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RESEARCH ON THE EFFECT OF RECONSTITUTED MILK IN THE LEARNING OF INFANT LAMBS

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Abstract

The paper aims at the artificial weaning that is currently used in sheep and goat farms. In Romania, the main mating season is autumn, and calving takes place in spring. The price of milk and dairy products is high during this period because the milk produced by sheep and goats is consumed especially by lambs / kids, to be capitalized on the stain only after their weaning. In sheep and goats with very good milk yields, one milking per day can be practiced provided that enough milk remains for sucking lambs. In other cases, the lambs are weaned early and will be raised with milk substitutes and the milked milk is fully exploited on the market. Breeders who want to capitalize on all or part of the milk production produced by the mother sheep as early as possible after farrowing try to find those technological variations of feeding lambs / kids that do not affect their growth. This line also includes the research carried out regarding the effect of using milk substitutes (reconstituted milk) in the feed of lambs / kids by breastfeeding and by incorporating them into the mixture of concentrates.

Key words*: lambs, milk powder, nutrition, Romania, weaning.*

INTRODUCTION

Artificial rearing of lambs is necessary in cases of orphaned and mismothered lambs and is becoming an increasing requirement in the sheep dairy industry. (Caroprese et al., 2016). Traditionally, fulfilment of a lamb's nutrient requirement was considered to depend on milk intake due to negligible solid feed intake in the first few weeks of life (Owen et al., 1970). Consequently, many studies have focused on optimisation of milk composition to improve lamb growth. (Danso et al., 2018).

Early weaning of artificially grown lambs with powdered milk in liquid formula would benefit farmers by shortening the feeding phase, reducing labor costs. In sheep with high milk yields, one milking per day can be practiced if they are higher than the amount of milk that lamb can consume.

This is actually the purpose of our research to find those technological variants that allow us to increase the production of milked milk to be harnessed in the market.

The objective of the study was to investigate the effect of milk replacer on some growth parameters compared to milked whole milk from the mother sheep.

MATERIALS AND METHODS

The researches were carried out at a private farm in the Western Part of Romania, on a herd of 20 lambs of the Turcan breed, coming from twin calving in order to increase the accuracy of the results obtained.

Immediately after calving we individualized the lambs by earmarking and for the formation of batches by marking with paint in the withers region.

In order for the batches to be as homogeneous as possible, the twin lambs born for 48 hours were retained, and subsequently, those whose body mass was too small or too large were eliminated.

In order to have as many twin lambs as possible to meet the requirements, the experiment was organized in the middle of the calving period and the maternal sheep herd was large enough to allow the selection of lambs.

The remaining twin lambs were divided into two batches, depending on weight and sex. Each batch consists of 4 males and 5 twin females, according to Table 1.

LM consisted of 9 twin lambs, four males and 5 females, who were artificially breastfed with

milk milked from the mother sheep. These millet come from different mothers

LR had in its composition the brothers and sisters of the lambs from lot 1, also 4 males and 5 females, who were fed with reconstituted milk 200 g of powdered milk / 1 liter of water.

In order not to have an influence on the results obtained, the maintenance of the lambs from the control and experimental group was carried out under the same environmental conditions, in a clean and airy shelter.

Table 1. The mode of organizing the experiment

Specify	LM	LR
n	10.00	10.00
Infant lambs in the age period 7-28 days	Artificial breastfeeding	Artificial breastfeeding
	Milked milk from mother sheep	Reconstituted milk
	+	200 g /1 liter of water
		+
	Mixture of concentrates with 18% PB	Mixture of concentrates with 18 % PB
	Hay alfalfa	Hay alfalfa

Note: LM is the lambs raised with milk from sheep and LR are the lambs raised with reconstituted milk.

The fact that the twin brothers/sisters are in the corresponding group, increases the accuracy of the results obtained. The preparation of the powdered milk replacer was used hot water and the ratio being of 1/4 (g). (Danso et al., 2018).

RESULTS AND DISCUSSIONS

The milk production of the mother sheep was estimated at the beginning of the experimental period. The values obtained are shown in Table 2.

Table 2. Milk production of mother sheep

Curent Number	Milk Production [g]
1	880.00
2	840.00
3	1,210.00
4	970.00
5	1,120.00
6	860.00
Curent Number	Milk Production [g]
7	1,040.00
8	1,010.00
9	970.00
Variability coefficient %	12.41

From the analysis of this table it can be seen that the milk yield of the mother sheep falls within the range of 840 g / day up to 1,210 g/ day. The coefficient of variability is 12.41% which gives us the information that milk production has a medium variability. The average for the 9 mother sheep who have calved twins is 988.89 g/day.

