

THE EFFECTS OF DIFFERENT HOUSING AND FEEDING SYSTEMS ON THE GROWTH AND MUSCULARITY OF WEANED LAMBS

Birutė Zapasnikienė

Institute of Animal Science of Lithuanian Veterinary Academy

R. Žebenkos str. 12, LT-82317 Baisogala, Radviliškis distr., Lithuania, e-mail: birutez@lgi.lt

Summary. In many EU countries fattening lambs are usually left in the stables, while those for breeding are grazed somewhere nearer the stables and fed additionally. Unfortunately, sheepbreeders of Lithuania mostly choose the extensive method of lamb raising (without concentrates and without additional feeding) because low sheep purchase prices dominate, and there is no system of payment according to the quality of carcasses.

The purpose of the study was to determine the efficiency of lamb grazing and keeping in the sheepfold and to define the effects of extensive and intensive feeding on the growth and muscularity of weaned lambs. Weaned native coarse-wooled lambs were allotted into groups. In 2007, 15 female lambs and 12 male lambs were turned to pasture, and also 15 female lambs and 13 male lambs were left for feeding in the sheepfold near the stables. In 2008, 8 female lambs were left in the sheepfold and 8 turned to pasture. Besides, there were two groups of five male lambs each for fattening in the stables. The two groups of lambs were fed daily, respectively, 500 g and 200 g compound feed and each animal in the groups received 2-3 kg grass daily. The fattening of lambs lasted for 60 days (from 3 to 5 months of age). The lambs that were grazed (from 2 to 7 months of age) received only pasture grass and those kept in the sheepfold received 200 g of compound feed and 2 to 4 kg of green feed (beginning from August – 0.8 kg hay).

The results of the study indicated that pasturage of weaned lambs and fattening of male lambs had a positive effect on their growth rate and muscularity. Grazing female lambs from 2 to 7 months of age gained daily on the average 14 g while male lambs 8 g. Thus, at the age of 7 months they were by 1.31 - 2.34 kg heavier and their muscularity was by 0.11-0.55 points higher than that of their contemporaries fed in the sheepfold. Fattening lambs gained 3.06 kg more weight in 60 days.

Keywords: lambs, grazing, feeding, growth, muscularity.

SKIRTINGŲ LAIKYMO IR ŠĖRIMO BŪDŲ ĮTAKA NUJUNKYTŲ ĖRIUKŲ AUGIMUI IR RAUMENINGUMUI

Birutė Zapasnikienė

Lietuvos veterinarijos akademijos Gyvulininkystės institutas

R. Žebenkos g. 12, LT-82317 Baisogala, Radviliškio r.

tel. (8-422) 65 383; faks. (8-422) 65 886; el. paštas: birutez@lgi.lt

Santrauka. Daugelyje ES šalių mėšai auginami ėriukai paliekami tvarte penėti, o veislei laikomas prieauglis ganomas arčiau avidžių ir šeriamas papildomai. Deja, Lietuvos avių augintojai dažniausiai renkasi ekstensyvų ėriukų auginimo būdą (be koncentratų ir be papildomo šėrimo), nes avių supirkimo kainos yra žemos, o atsiskaitymo pagal skerdenų kokybę sistema – neįdiegta.

Mūsų tyrimų tikslas – įvertinti nujunkytų ėriukų ganymo ir laikymo diendaržyje efektyvumą bei nustatyti ekstensyvaus ir intensyvaus šėrimo įtaką nujunkytų avinukų augimui ir raumeningumui. Bandymai atlikti su nujunkytomis Lietuvos vietiniais šurkščiavilniais ėriukais, suskirstytais į grupes. 2007 m. 15 avyčių ir 12 avinukų išleisti į ganyklą, o 15 avyčių ir 13 avinukų palikti šerti diendaržyje prie tvarto. 2008 m. 8 avytės paliktos diendaržyje, o 8 išleistos į ganyklą. Taip pat sudarytos dvi avinukų grupės penėti tvarte, po 5 avinukus kiekvienoje. Penimiems 5 avinukams kasdien buvo duodama po 500 g avims skirto kombinuotojo pašaro (kitiems 5 – po 200 g) ir 2–3 kg žolės. Avinukų penėjimas truko 60 dienų (nuo 3 iki 5 mėn.). Tuo tarpu ganomi ėriukai (nuo 2 iki 7 mėn.) mito vien ganyklos žole, o diendaržyje laikomas prieauglis gavo po 200 g kombinuotojo pašaro ir 2–4 kg žalios masės (nuo rugpjūčio mėn. – po 0,8 kg šieno).

