IMPORTANCE OF BALANCED FEEDING IN THE BREEDING OF YOUNG SHEEP

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Summary. The aim of the study was to determine the impact of a balanced diet upon the growth and quality of ewes after 365 days. The research was carried out on the farm "Mežkalēji" in Latvia, using 46 ewes of different origin, born in the year 2002 from the Latvian dark headed sheep breed. During the study period the sheep of the control group received a standard feed produced on the farm supplemented with mineral feed additives (BF). Sheep in the trial group received basically the same feed, but common barley was replaced with the same amount of hull-less barley L-302. During the study we carried out the following: testing for main feed nutrients and optimization of feed ration, registration and analysis of the changes in live weight, evaluation of one-year old female sheep, registering the length of the wool, clip and fineness.

The number of ewes at birth was negatively correlated with birth weight (-0.588), weight gain per 24 hours in the suckling period (-0.581) and live weight at weaning (-0.391).

Our results suggest that hull-less barley may be used as protein feed for sheep and other ruminants. Balanced feeding significantly increased weight gain per 24 hours in the experimental group (+45 g, $p < 0.01$) as well as live weight in the end of the study period (+3.2 kg, $p < 0.05$). The composition of the feed ration did not affect wool clip and wool quality. However, the analysis of the feature coherence indicated that the live weight of ewes essentially affected their wool clip. In evaluating, live weight and clip are features, which are taken into account, and they affect the complex evaluation of the ewes.

Keywords: ewe, sheep nutrition, hull-less barley, liveweight gain, wool.

SUBALANSUOTO PAŠARO SVARBA AUGINANT AVIS

Santrauka. Tyrimu buvo siekiama nustatyti subalansuotos dietos įtaką ėriukų augimui ir kokybei po 365 dienų. Tyrimas atliktas Latvijoje, „Mežkaleji" fermoje. Ištirtos 46 įvairios kilmės 2002 metais atsivestos juodgalvės avys.

Stebėjimo metu I kontrolinės grupės avys buvo šeriamos ūkyje pagamintais pašarais ir mineraliniais pašariniais priedais (BF). II eksperimentinės grupės avims įprastiniai miežiai buvo pakeisti tuo pačiu kiekiu miežių L-302, turinčių mažiau lukštų. Tyrimo metu nustatytos pagrindinės maistingosios medžiagos ir optimizuotas racionas, atlikta kūno masės pokyčių analizė, vertinamos vienerių metų avys, matuojamas vilnos ilgis, vertinama kirpimo kokybė. Neigiama koreliacija nustatyta tarp avių skaičiaus ir kūno masės ėriavimosi metu (–0,588), paros kūno masės priaugimo žindymo laikotarpiu (–0,581) ir kūno masės nujunkymo metu (–0,391).

Mes siūlome išlukštentais miežiais kaip proteininiu pašaru šerti avis ir kitus atrajotojus. Eksperimentinės grupės avis šeriant subalansuotu pašaru žymiai padidėjo svorio prieaugis per parą – 45 g ($p < 0,01$), o per tyrimo laikotarpį – 3,2 kg ($p < 0,05$). Raciono sudėtis nežymiai veikė vilnos kirpimą ir kokybę. Atlikti tyrimai atskleidė ryšį tarp avių kūno masės ir vilnos kirpimo. Kūno masė ir kirpimas – svarbiausi veiksniai kompleksiškai vertinant avis.

Raktažodžiai: avis, avių mityba, išlukštenti miežiai, kūno masės priaugimas, vilna.

Introduction. Well-balanced and optimized nutrition of sheep is important precondition in sheep breeding and production of high quality lamb meat. For this purpose there is necessity for extra feeding of suckle lambs and optimal feeding after weaning with the aim to get liveweight gain to 200 g per day and more. At the age of 6 months lambs should be in more than 35 kg. Shortage of different nutrients at first can lead to lower clip and quality of wool, amount and quality of meat, feed conversion for production of meat and wool, and to growth of suckle lambs finally.

Sheep ability for intake of dry matter (DM) is similar to cow, and requirement for DM is from 2.5 to 3.5 kg to 100 kg liveweight. Requirement for feed energy is from 1.8 to 2.5 feed units (FU) to 100 kg liveweight and from 8 to 10 MJ to 1 kg DM (Latvietis, 1995).