Based on the amount of whole milk (LM) and reconstituted milk (LR) distributed daily and the remaining unconsumed milk, it was possible to calculate the average consumption per lamb and per day. The data obtained are presented in Table 3.

Table 3. Amount of milk consumed by lambs during the experimental period (liters)

Specify	n	LM Milked milk [l]	LR Reconstituted milk[l]
Total quantity	9.00	180,720.00	235.40
Average/ day/group	9.00	8,214.00	10,701.00
Average/ day/lamb	1.00	0.91	1,189.00

We mention that only the consumption of milk until the age of 28 days was taken into account because the increase in weight is constituted on the basis of sucked milk. From the age of two weeks, a mixture of concentrates with 143 g PDIN/1 CFU, respectively alfalfa hay was distributed, but there was no difference in composition between the two batches. According to the consumption of additional fodder for the lambs until the age of the end of the experiment does not have significant influences on the increase, which is why it was not taken into account only the daily consumption (Hutu, 2019).

Analyzing the data contained in Table 3, it can be seen that the milked whole milk and distributed to the lambs was consumed in the amount of 180.72 liters in the 22 experimental days, while the reconstituted milk was consumed in the amount of 235.4 l.

The difference between the two batches is 54.68 liters.

On the lot it is found that, daily, the lambs from the LM group consumed 8.21 liters of whole milk, and those in the LR group consumed more by 2.49 liters and 10.7 liters respectively.

The daily consumption per lamb was 0.91 liters in the batch with milked whole milk and 1.19 liters in the batch with reconstituted milk which means a difference of 0.277 liters per day.
We can conclude that the reconstituted milk is consumed by lambs in the LR group in an amount greater by 30.37% compared to the LM group, whose lambs consume whole milk. The motivation could be that whole milk is more complete and provides all the necessary nutrients for growing lambs, and the state of satiety is satisfied with a smaller amount of milk.
Evolution of body mass and weight gain, at the calving of lambs, with the individualization, a pre-selection of twin lambs was made on the basis of body mass and sex. The data obtained are presented individually in Table 4.

Table 4. Body weight of lambs from the experimental variant

Current number	LM		LR	
	Sex	Weigh [kg]	Sex	Weigh [kg]
1	f	2.80	m	3.30
2	m	3.60	m	3.40
3	f	2.70	m	3.00
4	f	2.60	f	2.50
5	f	2.90	f	2.40
6	m	3.40	f	2.90
7	m	3.10	f	2.60
8	m	2.70	f	2.90
9	f	3.20	m	3.50
Σ		27.00		26.50
X ± Sx		3.00 ± 0.12		2.94 ± 0.13
s		0.35		0.40
Variability coefficient %		11.55		13.49

In the batch of LM lambs fed with whole milk, the body mass was within the weight limits between 2.6 and 3.6 kg with an average of 3.00 ± 0.12 kg, and in the batch of LR lambs fed with reconstituted milk, the body mass was within the range of 2.4-3.4 kg with an average of 2.94 ± 0.12 kg, the difference between the averages of the two lots being only 0.06 kg.
The variability expressed by the coefficient of variability has a value of 11.55% at the LM and 13.49% at LR, respectively.

After the colossal period the, lambs were accustomed to artificial feeding to the nipple until the age of 7 days when they were weighed again.
The data contained in Table 5 was considered the start metrics for the beginning of the experiment.

Table 5. Body weight of lambs from the experimental variant (7 days)

Current number	LM		LR	
	Sex	Weight [kg]	Sex	Weight [kg]
1	f	3.80	m	4.10
2	m	4.50	m	4.30
3	f	3.40	m	3.70
4	f	3.60	f	3.40
5	f	3.70	f	3.20
6	m	4.30	f	3.80
7	m	4.20	f	3.40
8	m	3.80	f	3.90
9	f	3.90	m	4.30
Σ		35.20		34.10
X ± Sx		3.91 ± 0.12		3.79 ± 0.13
s		0.36		0.41
Variability coefficient %		9.08		10.59