Tyrimų rezultatai parodė, kad nujunkytų ėriukų ganymas ir avinukų penėjimas turėjo teigiamos įtakos augimo sparčiai ir raumeningumui. Ganytos avytės 2–7 mėn. laikotarpiu kasdien vidutiniškai priaugo po 14 g daugiau, o avinukai – po 8 g, todėl 7 mėnesių jie buvo 1,31–2,34 kg sunkesni ir 0,11–0,55 balo raumeningesni už diendaržyje šertus bendraamžius. Penėti avinukai per 60 d. ne tik priaugo 3,06 kg daugiau, bet ir nepenimi (5–7 mėn. laikotarpiu) augo greičiau po 31 g per parą palyginti su niekuomet nepenėtais avinukais.

Raktažodžiai: ėriukai, ganymas, šėrimas, augimas, raumeningumas.

Introduction. Mutton, especially lamb meat, is considered to be the most important sheep produce in Europe. In order to supply the market with this salable meat, it is required not only to grow sheep of mutton breeds having

prospects and establish large-scale sheep breeding farms, but also to implement the most progressive housing and feeding technologies for weaned lambs.

Technology is the whole of the processes (operations)

required to produce certain products. It covers all the processes related with sheep mating, lambing and raising for meat or breeding. Lamb growing after weaning at 2 to 4 months of age is highly relevant. Lambs are male or female sheep youngsters until puberty (5-7 months of age). Therefore, it is expedient to separate female lambs from male lambs at the age of 4 to 5 months.

The studies of the researchers from many countries indicated that the most economical weaning time is at day 35-40, however, the best weaning time is considered to be at 2 months of age. Weaned lambs should be provided with either the best pasture or the highest quality feeds (Strittmatter, 2003; Рафальская, 1987).

In many countries fattening lambs are left in the stables, while those for breeding are grazed somewhere nearer the stables and fed additionally. Besides, after weaning the progeny, it is possible to graze ewes and female lambs and breeding rams and male lambs together or feed the lambs in the sheepfold (Murphy, 2005; Zapasnikienė, Ribikauskienė, 2005; Воробьев, 1990).

In Lithuanian, sheep breeders most often choose the extensive method of lamb feeding due to economic reasons because there is no system of payment according to the quality of carcasses. Meanwhile, fattening of lambs, especially male lambs, has a positive effect on their growth and lean meat content. Usually concentrated feeds have a major influence on the growth of fattening lambs, however, lamb grazing on a high-quality grass and legume pasture is also effective. In that case, the cost of feeds is lower but the fattening lasts longer (Зипер, 2002; Gyvulininkystės žinybas, 2007).

The researchers in England have found that lamb grazing on a high-quality grass and legume pasture or cereal pasture without concentrate feeding resulted in daily weight gains of 300 g and 240 g, respectively. Meanwhile, in Norway fattening lambs that were grazed on a rape pasture gained daily from 280 to 470 g (Šveistienė, 1988; Zapasnikienė, 2003²).

The purpose of the study was to determine the efficiency of lamb grazing and keeping in the sheepfold and to define the effects of extensive and intensive feeding on the growth and muscularity of weaned lambs.

Materials and Methods. The study was carried out in the conservation flock of Lithuanian coarsewooled sheep belonging to the LVA Institute of Animal Science following all the requirements for the animal care, housing and usage as defined by the law of the Republic of Lithuania No 8-500 of 06 Nov 1997. The study was carried out in the period from May to October 2007-2008, and almost all the lambs (n=81) born in those years were used in the study. In 2007 one half of weaned female lambs (n=15) were turned to pasture together with the ewes, and one half of male lambs (n=12) were grazed together with breeding rams. The remaining female (n=15) and male (n=13) lambs were left for feeding in the sheepfolds near the stables.

In 2008, after evaluating all 37 weaned (at 2 months of age) female lambs, two groups of 8 lambs each were

formed with respect to the lamb age, type of birth (number of lambs born), kinship and weight. In each group half of the female lambs were from the same litter. Eight female lambs were turned to pasture together with the ewes and the other eight were left in the sheepfold near the stables together with the remaining weaned female lambs. The sheep spent all the grazing period until October 10 th on the pasture and received no additional feeding. Meanwhile, the lambs kept in the sheepfold received daily 200 g compound feed and 2 to 4 kg grass (until August 1 st) and later, until October 10 th, they received 300 g compound feed and 0.8 kg hay (Zapasnikienė, 2003³).

