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Original Research Article

Growth Performance of Kivircik Lambs Fed Different Silages

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ABSTRACT

The experiment with 36 male growing Kivircik lambs, the effect of maize silages supplementation on growing performance and ruminal fermentation was determined. In the 56 days experiment, lambs were allocated to 3 treatments group (Control, MS-1 and MS-2) of 12 lambs each. The three group consisted of concentrate alone (control), 25% maize silages supplemented with concentrate (MS-1) and 50% maize silage supplemented with concentrate (MS-2). Diet had a significant daily weight gain (P<0.05). Inclusion of maize silages in diets did not alter significantly dry matter intake and feed conversion. Rumen fluid pH and butyric acid were increased by maize silage levels (P<0.05).

Keywords: Lamb, growth performance, silages, concentrates ruminal fermentation.

INTRODUCTION

Silage can be successfully fed to sheep to improve animal performance pasture utilization, and management by transferring surplus feed to less favorable periods of feed supply. Silage has many potential roles in sheep enterprises. It can be used to improve pasture utilization, increase animal production per head and increase stocking rate, as well as a drought feed and also for the finishing of lambs in a feedlot (Marley *et al.*, 2007; Stanley, 2003). Sheep production systems in South Africa are traditionally extensive and sheep are more sensitive to silage quality than cattle, which give the impression that silage is not a practical or effective source of roughage for sheep. Silages are mostly used in total mixed ration (TMR) and it is thus important to also determine the nutritive value to ensure that animals receive a balanced diet.

Silage quality and its nutritional value are influenced by numerous biological and technological factors (Owens *et al.*, 2009). One of the most important factors is the production of lactic acid during ensiling process which in turn is dependent upon the soluble sugars present in the crop (Schaefer *et al.*, 1989). Therefore, cereal fodders particularly maize, sorghum and millet offer potential suitability for silage making and usually there is no need to add energy source during ensiling process (Wierenga *et al.*, 2010). Khan *et al.* (2011), reported high daily weight gain of lambs fed maize silage with or without concentrate may be attributed to high dry matter intake in maize silage when compared to millet and sorghum silages.

The main of this research work is to develop a feeding system for growing Kivircik lambs by feeding maize silage based rations supplemented with concentrate at certain levels to investigate the growth rate.

MATERIALS AND METHODS

The study was conducted at the Department of Animal Science Small Ruminant Research Units, the University of Uludag, Bursa (Turkey). The research units are located on 40°N and 29°E latitude and longitude, respectively. The area receives on average 700 mm of rain fall. Mean annual minimum and maximum temperatures experienced at the site 1.7 and 30.6 °C respectively.

Thirty six male Kivircik lambs, initial weight of 32.1 kg were randomly allotted to three experimental rations (twelve lambs per ration). After weighing, they were allowed 7 days acclimatization before the trial began. The three diets consisted of concentrate alone (control), 25% maize silage supplemented with concentrate (MS-1) and 50% maize silage supplemented with concentrate (MS-2) in DM basis. Lambs of each group were raised identically, had ad libitum access to feed and water. Concentrate was mixed with silages manually, every morning before feeding to the lambs. Ingredients and chemical composition of the concentrate ration is presented in Table 1.

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Table 1. Ingredient and chemical composition of diets.

		Diets	
Ingredients, g/kg DM	**Control diet**	**25% maize silage (MS-1)**	**50% maize silage (MS-2)**
Wheat grain	49.0		
Corn grain	20.0	75% control diet+25%	50% control diet+50%
Sunflower meal	28.0	maize silage	maize silage
Calcium carbonate	1.7		
Salt	1.1		
Mineral and vitamins*	0.2		
Chemical composition of the diets			
Dry matter, g/kg	1000	1000	1000
Crude protein, g/kg DM	174.3	159.2	144.1
Ether extract, g/kg DM	30.8	33.0	35.1
Neutral detergent fiber, g/kg of DM	273.4	370.1	466.8
Acid detergent fiber, g/kg DM	152.4	184.3	216.1
Ash, g/kg DM	64.3	64.0	63.6
Metabolizable energy, kcal/kg	2755	2533	2312

*Provided the following per kilogram of diet: 60 mg manganese; 13 mg iron; 1 mg copper; 1.6 mg iodine; 1 mg cobalt; 60 mg zinc; vitamin A, 5000 IU; vitamin D, 2000 IU; vitamin E, 10 mg.

Before starting the experiment, all the lambs were treated for external and internal parasites with administering recommended doses. During the 56 days experimental period, lambs were weighed individually at the commencement, and at 14 days intervals, and daily weight gain (DWG) was calculated. Feed intake was measured daily on a group basis, and dry matter (DM) intake and feed conversion calculated. On days 7, 28 and 56 of the study, ruminal fluid was collected from five lambs randomly selected from each treatment group using an orogastric tube into 50 ml plastic tubes and pH was measured immediately (Sartorius, PB-20 model pH meter, Germany). Rumen fluid samples were analyzed for ammonia N (Chaney and Marbach, 1962), total volatile fatty acids (TVFA) (Wiedmeier *et al.*, 1987).

