbred lambs were more suitable for fattening program in terms of live weight gains, they showed more abnormal behaviours in the limited breeding area, parallel to the lessening of the area by the rise in their live weights. Male lambs were more active than female lambs. The lambs spent a significant proportion of their time feeding and drinking in the mornings and showed behaviours like lying and rumination in the afternoons. The abnormal behaviours were observed more in the morning periods.

As a result, it can say that wider breeding area in intensive lamb fattening may decrease the occurrence of stress behaviours.

References

1. Brummer, H.: Verhaltenstörungen. In: H.H. Sambras, Ed. Nutztierethologie, Verlag Paul Parey, Berlin-Hamburg, 1978.
2. Odberg, F.: Abnormal Behaviours: Stereotypies. In: Proceedings of 1st World Congr. Ethol. And Appl. Zootech. Madrid, Spain, 1978; 475.
3. Rushen, J., Lawrence, A.B., Terlouw, E.M.C.: The motivational basis of stereotypes. In: Lawrence, A.B., Rushen, J., Eds. Stereotypic Animal Behaviour: Fundamentals and Applications to Welfare. CAB International, Wallingford, UK, 1993; 41-64.
4. Dantzer, R.: Behavioural, physiological and functional aspects of stereotyped behaviour: a review and a re-interpretation. J. Anim. Sci., 1986; 62: 1776-1786.
5. Lynch, J.J., Hinch G.N., Adams D.B.: The Behaviour of Sheep, Biological Principles and Implications for Production. CAB International and CSIRO, Australia, 1992.
6. Fraser, A.F., Broom, D.M.: Farm animal behaviour and welfare. In: Describing, Recording and Measuring Behaviour. Third Edition. Bailliere Tindall, London, 1990; 7-16.
7. SAS Institute Inc.: User's Guide. Vers. 6.07, Cary, NC, USA, 1992.
8. Sambras, H.H.: Stereotypes. In: A.F. Fraser, Ethology of Farm Animals. Elsevier, Amsterdam, 1985; 431-441.
9. Cooper, J., Emmans, G.C., Friggens, N.C.: Effect of diet on behaviour of individually penned lambs. Anim. Sci., 1994; 58: 441.
10. Cooper, J., Haskell, M., Lewis, R.M.: The development of stereotypes in experimental sheep. Anim. Sci., 1996; 62: 674.
11. Yurtman, İ.Y., Savaş, T., Karaağaç, F., Coşkuntuna, L.: Effects of daily protein intake levels on the oral stereotypic behaviours in energy restricted lambs. Appl. Anim. Behav. Sci., 2002; 77: 77-88.
12. Cooper, J., Mc Cullam, J., Shanks, M.: The effect of fibrous diet on abnormal oral behaviour in stall housed lambs. British Society of Animal Science Winter Meeting, Summaries, 1995; 207.
13. Marsden, D., Wood-Gush, D.G.M.: A note on behaviour of individually penned sheep regarding their use for research purposes. Anim. Prod., 1986; 42: 157-159.
14. Redbo, I., Emanuelson, M., Lundberg, K., Oredson, N.: Feeding level and oral stereotypes in dairy cows. Anim. Sci., 1996; 62: 199-206.
15. Savaş, T., Yurtman, İ.Y., Karaağaç, F., Köycü, E.: Einfluss der intensiven Gruppenhaltung und Geschlecht auf Oral Stereotypien und einige Verhaltensmerkmale bei Mastlämmern. Arch. Tierz., Dummerstorf 2001; 44: 313-322.

16. Key, C., Maciver, R.M.: The effect of maternal influences on sheep: breed differences in grazing, resting and courtship behaviour. *Appl. Anim. Ethol.*, 1980; 6: 33-48.
17. Meyer, P.: Schaf. In: Bogner, H., Grauvogl, A., Eds. *Verhalten Landwirtschaftlicher Nutztiere*. Verlag Eugen Ulmer, Stuttgart, 1984.
18. Fraser, A.F., Broom, D.M.: *Farm Animal Behaviour and Welfare*. In: *Abnormal Behaviour*. Third Edition. Bailliere Tindall, London, 1990, 305-349.