The chemical composition of the feeds was analyzed at the Analytical Laboratory of the LVA Institute of Animal Science by approved methods (AOAC, 1990). The nutritive value of feeds for lambs met the standard requirements. A kilogram of cultivated pasture grass contained on the average 2.24-2.63 MJ metabolizable energy, 0.19-0.24 feed units and 20.9-27.5 g digestible protein. Meanwhile, hay made from cultivated pastures contained 6.09-6.42 MJ metabolizable energy, 0.39-0.47 feed units and 39.4-48.3 g digestible protein. A kilogram of compound feed for sheep contained 10.87-11.20 MJ metabolizable energy, 1.14-1.16 feed units and 108.6-138.2 g digestible protein.

The growth rate of lambs was determined by weighing the lambs at birth, 2 months (trial start) and 7 months of age (trial finish). At the end of the trial, lamb muscularity was determined visually on a 1-9 point scale by groping their back, shoulder-blades and thighs (Avių vertinimo taisyklės, 2006).

Comparison of the extensive and intensive lamb growing methods was carried out by designing two groups of 5 Lithuanian coarsewooled male lambs each. The groups were housed in the stables and fed cultivated pasture grass and concentrates. Fattening lambs were offered daily 500 g of compound feed and 2 to 3 kg grass. All the other lambs received only 200 g of compound feed and 2 to 3 kg grass daily. The feeds and feed remains were weighed every morning and evening (Zapasnikienė, 2007). The fattening of lambs lasted for 60 days from 3 to 5 months of age. Until 7 months of age all the lambs were kept in the sheepfold and fed 1-1.5 kg hay and 300 g concentrates daily. The growth rate of lambs was determined by weighing the lambs at birth, 2, 3, 5 and 7 months of age.

The data were processed biometrically using Windows Excel version 1.1 Data analysis. The significance was determined by Student's table (Čekanavičius, Murauskas, 2002; Microsoft Office Excel, 2007).

Results and Discussion. Correct feeding and care of weaned lambs has a great influence on their further growth and development. After progeny weaning, ewes and female lambs, also breeding rams and male lambs can be grazed together. Besides, it is possible to feed the lambs in the sheepfold or graze them on a separate pasture. The effects of grazing and feeding in the sheepfold on the growth and development of the muscular tissue of lambs are indicated in Tables 1 and 2.

Table 1. **Growth rate of lambs fed and kept differently**

Item	Groups of lambs			
	Grazed		Fed in sheepfold	
	n	M ± m	n	M ± m
Weight of newborn lambs, kg:				
females	18	2.80±0.111	19	2.84±0.093
males	14	3.09±0.116	15	3.16±0.119
Weight of 2-month-old lambs (25-05-2007), kg:				
females	15	12.96±0.468	15	13.07±0.627
males	12	14.72±0.544	13	14.68±0.672
Daily weight gain from 0 to 60 days of age, g:				
females	15	169±11.242	15	170±12.016
males	12	194±17.814	13	192±18.546
Weight at 7 months of age (22-10-2007), kg:				
females	14	31.03±1.218	14	29.11±0.838
males	9	35.12±2.071	9	33.81±1.839
Daily weight gain from 61 to 210 days of age, g:				
females	14	121±12.739	14	108±10.964
males	9	137±14.026	9	129±15.374
Lamb muscularity at 7 months of age, points:				
females	14	6.26±0.423	14	6.01±0.365
males	9	6.83±0.244	9	6.72±0.238

As it can be seen from Table 1, lamb grazing affected positively their growth rate and muscular development. The lambs chosen for feeding in the sheepfold weighed by 0.04-0.07 kg more at birth and grew almost similarly till weaning at 2 months of age (females 170 g and males 193 g daily), however, later, till 7 months of age, grazing lambs had higher weight gains if compared with the youngsters fed in the sheepfold.

Sheepfold lambs were fed daily 200-300 g compound feed and 2 to 4 kg grass or 0.8-1.0 kg hay. Meanwhile, grazing lambs were not fed additionally. Nevertheless, from 2 to 7 months of age grazing female and male lambs gained, respectively, by 13 (10.75%) and 8 g (5.84%)

more than the contemporaries kept in the sheepfold. Therefore at the age of 7 months, the weight of grazing lambs was from 1.31 to 1.92 kg (3.74-6.19%) higher and their muscularity was 0.11-0.25 points (1.92-4.01%) higher than that of sheepfold lambs. The differences were statistically insignificant.

Similar results were also obtained in 2008 after carrying out the same trials with weaned female lambs. Eight female lambs were turned to pasture together with the ewes, and the other eight were left in the sheepfold near the stables together with the remaining weaned female lambs.

