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The Effect of Voluntary Feed Intake on Some Plasma Parameters in Different Sex Lambs

[1]Karaalp Musa, [1]Cimen Murat and [2]Elmastas Mahfuz
[1]Department of Animal Science, Faculty of Agriculture,
[2]Department of Chemistry, Faculty of Science, Gaziosmanpasa University, 60240 Tokat, Turkey

Abstract: In this study, the changes in the plasma parameters of different sex lambs were investigated when diet is constituted by the free choice of animals instead of feeding a standard diet. 6-7 months old Karayaka lambs (7 male and 7 female) were used in experiment 1. Sugar beet pulp, perennial ryegrass and alfalfa straw were used to feed lambs in the research lasting for 28 days. In experiment 2, 7-8 months old Karayaka lambs (7 male and 7 female) were used. The ground barley, wheat bran, expeller cottonseed meal and alfalfa straw were used to feed. The second experiment was continued for 42 days. In roughage selection, male lambs consumed more feed (42.6%) than female lambs in total consumption (experiment 1). Besides, the sugar beet pulp consumption of male lambs were higher (66%) than that of the female lambs, but were lower (76.3%) for alfalfa straw. In experiment 2, total feed consumption of male lambs was higher (10.2%) than that of female lambs. Besides the feed consumption of male lambs was higher 43.7 and 35.7% for wheat bran and alfalfa straw, respectively. In both experiments, there were no significant ($p>0.05$) differences between plasma glucose, total protein, albumin, globulin, amylase, sodium and potassium of the groups. The cholesterol level were higher ($p<0.01$) in male lambs in experiment 1. Besides, the triglyceride values were found to be higher in male lambs in experiment 1 ($p<0.05$) and 2 ($p<0.01$). In experiment 1, the high cholesterol levels in males may due to their hormonal status and more sugar beet pulp intake. Plasma triglycerides elevated in males in both experiments, because of their low estrogen level according to females. The other plasma parameters (glucose, total protein, albumin, globulin, amylase, sodium and potassium) of lambs were not differ between sex in both experiments.

Key words: Voluntary feed intake, lamb, sex, plasma parameters

INTRODUCTION

Changes in concentration of blood components of ruminants have been used as a criterion of nutrient status[1-4]. Blood parameters carry valuable information on how nutritional and management factors affect blood parameters and how those parameters are related to the health status of animals[5]. Blood Parameters are influenced by many factors, such as live weight, breed[6,7], age, sex and nutrition[6].

In previous studies the changes on blood parameters of sheep were often investigated by feeding the groups with standard diets. However, use of a standard diet may cause intake fewer or higher nutrients than needs. This situation may lead to deviations from normal blood parameters for a certain live weight, breed and sex. It was announced that blood parameters are different between females and males in animals[8,10] and they can select diets according to their needs[11-13]. In this study, the changes in the plasma parameters of male and female lambs were investigated when animals are subjected to the free choice instead of feeding a standard diet.

MATERIALS AND METHODS

In experiment 1, Karayaka lambs (7 male and 7 female), chosen among 6-7 months old lambs in a raiser flock were used. Dry Matter (DM) and Crude Protein (CP) (Kjeldahl-Nx6.25) of feed sources were determined by AOAC[14] procedures. Metabolizable energy (ME, Mcal kg^{-1}) of feeds calculated from feed composition tables[15]. Sugar Beet Pulp (SBP), Perennial Ryegrass (PR) and Alfalfa Straw (AS) were used in the research. Some nutrient contents of roughages are given in Table 1. The mangers were divided to three parts and each roughages was placed in one of the parts. The experiment was continued for 28 days.

The lambs were trained to concentrate diets one week between experiment 1 and 2. In experiment 2, 7-8 months old Karayaka lambs (7 male and 7 female) were used. The experiment 2 was commenced a week after completing experiment 1. The ground Barley (B), Wheat Bran (WB), Expeller Cottonseed Meal (CSM) and Alfalfa Straw (AS) were used in the research. Nutrient contents of feed materials are given in Table 1. The mangers were divided

Corresponding Autor: Karaalp Musa, Department of Animal Science, Faculty of Agriculture,
Gaziosmanpasa University, 60240 Tokat, Turkey
Tel: +90 356 252 14 79 Fax: +90 356 252 14 88

