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Fattening of Improved Jezersko-Solčava weaned lambs with different diets

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ABSTRACT

The study was performed in a stable of Educational and Research Animal Husbandry Centre in Logatec. Thirty-five weaned Improved Jezersko-Solčava lambs, 16 females and 19 males, were included in the experiment. At the beginning of the study, lambs were on average 129 days (4.3 months) old and weighted on average 25.6 kg. Lambs were divided into four dietary groups by eight to nine lambs per group. Group I was fed with hay I and second harvest in the ratio 40:60 and 650 g of concentrate per lamb. Group II was fed with hay I and second harvest in the ratio 40:60, without concentrate. Group III was fed with hay II and supplemented with 650 g of concentrate per lamb, and group IV was fed only with hay II. Mineral-vitamin mixture and water were available to lambs ad libitum. The experiment lasted 40 days. Lambs were weighted every 10 days. Hay, second harvest, and concentrate offered to lambs were weighted every day. Data were analysed using SAS software. The statistical model included group (diet), sex, and birth weight. The average daily gains were: 196 g for Group I, 130 g for Group II, 169 g for Group 3, and 50 g for Group 4. The difference in the average daily gain among four groups of the lambs was statistically significant (P<0.001). We can conclude that diet influenced the average daily gain of the weaned lambs.
(Keywords: lambs, fattening, diet, daily gain)

INTRODUCTION

Improved Jezersko-Solčava (JSR) sheep is a result of improving the autochthonous Jezersko-Solčava (JS) sheep with Romanov (*Kompan et al.,* 1996). The JSR sheep is rather fertile breed, suitable for an intensive rearing of slaughter lambs. It is the most spread and the most numerous sheep breed in Slovenia. Breed JSR is mainly bred in the North and North-Western part of Slovenia. The population of JSR sheep is estimated to around 60,000.

The breed is fertile all year round, but most of sheep lamb in spring. The main production system in JSR breed is that lambs graze with their mothers on the pasture till they rich 25 to 35 kg. Lambs are then slaughtered. Some breeders, who have lambings in autumn, rear suckling lambs in stable, together with their mothers. There is also a tendency for fattening lambs after weaning, but different technologies, especially in feeding intensity, among breeders exist. In winter time, when lambs are fattened in stable, the diet is based on hay and sometimes cereal or concentrate supplementation. When lambs are fattened on pasture, they are often not supplemented, but their diet is only pasture.

Regarding feeding intensity in fattening lambs after weaning, daily gain of body weight varies among breeders (technologies). *Žgur et al.* (2003) fattened weaned JSR lambs with hay and commercial concentrate *ad libitum*. Daily gain of the lambs from birth to slaughter at 29 or 43 kg of live weight was over 300 g/day, regardless of their

live weight at slaughtering. *Cividini et al.* (2007) reported about 204 g of daily gain in pure JS lambs after weaning, which were fed with hay and cereals *ad libitum* or with pasture.

Daily gain of the lambs mainly depends on protein and energy level in their diet. Bahmaei lambs, which were fed three different metabolizable energy (ME) level diets (9.83 to 10.32 Mcal/kg of dry matter), grew from 197 to 218 g/day (*Hosseini et al.,* 2008). Increasing ME level in lamb's diets thus resulted in increasing growth performance. Some researches have shown that increasing the level of protein in high grain diets increases performance of the sheep (*Dabiri and Thonney,* 2004; *Haddad et al.,* 2001; *Kaya et al.,* 2009; *Suliman and Babiker,* 2007). In these studies, the protein concentration in the diet was 100 to 200 g in a dry matter basis. On the other hand, *Ruíz Nuno et al.* (2009) found that protein level has a minor effect on lamb performance.

Objective of the present study was to evaluate the effect of the winter diet on growth rate of weaned JSR lambs and their daily gain of body weight in a stable.

MATERIALS AND METHODS

The experiment was performed in December 2009 and January 2010 in a stable of Educational and Research Animal Husbandry Centre Logatec. Thirty-five weaned lambs of Improved Jezersko-Solčava (JSR) breed were included. Sixteen lambs were females and 19 were males. Lambs were divided into four groups regarding of the sex, so that approximately half of the females and half of the males were in the group. There were eight to nine lambs in each group. The initial average body weight of the lambs was 25.4 kg. They were on average 129 days (4.3 months) old.

Before the beginning of the experiment, the 10-day adaptation period was performed, when lambs were shared and treated against parasites. Lambs were also adapting to the diet and new environment in this period.