Table 2. **Growth rate of female lambs**

Item	Groups of female lambs			
	Grazed		Fed in sheepfold	
	M ± m	C _v	M ± m	C _v
Weight of newborn female lambs, kg	3.24 ± 0.091	7.92	3.21 ± 0.094	8.27
Weight of lambs at the start, kg (13-05-2008, at 2 months of age)	13.85 ± 0.629	12.84	13.90 ± 0.605	12.31
Weight of lambs at the trial end, kg (10-10-2008, at 7 months of age)	34.91 ± 1.556	12.61	32.70 ± 0.681	5.89
Weight gain in 150 days, kg	21.14 ± 1.216	16.27	18.80 ± 0.730	10.98
Daily gain during the trial, g	140.88 ± 8.143	16.35	125.50 ± 4.859	10.95
Lamb muscularity at 7 months of age, points	6.68 ± 0.295	12.14	6.13 ± 0.295	13.62

The data in Table 2 indicates that grazing of female lambs had a positive effect on their weight and muscularity. During the trial (from 2 to 7 months of age) grazing lambs gained by 2.34 kg more weight and had by 0.55 points higher muscularity score than the contemporaries kept in the sheepfold (the differences were statistically

insignificant). Though the grazing female lambs were not fed additionally, but they gained daily 15 g more weight than the lambs fed in the sheepfold. Thus, it may be concluded that pasture grass, fresh air and motion and grazing in the company of ewes had a positive effect on the further growth and development of lambs. Meanwhile, the

lambs kept in the sheepfold required additional labour and more expensive feeds.

As the majority of female lambs are left for breeding and male lambs are slaughtered for meat, it is expedient to keep them for fattening. The studies by different researchers have shown that the meat from fattening male lambs is of higher nutritive value and palatability and the dressing percentage is 10% higher (Mastleistungsprüfung, 1981; Zapasnikienė, 2003¹).

In order to determine the differences in weight and daily gain between fattened and unfattened male lambs, two groups of five lambs each were made up. The results of the growth rate are presented in Table 3.

As it can be seen from Table 3, in 60 days fattening male lambs gained 3.06 kg (23.62%) more weight, how-

ever afterwards when fattening was finished, these lambs in the period from 5 to 7 months of age also gained daily 31 g (18.46%) more in comparison with their contemporaries that have never been fattened. Therefore, at the age of 7 months, fattening lambs gained by 4.59 kg (11.72%) more weight than those that were not fattened ($P>0.05$). In 210 days, fattening lambs consumed 18 kg (30.99%) compound feed more, but their weight increase in this period was higher (4.70 kg or 13.08%). On the other hand, higher amount of compound feed (0.31 kg or 21.68%) was required to gain one kilogram weight, but there were no losses as the lambs of higher weight had been sold. Besides, muscularity of fattening lambs was by 0.68 points higher.

Table 3. **Growth rate of male lambs**

Item	Fattened lambs		Unfattened lambs	
	M ± m	C _v	M ± m	C _v
Weight of newborn lambs, kg	3.12±0.064	5.40	3.23±0.117	6.87
Weight of 2-month-old lambs, kg	15.28±0.736	16.18	15.41±1.506	20.05
Daily gain from 0 to 60 days of age, g	203±21.326	24.11	204±23.042	29.17
Weight of 3-month-old lambs, kg (trial start – 09-06-2008)	20.71±1.474	15.21	21.05±1.761	17.01
Daily gain from 61 to 90 days of age, g	181±18.967	21.07	186±22.743	31.30
Weight of 5-month-old lambs, kg (trial end – 07-08-2008)	33.67±2.293	15.83	30.95±1.199	7.67
Daily gain from 91 to 150 days of age, g	216±27.311	30.14	165±31.984	36.26
Weight of 7-month-old lambs, kg	43.75±2.241*	15.77	39.16±1.833	12.33
Lamb muscularity at 7 months of age, points	7.80±0.365	8.53	7.12±0.432	14.91
Daily gain from 151 to 210 days of age, g	168±29.516	30.37	137±31.397	44.15
Daily gain from birth till 7 months of age, g	194±16.914	23.55	171±10.063	14.82
Weight gain in 210 days, kg	40.63	-	35.93	-
Compound feed fed in 210 days, kg	58.10	-	40.10	-
Compound feed per kg gain, kg	1.43	-	1.12	-

* $P<0.05$.

In EU countries, sheepbreeders are paid according to the lean meat and fat content of the carcasses. It is much more profitable to produce low fat and high lean meat content carcasses (by SEUROP standard). Therefore, lamb fattening is a very important factor as fattened lambs are much leaner. Meanwhile, unfattened lambs reach the slaughter weight of approximately 40 kg in longer time. The muscle development for the lambs that are not fattened is poor and fat deposition begins already at the age of 6 to 7 months. On the other hand, the development of the muscular tissue is enhanced by grazing, fresh air and motion. Thus, weaned lambs should be either grazed on a highly productive pasture or fed additionally.