Data were analyzed by one-way analysis of variance and significant differences among treatment means were tested using linear and quadratic contrasts at 5% probability level, using the SPSS Statistical Software Package (Release 10.0, 1999), (Minitab, 1998).

RESULTS AND DISCUSSION

The average daily gain observed in the Kivircik lambs fed rations concentrate (control), concentrate + 25% and 50% maize silage were 272.2, 197.8 and 189.4 g in DM basis. Significant difference among experimental lambs fed different maize silage groups and concentrate based rations was found ($P<0.05$). Lowest feed conversion was noticed in lambs fed concentrate ration than those fed MS-1 and MS-25 rations (Table 2). Jadoon *et al.* (1990) reported that the highest daily weight gain in sheep was observed in maize silage plus concentrate ration than those of maize and oat silages alone or along with crushed maize grain/concentrate rations. Azim *et al.* (1995) reported a significantly higher daily weight gain in lambs fed maize plus cowpea silage than those fed maize silage alone. Several studies indicated that maize, sorghum and other grass silages supplemented with different protein sources increased the growth rate of growing animals (Kim *et al.*, 2000).

Lambs fed MS-1 and MS-2 rations have significantly higher DM intake than fed concentrate ration. Jadoon *et al.* (1990) reported that the highest DM intake in sheep was noticed in maize silage plus concentrate ration than those of maize and oat silages alone. Supplementation with grain will increase total DM intake and lamb live weight gain when using silage-based diets to finish lambs (Steen *et al.*, 1998). Lambs fed to concentrate diet had higher daily weight gain, and lower DM intake and feed conversion than those fed the silage diets. Higher DM intake of lambs fed maize silage when compared to those fed other rations may be attributed to low NDF content in maize silage than those of millet and sorghum silages (Kung *et al.*, 2008). Neutral detergent fiber concentration is highly correlated with DM intake (Cooke *et al.*, 2008). Mustafa *et al.* (2008) who reported

that lambs fed the concentrate diet consumed more energy and protein compared to lambs on the silage diet, which led to a higher growth rate and lower feed conversion ratio in the lambs fed the concentrate diet.

Table 2. Dry matter intake, initial and final lives weight, average daily gain, and feed conversion of lambs.

	Diets			
Characteristics	**Control**	**MS-1**	**MS-2**	**SEM**
Initial live weight, kg	32.1	32.2	31.9	1.456
Final live weight, kg	44.8	43.3	42.5	1.570
Average daily gain, g/day	227.2[a]	197.8[b]	189.4[b]	10.140
DM intake, g/day	1140.3	1246.4	1235.3	-
Feed conversion[a], kg	5.2	5.8	7.1	-

SEM=standard error of the means

[a,b] Within rows differences were statistically significant ($p<0.05$)

[a]Calculated as mean DM intake/mean average daily gain.

Rumen pH value of lambs fed control group was lower than that of lambs fed the MS-1 and MS-2 groups (Table 3). The rumen pH followed a similar pattern to that of silage pH. For all silage diets however, the levels of rumen pH recorded were within the optimal pH recommendation ranges for high proteolytic (pH 6 to 7) and cellulolytic (pH 6.2 to 6.8) actives (Abubeker *et al.*, 2009). Total volatile fatty acid, acetic acid, propionic acid, isobutyric acid, valeric acid and isovaleric acid were higher than two maize silages groups ($p<0.05$). Butyric acid value of feed MS-2 higher than that of fed the control and MS-1 groups. Higher butyric acid in silage is an indicator of undesirable fermentation and/or secondary fermentation (Schroder, 2004).

Table 3. Ruminal fermentation characteristics of lambs.

	Diets			
Characteristics	**Control**	**%25 maize silage**	**%50 maize silage**	**SEM**
Ruminal fluid pH	5.9[c]	6.3[b]	6.7[a]	0.035
Total VFA, m*M*	131.3[a]	117.9[b]	107.4[c]	1.034
Acetic acid, mol/100 mol	65.5[a]	58.9[b]	54.6[c]	0.680
Propionic acid, mol/100 mol	41.2[a]	35.1[b]	27.1[c]	0.416
Butyric acid, mol/100 mol	16.3[b]	17.0[b]	18.9[a]	0.324
Isobutyric acid, mol/100 mol	2.7[a]	2.3[b]	2.1[c]	0.093
Valeric acid, mol/100 mol	2.8[a]	2.2[c]	2.4[b]	0.081
Isovaleric acid, mol/100 mol	2.8[a]	2.3[b]	2.3[b]	0.088
Acetate:propionate	1.6[b]	1.7[b]	2.0[a]	0.028

SEM=standard error of the means

[a,b,c] Within rows differences were statistically significant ($p<0.05$)

Result of the present study were concordant with those of Beauchemin and McGinn (2005) reported lower ruminal pH and higher total VFA concentration for beef cattle fed corn-versus barley based diets, a likely reflection of higher DM intake for cattle fed corn-based diets.

It is concluded that the lambs fed silage in combination with concentrate different ratio (DM basis) had higher values of DM intake, than control groups. Average daily weight gain a feed conversion values of lambs fed concentrate had higher than MS-1 and MS-2 groups.

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