Every group of the lambs was fed with its own diet. The diet was calculated using the average live weight of the lambs and nutrient requirements for fattening lambs (*NRC,* 1985). For this purpose the chemical composition of hay and second harvest was determined (*Table 1*). Metabolizable energy (ME) in hay and second harvest was estimated using the equations 1 and 2, by *Babnik et al.* (2001). In the course of the experiment, the quantity of the hay and second harvest was increased according to the lambs' consumption, while the quantity of the concentrate stayed the same.

Table 1

Chemical composition of hay, second harvest and concentrate

	Hay I	**Hay II**	**Second harvest**	**Concentrate**
Dry matter (DM, g/kg)	877.3	878.1	847.4	880.1
Crude proteins (CP, g/kg)	76.5	61.9	124.4	205.0
Crude fat (CFat, g/kg)	15.0	13.0	25.4	
Crude fiber (CF g/kg)	326.0	338.5	271.7	
Ash (g/kg)	43.7	95.3	83.3	
Nitrogen free abstract (g/kg)	518.8	491.3	495.2	
Metabolizable energy (MJ/kg SS)	8.36	8.19	9.09	11.36

Estimation of metabolizable energy (ME, MJ/kg DM)

Hay – first harvest (*Babnik et al.,* 2001):

$$ME\ (MJ/kg^{-1}\ DM) = 13.00 - 0.01415 \cdot CF + 0.02256 \cdot CFat - 0.00482 \cdot CP \quad (1)$$

Second harvest (*Babnik et al.,* 2001):

$$ME\ (MJ/kg^{-1}\ DM) = 11.73 - 0.01129 \cdot CF + 0.04526 \cdot CFat - 0.00577 \cdot CP \quad (2)$$

The diet for Group I consisted of hay I and second harvest in the ratio 40:60 and 650 g of concentrate per lamb (*Table 2*). For Group II, the diet contained hay I and second harvest in the ratio 40:60, without concentrate. The diet for Group III consisted of hay II and 650 g of concentrate per lamb, and the diet for Group IV contained only hay II, without concentrate. The concentrations of crude proteins (CP) and ME in the DM of the diets differed among groups. The diet for group I contained the highest CP and ME concentration in DM (157 g CP and 11.16 MJ ME). Group IV contained the lowest concentrates of CP (70 g/kg DM) and ME (9.31 MJ/kg DM). Concentrate was fed individually, while second harvest and hay were fed per group. Mineral-vitamin mixture and water were available to lambs all the time.

Table 2

Daily composition of the diet offered to lambs

	Group I	Group II	Group III	Group IV
Hay I (g/lamb)	500	700		
Hay II (g/lamb)			1400	1700
Second harvest (g/lamb)	700	1200		
Concentrate (g/lamb)	650		650	
DM (g/day)	1603	1627	1801	1493
CP (g/kg DM)	157	127	122	70
ME (MJ/kg DM)	11.16	10.33	10.49	9.31

The experiment lasted 40 days. Lambs were fed once a day, in the morning. Firstly, Group I and Group III got the adherent quantity of concentrate. Lambs from these two groups were blocked into hayrack to eat its own concentrate, and they were left out afterwards. The refused concentrate was then removed from the hayrack. Hay and second harvest were then weighted and put into hayrack, regarding to the group. Before feeding next morning, the leavings of hay and second harvest in hayracks were removed. Lambs were weighted every 10 days, prior to the feeding. Daily gain of live weight was calculated from live weights of the lambs.

Statistical analysis was done using statistical package *SAS/STAT* (2001). Fixed part of the model was developed using the GLM procedure, where also descriptive statistics was done. Statistical model included group (diet; G_i) with four levels and sex (S_j) with two levels. Birth weight (W_k) was treated as covariate in a simple linear regression. Litter size, initial age at the experiment, and initial age at the experiment did not affected daily gain of the lambs, therefore, they were excluded from the model.

RESULTS AND DISCUSSION

The effect of winter diet on the growth rate of weaned JSR lambs and their daily gain of body weight in a stable was studied. Groups I and II were fed with hay I and second harvest in the ratio 40:60. Group I was supplemented with 650 g of the concentrate per

lamb. Hay II was fed to groups III and IV, while group III was supplemented with 650 g of the concentrate per lamb.