Conclusions

1. Grazing of weaned lambs had a positive effect on their growth rate and muscle development. From 2 to 7 months of age, grazing lambs gained daily by 8 to 15 g more and weighed by 1.31-2.34 kg more than their contemporaries kept in the sheepfold. The muscularity of grazing lambs was also by 0.11-0.55 points higher.

2. The comparison of the difference in weight and

weight gain between fattened and unfattened lambs indicated a positive influence of fattening on the growth and muscularity of lambs. From 3 to 5 months of age, fattening lambs gained daily 51 g more weight or 3.06 kg more weight in the whole period than their unfattened contemporaries.

3. Fattening lasted for 60 days (from 3 to 5 months of age), however fattening lambs gained weight faster for 2 more months when they were not fattened. Thus, at the age of 7 months they surpassed unfattened lambs by 4.70 kg and had by 0.68 points higher muscularity.

4. Lambs for breeding should be kept by their mothers as long as possible and grazed together on pasture until 4 to 5 months of age, while the progeny raised for meat should be fattened for at least a short period of 30-60 days.

References

1. Avių vertinimo taisyklės. Sudarytoja B. Zapasnikienė. Baisogala, 2006. 56 p.

2. Čekanavičius V., Murauskas G. Statistika ir jos taikymas II. Vilnius, 2002, P. 7-54.
3. Gyvulininkystės žinynas. Autorių kolektyvas. Baisogala, 2007. P. 394-417.
4. Grassland: a global resource. Edited by: D. A. McGilloway. Wageningen Academic Publishers the Netherlands, 2005. S. 375-387.
5. Januškevičius A. Zootechninių bandymų metodiniai nurodymai. Vilnius, 1992. 25 p.
6. Leistungs- und Qualitäts prüfungen in der Tierischen Erzeugung 2003. Hannover, 2004. S. 58-65.
7. Mastleistungsprüfung für Lämmer in Eickelborn 1980. Deutsche Schafzucht. 1981. B. 73, H 10. S. 188-189.
8. Official Methods of Analysis of The Association of Official Analytical Chemists. Arlington, 1990. 45 A. 15 th ed. P. 69-90.
9. Statistinė duomenų analizė Microsoft Office Excel 2007
<http://www.microsoft.com/downloads/details.aspx?FamilyId=9AB28283-0320-4527-B033-5E80EF32CD34&displaylang=en>
10. Strittmatter K. Schafzucht. Ulmer, 2003. S. 51-54.
11. Šveistienė E. Lietuvos juodgalvės avys: Žinynas. Vilnius, 1988. P. 115-123.
12. Utilisation of grazed grass in temperate animal systems. Edited by: J. J. Murphy. Wageningen Academic Publishers the Netherlands, 2005. S. 178-212.
13. Zapasnikienė B. Ėriukų kontrolinis penėjimas: Metodiniai nurodymai. Baisogala, 2007. 50 p.
14. Zapasnikienė B.¹ Lietuvos vietinių šiurkščiavilnių avių augimo sparta ir mėsinės savybės. Gyvulininkystė: LVA GI Mokslo darbai. 2003. T. 42. P. 23-32.
15. Zapasnikienė B.² Mėsinės avys: Monografija. Baisogala, 2003. P. 96-117.
16. Zapasnikienė B.³ Mitybos normos avims ir ožkoms. Baisogala, 2003. P. 10-16.
17. Zapasnikienė B., Ribikauskienė D. Avių, ožkų ir triušių šėrimas. Baisogala, 2005. P. 5-15.
18. Zuchtreport 2000 des Landes Mecklenburg-Vorpommern. Gülzow, 2001. S. 131-155.
19. Zupp W., Grumbach S. Ausgewählte Ergebnisse zur Mast- and Schlachtleistungsprüfung. Deutsche Schafzucht 13. 1996. S. 326-329.
20. Воробьев П. А. Содержание овец на малой ферме. Москва, 1990. С. 64-69, 101-103.
21. Зипер А.Ф. Корма и кормление домашних животных. Москва, 2002. С. 121-129.
22. Практическое руководство по применению интенсивных технологий производства баранины. Москва, 1987. С. 42-51.
23. Рафальская И. Выращивание ягнят. Прага, 1987. С. 5-18.

Received 26 March 2009

Accepted 5 March 2010