At one week, the lambs of the LM group had a body mass in the weight range of 3.4 - 4.5 kg with an average of 3.91 kg. In combination with the body mass at calving, a total increase of 0.91 kg was recorded, which corresponds to an average daily increase of 130 g/day. We mention that during this period the lambs had to adapt with artificial feeding to the bottle, which has negative influences on the increase.
In the LR group, the body mass was classified in the limes 3.2-4.3 kg, with an average of 3.79 kg. Compared to the values recorded at calving, there was a total increase of 0.79 kg and an average daily hope of 113 g, lower by 17 g compared to lambs in the LM group.
The homogeneity of the lots expressed by variability coefficient % increased further, taking into account that for the LM lot the registered value was 9.08% and 10.59%, at LR the difference between them being only 1.15 percentage points.
After 22 experimental days, at the age of the lambs of 28 days, the values for body mass,

presented in Table 6, were recorded and suggestively in Figure 1.
From the analysis of this table it can be found that the body mass of the lambs from the group fed with whole milk (LM) were included in the range of 6.7-8.3 kg with an average of 7.43 kg. In the batch of lambs fed with reconstituted milk body mass had values that fall within the weight limits of 6.4-8 kg with an average of 7.04 kg.

Table 6. Body weight of lambs from the experimental variant

Current Number	LM		LR	
	Sex	Weight [kg]	Sex	Weight [kg]
1	f	6.70	m	6.80
2	m	8.30	m	8.00
3	f	7.10	m	7.30
4	f	7.00	f	6.70
5	f	6.80	f	6.40
6	m	7.80	f	6,6
7	m	8.10	f	6.40
8	m	7.80	f	7.70
9	f	7.30	m	7.50
Σ		66.90		63.40
X ± Sx		7.43±0.19		7.04±0.20
s		0.58		0.59
Variability coefficient %		7.84		8.43

Figure 1. Graphic representation of final body mass

Differentiated feeding with milked whole milk and reconstituted milk had a greater differentiating effect on the LR lot where the reconstituted milk, even if consumed in greater quantity, had the effect of achieving lower body weights that fit into a wider range. In Figure 1 it can be seen that in only 3 couples of lambs (1.3 and 9) the body mass is higher in lambs of the LR group and in 5 couples of lambs (2, 4, 5, 6, 7, 8) it is higher in lambs of the LM group.
As for the sex, the highest body mass is recorded in males regardless of the batch. By the difference between the body mass recorded at the end (28 days) and the beginning of the experiment (7 days), the total individual increase achieved by the lambs of the two batches was calculated, the factorial factor being the composition of the milk. The data obtained are recorded in Table 7.

Table 7.Total gain of suckling lambs during the control period (7-28 days)

Current number	LM		LR	
	Sex	Total weinght [kg]	Sex	Total weinght [kg]
1	f	2.90	m	2.70
2	m	3.80	m	3.70
3	f	3.70	m	3.60
4	f	3.40	f	3.30
5	f	3.10	f	3.20
6	m	3.50	f	2.80
7	m	3.90	f	3.00
8	m	4.00	f	3.80
9	f	3.40	m	3.20
Σ		31.70		29.30
X ± Sx		3.52±0.12		3.26±0.13
s		0.37		0.39
Variability coefficient %		10.41		11.91

Breastfeeding with whole milk, supported in lambs of the LM group a total increase of between 2.9 and 4 kg, with an average of 3.52 kg. On the other hand, breastfeeding with reconstituted milk resulted in lambs in the MRL group of a total increase of between 2.7 and 3.8 kg with an average of 3.26 kg.
As regards the total increase, the coefficient of variability is 10.41% in LM and 11.91% in LR.
By reporting the total increase to 22, which is the number of days in the experimental period, we obtained the average daily increase per lamb. The resulting data are given in Table 8 and Figure 2.

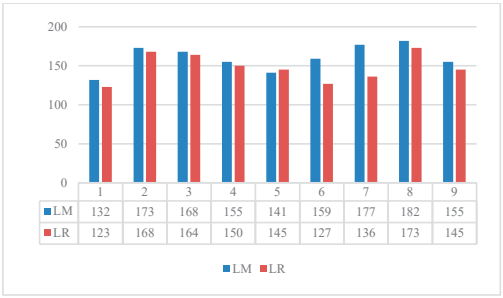

Figure 2. Graphical representation of the average daily increase

Table 8. Average daily gain of suckling lambs during the control period (7-28 days)

Current number	LM		LR	
	Sex	Average daily grain [g]	Sex	Average daily grain [g]
1	f	132.00	m	123.00
2	m	173.00	m	168.00
3	f	168.00	m	164.00
4	f	155.00	f	150.00
5	f	141.00	f	145.00
6	m	159.00	f	127.00
7	m	177.00	f	136.00
8	m	182.00	f	173.00
9	f	155.00	m	145.00
Σ		1,440.91		1,331.82
X ± Sx		160.1 ± 5.56		147.98 ±5.87
s		16.67		17.62
Variability coefficient %		10.41		11.91

From the analysis of this table it can be seen that the highest average daily increase was obtained in the LM group whose lambs were fed whole milk. The values were within the range of 132-182 grams, and the average per batch was 160.1 grams.