Table 1: Nutrient contents of feeds

	Experiment 1			Experiment 2			
Component	SBP	PR	AS	B	WB	CSM	AS
DM*, (g kg^{-1})	156.5	907.2	894.8	891.1	892.3	922.3	894.8
CP*, DM(g kg^{-1})	94.6	106.0	173.6	111.5	170.3	298.4	173.6
ME**, DM (M cal kg^{-1})	2.68	2.09	2.04	3.15	2.46	2.69	2.04

* analysed values, ** Fom feed composition tables[15]

Table 2: Live weights (kg) of lambs in both experiments (M±SE)

	Experiment 1		Experiment 2	
Groups	Initial weight (kg)	Final weight (kg)	Initial weight (kg)	Final weight (kg)
Male	34.68±0.60	37.30±0.53	37.84±0.99	45.30±1.15
Female	33.86±0.62	36.00±0.80	36.86±1.79	39.68±1.99*
p-value	0.36	0.20	0.65	0.04

*Within a column means differ ($p<0.05$)

to four parts and each feed material was placed on one of the parts. The experiment was continued for 42 days. Limestone, salt and vitamin-mineral premix were supplemented to each feed, except alfalfa straw, 15, 10 and 3 g kg^{-1}, respectively.

The blood samples were collected from each animal by disposable syringe through vein and were placed in heparinized tube. Then the samples were centrifuged at 3500 rpm for 5 min. The plasma obtained in each tube was separated and immediately frozen to - 40°C until it was analysed. The following techniques were used to determine the biochemical parameters: an enzymatic colorimetric test for total plasma cholesterol (mg dL^{-1}; Boehringer Mennheim CHOD-PAP method) and triglycerides (mg dL^{-1}; Boehringer Mennheim GPO-PAP method)[16]. The total plasma protein content of sample and standard solution were determined by the Lowry method[17]. Plasma albumin, globulin, glucose, amylase, sodium (Na) and potassium (K) were measured with an autoanalyzer (Advia™ 1650, Japan).

The data were assessed by analysis of variance (ANOVA) and were compared by Independent Samples t-test with the help of the SPSS[18].

RESULTS AND DISCUSSION

Initial and final weights of lambs are given in Table 2. There were no differences in initial weights between groups in beginning of the both experiments. The differences were only found in final weight in experiment 2 ($p>0.05$) but not in experiment 1.

Animals can select diets according to their needs[11-13]. Ruminants adapted to poor-quality forage have highly developed forestomachs[19]. Amount of intake is consequence either of rapid outflow or of increased rumen volume, or both[20]. Ruminants prefer high-moisture roughages to dry roughages[21]. Lambs could selectd different roughage materials according to their needs in this research. The consumed amount of roughages and daily nutrient consumption of lambs are given in Table 3. It was seen in roughage selection that male lambs consumed more feed (42.6%) than female lambs in total consumption. Besides, the roughage consumption of male lambs was higher than that of the female lambs; for SBP (66%), but were lower (76.3%) for AS.

Daily ME intake of male lambs per kg MW were higher than daily intake of female lambs with 9.1%, but were lower (16.1%) for daily CP (Table 3). In kg DM, ME content of daily chosen roughage diet of male lambs was higher than female lambs' with 6.1%, whereas CP content of the diet of female lambs was greater than male lambs with 16.1%. In the same way feed and daily nutrient consumptions of lambs in feed selection are given in Table 4 (experiment 2). The experiment showed that male lambs consumed 10.2% more total feed than female lambs. Besides, the feed consumption of male lambs was higher 43.7 and 35.7% for WB and AS, respectively.

Daily CP and ME intake of female lambs per kg MW were higher than female lambs with 67.3 and 47.8%, respectively. It is known that carcass of females contains relatively higher fat than males'. The energy cost of per 1 g fat deposition in growing lambs was estimated to be 14.97 kcal ME[22].

The plasma parameters of groups at the end of the roughage selection and feed selection are given in Table 5. Plasma data in the present study were in agreement of those reported values for sheep[23].