Shortage of protein in feed can decrease clip of wool for 40 % and more. The quality of wool also is low in such a case. The hairs of wool become thin, with stricture, breakable and tricky. Young breeding sheep require 2.8 – 3.2 DM to 100 kg liveweight, and 1 kg DM must contain 10,5 – 11,0 MJ ME and 13 – 16 % crude protein. Amount and quality of wool depend on quality of protein – it should contain such aminoacids as methionine, cistine and cisteine. The important thing in sheep nutrition is level of sugars and optimal balance between crude protein and sugars. Sufficient level of feed sugar is 2-4 g sugar to 1 kg liveweight, and well-balanced relationship between protein and sugars is 0.9:1.2 (Cjuksa, 1960, Ositis, 1987).

The amount of fiber must not exceed 16 – 18% in DM in lambs' ration. Shortage of crude fiber causes disturbances in digestion and decreases amount of microorganisms in paunch, resulting in decreased nutrition (Norvele et al, 2001). The quality of forage and quality of nutrition depends on content of acid detergent fiber (ADF) and neutral detergent fiber (NDF). NDF determines the feed intake, but ADF affects digestibility of forage (Ositis et al, 2001). The ability to intake NDF is 1.2 % from liveweight for ruminants' (Ositis, 1998). It

means, that young sheep with 50 kg liveweight can intake 0,6 kg NDF per day.

In Latvia the basic feed for sheep is hay of good quality and concentrates. The best hay is hay from natural meadows. Concentrates mostly consist of barley, oats and wheat, which can be supplemented by proteinfeed, minerals and vitamins. In Latvia and other countries scientists try to develop new breeds and lines of barley with high content and quality protein, also with high content of starch and sugars. Also in Latvia scientists are studying new hull-less breeds of barley, which are over other breeds by content of protein and content of aminoacids, because they have higher level of lysozymes and other aminoacids. The digestibility of aminoacids for hull-less barley is higher than that for common barley, and this is very important factor for using them in animal nutrition (3). The content of protein for lines of hull-less barley breeds can reach 16 – 23%, what is 3 – 5 % higher than that for lines of common barley (Belicka, 1998, 1999).

The relative criterion of meat productiveness is live weight and its gain during the rearing and feeding period. These features have average heredity – h^2 = 0.20–0.50 (König,1990; Korn, 1992; Löhle, Leucht, 1997 et. al.).

Between the gain in live weight and feed consumption a close negative correlation has been observed (Ульянов, Куликова, 2003), therefore it can serve as an index of feed utilisation. Average heredity has also been observed for the feed conversion – h^2 = 0.25 – 0.54 (Korn, 1992. et.al.).

Liveweight of lambs at birth depending on the number of the new born can fluctuate in a wide range from 2.5 up to 7 kg. Further growth intensity has close connection with the ewe yielding capacity. It is stated that the Merino lambs – singles reached reliably higher gain in live weight than twins of the same breed, which is, 133 g and 127 g. respectively.

The number of the lambs essentially affects the above-mentioned features at birth and management on the farm, but less by the animal genotype (Hamann, 1987; Болдирев, Мороз, 2003).

As the sheep is a ruminant, the feeding of sheep is very similar to feeding of cow. However variety of products – meat, wool, milk – require well-balanced nutrition. Therefore profitable sheep breeding is not possible without complete nutrition.

Materials and methods. The aim of research was to determine the impact of a balanced diet upon the growth and quality of ewes after 365 days.

The research was carried out on the farm "Mežkalēji", of the Platone village, located at the District of Jelgava. The farm is situated 17 km away from Jelgava, and specialises in rearing ewes.

For keeping ewes a sheepfold with thick litter, automatic drinking facilities and manual feed distribution are used. The farm provides its animals with self produced feed. This farm owns 42.5 ha of land where 79.5 % of land is agriculturally utilized. The greatest part of the sowing area is occupied by cultivated grassland and barley, which is one of the most suitable kinds of cereal crops for ewe feeding. Fodder roots and potatoes are utilized only for feeding suckling ewes and lambs. Therefore this area is not large.

In the research 46 ewes of different origin, born in the year 2002 from the Latvian dark headed breed ewes, where used.