In the batch of lambs breastfed with reconstituted milk LR, the data obtained had lower values and were within the limit of 123-173 grams with an average per batch of 147.98 grams. We believe that this increase was achieved only on the basis of milk consumption, and only after the age of 28 days when the milk is no longer enough to support the growth of lambs will the additional distributed feed that lambs have learned to consume since the age of 2 weeks will also enter into account.

To remove the effect of the distribution of this feed on the growth of lambs, its quantities and composition was similar in both batches. Consumption of 10-20 g/day in the first month has an insignificant effect on the growth and development of lambs (Halga et al., 2005).

Just like the total increase, the coefficient of variability has average values and highlights the increasing differentiation of lambs from the batches of twins.

If we analyze Figure 2 it can be seen that in all couples of twins, the average daily increase was higher in the lambs in the breastfed group with whole milk, compared to the reconstituted milk with the exception of the 5th couple, consisting of females in which the lamb from the LR group had an average daily increase of 145 g/day and the one from the LM group a daily average sport of 141 g/day, the difference between them being very small of only 4 g/day. The biggest difference of 41 g/day was recorded in the twin couple number 7, where the male lamb from the LM group had an increase of 177 g/day, and the lamb from the LR lot an increase of only 136 g/day.

The testing of the meanings of differences for body mass and weight gain was carried out using the Mann-Whitney nonparametric test, for a small number of individuals, by using the statistical calculator program 7. The results obtained are shown in Table 9.

Table 9. The significance of the differences for the body mass, the total increase and the average daily increase

Specification	LM				LR				Differences	Test
	Milked milk				Reconstituide milk				L_1-l_2	Mann-Whitney
	n	x	s	VC%	n	x	s	VC%		
Initial weight [kg]	9.00	3.91	0.36	9.08	9.00	3.79	0.40	10.59	0.12	0.56 ns
Final weight [kg]	9.00	7.43	0.58	7.84	9.00	7.04	0.59	8.43	0.39	0.13 ns
Total weight [kg]	9.00	3.52	0.37	10.41	9.00	3.26	0.39	11.91	0.26	0.17 ns
Average daily gain[g]	9.00	160.10	16.67	10.41	9.00	147.98	17.62	11.91	12.12	0.15 ns

Note: ns not significant at $p \geq 0.05$ threshold

As can be seen from the analysis of this table, the difference in body mass between the LM and LR group, each consisting of 9 twin individuals, was, at the beginning of the experimental period, only 0.12 kg insignificant at the $p \geq$ threshold of 0.56. At the end of the experiment, the difference for body mass increased to 0.39 kg, which was still considered insignificant at a p-threshold ≥ 0.13.

The total increase recorded in the batch of lambs LM was 0.26 kg higher compared to the LR lot, the difference being insignificant at the p threshold of ≥ 0.17.

Finally, the difference between the calculated average daily increase between the two lots LM and LR was also insignificant ($p \geq 0.15$) and had a value of 12.12 g/day.

CONCLUSIONS

After obtaining these results we can conclude that both breastfeeding with whole milk and reconstituted milk support an average daily increase close and depending on the breeder's option and the economic effect can be applied either of the two growth methods.

The study shows that breastfeeding of twin lambs raised with milked whole milk (LM) and reconstituted face (LR), had an insignificant increase. The final body mass is higher in the lambs of the LM group, on average by 0.39 kg compared to the LR group. This difference disappeared with the approach of weaning, very possibly due to the increased intake of whole milk to the LR group, being on average 2.9 l/day.

The difference between the two lots is insignificant.

This observation agrees with the lack of differences in weaning weight relative to artificially or conventionally grown lambs (Napolitano et al., 2002).

For the farmer, raising lambs with reconstituted milk can be beneficial because it capitalizes on sheep production, but for lambs growing with reconstituted milk can cause negative effects on the behavior of premature separation from the mother being harmful.

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