At the beginning of the experiment, the average live weight of the lambs was between 24.8 kg in group I (*Table 3*) and 25.8 kg in group II. In the 40 day's trial, the increase of the live weight was the highest (7.6 kg) in group I, which was fed with the richest diet, hay I, second harvest, and concentrate. Group III, which was fed with hay II and supplemented with concentrate, grew up for 6.8 kg. For 5.3 kg of live weight grew up group II, which was fed with hay I and second harvest, without supplement. The lowest average increase of live weight had lambs in group IV (only 2 kg), what was expected, regarding that they were fed only with hay. At the end of the experiment, lambs were in the average 169 days (5.6 months) old and they weighted on average 30.8 kg.

Table 3

Basic statistical parameters for live weight of the lambs according to the group (kg)

Group	Day of the trial	n	Average	SD	Min	Max
I	1	9	24.8	3.8	19.8	31.0
	20	9	29.4	5.3	23.5	37.5
	40	9	32.4	6.1	25.3	41.2
II	1	9	25.8	3.1	21.7	31.0
	20	9	28.8	3.4	24.7	34.5
	40	9	31.1	3.6	26.7	37,1
III	1	8	25.5	3.1	19.1	28.7
	20	8	29.8	2.8	24.3	33.7
	40	8	32.0	3.1	25.4	36.1
IV	1	9	25.7	3.0	22.4	31.3
	20	9	27.2	2.9	22.8	31.4
	40	9	27.7	2.7	24.1	30.9

n: number of the lambs; SD: standard deviation

As expected, daily gain of the body weight was the highest in group I, which was fed with the richest diet (*Table 4*). The average daily gain of these lambs was almost 200 g/day. Similar daily gain was achieved in pure JS weaned lambs (*Cividini et al.,* 2007), which were fattened in the stable with hay and cereals *ad libitum* or with pasture. The diet offered to the lambs in group I contained the highest protein and energy level (157 g CP/kg DM and 11.16 MJ ME/kg DM– *Table 2*). *Hosseini et al.* (2008) fed lambs with different energy levels of diet (9.83 MJ ME/kg, 10.37 MJ ME/kg and 10.32 MJ ME/kg), and they found that lambs fattened with the highest energy level in the diet had the highest average daily gain, over 200 g/day). When *Haddad et al.* (2001) offered to lambs different crude protein concentrations (100, 120, 140, 160, and 180 g/kg DM) with 10.70 MJ ME/kg DM, the average daily gain was the highest (287 g/day) in the group fed with 160 g CP/kg DM. This diet was similar to the diet of group I in our experiment where lambs had also the highest daily gain among all four groups. *Ruíz Nuño et al.* (2009) fattened lambs also with different CP concentrations in the diet (140, 160, and 180 g CP/kg DM and 11.76 MJ ME/kg DM), but the average daily gain of the lambs (over 270 g/day) was not affected by the level of crude proteins. Group III of our experiment, which was also supplemented with concentrate, had lower daily gain (169

g/day) than group I. This group was offered quite lower CP concentration (122 g CP/kg DM) and also lower ME concentration (10.49 MJ ME/kg DM) in comparison to the group I. The lowest average daily gain had lambs in group IV, fed only with hay II. The average daily gain of this group was only 50 g/day. The diet of this group was the poorest as in proteins (70 g CP/kg DM) as in energy (9.31 MJ ME/kg DM) in comparison to other groups in the experiment. Regarding the level of CP and ME in the diets for our lambs, their daily gain, and nutrient requirements for fattening lambs (*NRC,* 1985), groups II, III, and IV were deficient especially in CP.

Table 4

Daily gain of the lambs' body weight (g/day) according to the group

Group	n	Average	SD	Min	Max
I	9	196	72	108	303
II	9	130	27	83	159
III	8	169	39	105	218
IV	9	50	36	-9	110

The statistical analysis showed significant differences ($P<0.01$; *Table 5*) in the average daily gain of body weight among observed four groups. The diet thus influenced the average daily gain of the weaned JSR lambs. The average daily gain of the observed lambs was affected also by sex and birth weight. Litter size, initial body weight at the experiment, and initial age at the experiment did not affect the average daily gain of the lambs. Therefore, they were excluded from the model.

Table 5

F- and P-values for the effects of group (diet), sex, and birth weight

	Group (diet)	Sex	Birth weight
F-value	17.17	15.86	7.22
P-value	<0.0001	0.0004	0.0118

CONCLUSIONS

The four groups of weaned JSR lambs, fed with different diets, had different average daily gain of the body weight. Lambs from the group I, fed with the richest diet, had the highest average daily gain (almost 200 g/day) in the 40 day experiment. As expected, lambs from group IV grew the less (50 g/day), but they were fed only with hay without supplementation.

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