In preparing period, which lasted for two weeks, the conditions of nutrition and management were equal for all sheep included in the experiment. In the follow-up period the sheep of the 1st control group received the basic food produced in farm and mineral feed additives (BF). For the sheep of the 2nd trial group the common barley was replaced with the same amount of hull-less barley L-302. The period of study was 47 days (Table 1).

Table 1. **Trial scheme**

Groups	Animals per group	Feed ration	Duration of period
1st control	23	Hay + common concentrates + minerals + black radish seeds (BF)	All period
2nd trial	23	Hay + trial concentrates + minerals + black radish seeds	All period

The amount of feed ration was alike for both groups, it was, 0,34 kg concentrates, 1,0 kg alfalfa and grass hay, 0,2 kg black radish seeds. Concentrates for the 1st control group consisted of 60 % barley "Abava", 30 % wheat and 10 % oats. Concentrates for the 2nd trial group consisted of 60 % hull-less barley L-302, 30 % wheat and 10 % oats.

Feed was tested for dry matter, crude protein content, NDF, ADF, Ca, P, total ash, total fat and NEL in LUA Scientific Laboratory for Agronomy research.

For rearing of the herd only E1 and Class1 ewes were kept in the farm. The evaluation of the ewes left for the purpose of growing was done in February when they were one year old. The actual indices of the liveweight and wool clip were recalculated for the age of 365 days, applying the formula $(W_t-W_0)/t*365+W_0$, where

W_t – liveweight in the end of the period, kg

W_0 – liveweight in the start of the period, kg

t –length of the period, in days.

The absolute live weight gain (in grams) per 24 hours from the moment of the birth to weaning was calculated.

For weighing, two kinds of scales were used: one with leverage up to 100 kg and accuracy up to $\pm$ 0.1 kg and the other with leverage up to 500 kg and accuracy up to $\pm$ 0.2 kg.

During the research we carried out the following:

– testing for main feed nutrients and optimization of feed ration;

– registration and analysis of the changes in live weight;

– evaluation of one-year old female sheep, registering the length of the wool, clip and fineness.

The obtained results were processed by the SPSS software (Backhaus, 2000). For the evaluation of the essential differences two levels of credibility were used

- $p<0.05$;
- $p<0.01$

Results and discussions. In feed ration for animals of the 2nd trial group there was included hull-less barley, the nutritive value of which is much higher than that of common barley by content of protein and aminoacids. The amount of main nutrients in feed ration is shown in Table 2.

Table 2. **Main nutrients in feed ration for young sheep**

Nutrients	Requirement	1st control group	Balance, %	2nd trial group	Balance, %
Dry matter, kg	1.4	1.4	± 0	1.4	± 0
Feed units, kg	1.2	1.25	+ 4.1	1.27	+ 5.8
ME, MJ	13.0	13.1	+ 0.7	13.4	+ 3.1
Crude protein, g	180.0	173.0	- 3.9	179.0	- 0.6
Dig, Protein, g	125.0	117.0	- 6.4	123.4	- 1.3
NDF (max), kg	0.6	0.82	+ 33.3	0.71	+ 18.3
Ca, g	6.0	9.74	+ 62.3	9.86	+ 64.3
P, g	4.2	5.90	+ 40.5	6.11	+ 45.5

In the Table 2 we can see, that better-balanced feed ration was for animals in the 2nd trial group, because the deviation from requirements was smaller.

Initially, we found out whether the formed groups of ewes were different in terms of their live weight and other indices during the suckling period (Table 3).

Table 3. **Growth analysis of ewes from birth to weaning**

Group	Number at birth	Average LW at birth, kg	Age at weaning, days	Average LW at weaning, kg	Average gain of LW within 24 hours from birth till weaning, kg
	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$
1st control group	1.61 ± 0.104	3.77 ± 0.029	140.7 ± 2.46	28.0 ± 0.89	0.172 ± 0.0063
2nd trial group	1.57 ± 0.106	3.79 ± 0.025	140.3 ± 2.48	28.2 ± 0.69	0.174 ± 0.0059

As the obtained results show, the both groups were similar at birth and according to any other indices summarized in the table .As a number of authors emphasize, it is significant because live weight and gain in live weight depend on the number of the new born lambs per litter, the ewe yielding capacity and feeding to a great extent, but less on the animal genotype (Hamann, 1987, Banduref, Moroz, 2003).