The plasma cholesterol value of male lambs (46.40 mg dL^{-1}) was higher ($p<0.01$) than female lambs' (29.85 mg dL^{-1}) at the end of the roughage selection. Serum cholesterol changes are associated with sex[24]. Plasma cholesterol could be increased since cholesterol is the main precursor of testosterone[25]. The high plasma testosterone is associated with high plasma cholesterol because there is a positive correlation between testosterone and cholesterol in plasma[26]. In addition, Bilal *et al.*[27] reported that cholesterol value increased when the SBP was consumed at the high amounts. Owing to the fact that male lambs consumed more SBP (66%) than female lambs, the plasma cholesterol value might have increased in experiment 1. But, the cholesterol values of groups were not found different in experiment 2. It was reported that however serum cholesterol level different between sex, the reasons for the sex differences is not apparent[24].

It was reported that triglycerides higher in males[10,28-32]. In the same way, there were found differences ($p<0.05$) between plasma triglyceride levels of male and female lambs in both experiments. Plasma triglycerides of male and female lambs were established

Table 3: Daily roughage and nutrient intake and contents of daily chosen diets (Exp. 1)

	Daily roughage intake (g lamb^{-1})				Daily nutrient intake (/ kg MW*)**		Contents of daily chosen diets (/kg DM/lamb)	
Groups	SBP	AS	PR	Total	CP (g)	ME (Mcal)	CP (g)	ME (Mcal)
Male	5351	478	177	6006	11.57	0.24	119.2	2.42
Female	3219	843	150	4212	13.43	0.22	138.4	2.28

*MW: Metabolic Weight (live weight$^{0.75}$) **[(daily intake)] / [(initial MW + final MW)/2]

Table 4: Daily feed and nutrient intake and contents of daily chosen diets (Exp. 2)

	Daily feed intake (g lamb^{-1})					Daily nutrient intake(/ kg MW*)**		Contents of daily chosen diets (/kg DM/lamb)	
Group	B	WB	CSM	AS	Total	CP (g)	ME (Mcal)	CP (g)	ME(Mcal)
Male	934	414	8	171	1527	12.23	0.23	135.1	2.84
Female	918	288	53	126	1385	20.47	0.34	136.6	2.89

*MW: metabolic weight, **[(daily intake)]/[(initial MW + final MW)/2]

Table 5: Plasma components of lambs in experiment 1 and 2 (Mean±SE)

	Experiment 1			Experiment 2		
	Male	Female	P	Male	Female	P
Glucose (mg dL^{-1})	43.40±3.51	36.00±2.52	0.116	63.28±3.01	59.00±2.97	0.332
Cholesterol (mg dL^{-1})	46.40±2.15**	29.85±1.95	0.001	57.42±2.35	51.14±4.62	0.257
Triglyceride (mg dL^{-1})	21.00±2.19*	14.60±0.67	0.026	29.28±3.13**	14.00±1.64	0.002
Total Protein (g dL^{-1})	7.62±0.05	7.57±0.14	0.720	07.51±0.23	7.45±0.21	0.861
Albumin (g dL^{-1})	3.64±0.06	3.52±0.09	0.357	03.68±0.06	3.52±0.09	0.202
Globulin (g dL^{-1})	3.96±0.06	4.02±0.07	0.560	03.85±0.16	4.00±0.07	0.461
Amylase (IU L^{-1})	22.42±4.00	16.71±1.37	0.217	21.14±3.73	15.57±1.47	0.203
Na (mmol L^{-1})	179.10±4.66	183.50±2.75	0.434	176.10±1.95	174.10±1.50	0.434
K (mmol L^{-1})	8.40±0.83	7.02±0.34	0.166	6.90±0.44	6.77±0.33	0.822

*Within a row means differ ($p<0.05$)

21 and 14.6 mg dL^{-1} in exp.1, 29.28 and 14 mg dL^{-1} in exp 2. In females, estrogen status determine significantly plasma triglyceride. The estrogen level of young females higher according to young males'. Therefore, the triglycerides of plasma lower in females[33]. Whereas, the males failed to decrease triglycerides in plasma because of their hormonal status[32]. In this study, other plasma parameters of lambs were not differ between groups in both experiments.

CONCLUSION

In experiment 1, the high cholesterol levels in males may due to more SBP intake and their hormonal status. Plasma triglycerides elevated in males in both experiments, because of their low estrogen level. The other plasma parameters (glucose, total protein, albumin, globulin, amylase, Na and K) of lambs were not differ between sex in both experiments.

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