The obtained average gain in live weight from birth to weaning was not high. The obtained gain in live weight above 200g for separate animals gives evidence that the genetic potential with the Latvian dark headed ewes is higher.

The obtained correlation coefficients testify to the closeness of the future coherence (Table 4).

Table 4. **Coherence of different features from birth to weaning**

Features	Number at birth	Average LW at birth	Age at weaning	Average LW at weaning
Number at birth	1			
Average LW at birth, kg	-0.588**	1		
Age at weaning, days	0.353*	-0.147	1	
Average LW at weaning	-0.391**	0.266	0.202	1
Average gain in LW from birth to weaning	-0.581**	0.300*	-0.434**	0.789**

*p<0.05; **p<0.01

The twin ewes had essentially lower average live weight at birth, gain in live weight, and live weight at weaning. The above mentioned coherence was confirmed by the obtained negative correlation between the number of ewes at birth and the above mentioned features.

Positive significant coherence is stated with the live weight at birth and gain in live weight during suckling. In turn, gain in live weight had a close positive coherence with the average live weight at weaning.

In the start of the research, age and live weight of the ewes in both groups were not essentially different (Table 5).

As the obtained results indicate, in the end of the research, live weight of the trial group No. 2 was essentially higher compared to the control group, the difference being 3,2 kg. The estimated gain in live weight with the eves from the trial group No. 2 was by 45 g higher and exceeded the live weight of the above

mentioned animals during the suckling period, although according to the sources of literature, the highest growth intensity is attained by ewes at the age of 4 – 5 months. Consequently, by providing valuable feeding we can obtain essentially higher gain in live weight and live weight itself.

Table 5. **Changes in the live weight of ewes during the research period**

Group	Average age in the start of research, days,	Average live weight in the start in the research, kg	Average live weight in the end in the research, kg	Gain in live weight within 24 hours during the research, kg
	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$
1st control group	334.9 ± 2.47	46.4 ± 1.22	54.5 ± 1.13*	0.171 ± 0.009**
2nd trial group	333.0 ± 3.81	47.6 ± 0.83	57.7 ± 0.94*	0.216 ± 0.009**

*p<0.05; **p<0.01

For evaluation, all the values of the definite features were recalculated for the age of 365 days.

The average length of wool was within the limits from 12.2 to 12.6 cm, but the wool clip was 3.49 kg. The wool fineness class was within limits of 48 to 56, but the wool thickness corresponded to the requirements of the breed. None of the mentioned features according to the groups had essential differences. Thus, ewe feeding did not affect them. The correlation coefficients are summarized in Table 6.

Table 6. **Correlation between the features at the age of 365 days**

Features	Age	Live weight	Wool clip	Wool length
Age	1			
Live weight	-0.039	1		
Wool clip	-0.305*	0.537**	1	
Wool length	-0.574**	0.315*	0.320*	1
Wool thickness	0.174	0.245	0.120	-0.123

*p<0.05; **p<0.01

Age increase of the bonitated ewes negatively affected the live weight within 365 days, as well as wool clip and wool length. In turn, the live weight had a positive, close coherence with the wool clip and average – with the wool length, but weak with the wool thickness. The wool clip was essentially increased by the live weight of ewes and their wool length. In turn, the wool length had a weak negative coherence with the wool thickness.

Conclusions.

1. Better-balanced feed ration was for animals in the 2nd trial group, for what in feed ration there was included hull-less barley, the nutritive value of which is much higher than that of common barley by content of protein and aminoacids. We suggest to use hull-less barley as proteinfeed for sheep and other ruminants.

2. The number of ewes at birth has close negative correlation with the live weight at birth (-0.588), and the gain in live weight per 24 hours in the suckling period (-0.581) and live weight at weaning (-0.391). In turn, the gain in live weight per 24 hours during suckling essentially affects the live weight of animals at weaning (0.300).

3. Balanced feeding gave an opportunity with the experimental group ewes to essentially increase gain in liveweight per 24 hours (+ 45 g, p <0.01) and live weight in the end of the research period (+3.2 kg, p<0.05).

4. The composition of the feed ration left insignificant effect on the wool clip and quality. However, the analysis of the feature coherence indicated that the live weight of ewes essentially affected their wool clip .In evaluating, live weight and clip are features, which are taken into account, and they affect the complex evaluation of the ewes.

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