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Growth of lambs receiving a supplementary milk replacer or reared traditionally in a flock of Polish Heath sheep

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The aim of the study was to compare the body weight gain and survival rate of lambs receiving a milk replacer as supplementary feed with lambs reared traditionally. The research was conducted in a flock of Polish Heath sheep. Of 244 lambs born, 42 lambs from multiple births were given supplementary feed. The lambs received the milk replacer until the 35th day of rearing. Body weight was monitored at birth and on days 28, 56 and 100 of life. Reproductive parameters and survival rate of lambs were derived from breeding documentation. There were no significant differences in the survival rate of lambs in the two groups, which was above 80%. The average birth weight of lambs reared traditionally and of those receiving the milk replacer was similar. During the entire rearing period, the lambs that required supplementary feeding grew more slowly. Twin lambs receiving the supplement and twin lambs reared traditionally had similar body weight and daily gains up to the 56th day of life, but the twin lambs receiving supplementary feed had a significantly lower body weight at day 100 and growth rate during the entire rearing period. The growth rate of triplets fed supplementary milk replacer was not significantly different from that of triplets reared traditionally in any period of the study.

KEY WORDS: lambs / rearing / supplementary feeding / milk replacer / body weight gain

One of the most important economic indicators in sheep production is the number of lambs obtained per ewe per year. This result is undoubtedly influenced by proper rearing of lambs, which ensures the lowest possible mortality rate. The mortality rate in the flock depends on many factors, the most important of which is the prolificacy of the ewe. Greater losses in rearing of lambs are noted in highly prolific breeds, which include the native Polish Heath breed [9]. Lambs from multiple litters have a greater risk of death than lambs from single births. The acceptable mortality rate for lambs in the flock is considered to be

5%, which can be achieved when single lambs are reared. In the rearing of twins, triplets or quadruplets, the mortality rate can reach up to 40% [1].

The proper development of lambs is determined by body weight at birth, the ewe's milk production and maternal instinct, the rearing method, and proper supervision and care [1, 3, 4, 7]. Lambs from multiple litters usually have a slower growth rate. In flocks with many births of this type, supplementary feeding of lambs with milk replacers can be used to improve rearing results and body weight. While this raises production costs, they may be compensated for by reduced losses of lambs [11]. The possibility of introducing supplementary feeding with milk replacers or replacing the traditional rearing system with shortened or artificial rearing has been shown in a number of studies carried out on various breeds and in a variety of environmental and production conditions [14, 15, 16].

A study was carried out to compare the growth and survival rate of lambs receiving supplementary feeding with a milk replacer with lambs reared traditionally in a flock of Polish Heath sheep.

Material and methods

The research was carried out on Polish Heath sheep at the Agricultural Experimental Station in Żelazna. Ewes mated in late September or early October in a harem system were fed according to applicable standards [13]. The feed ration consisted mainly of meadow hay and a compound concentrate feed, as well as carrots that were not suitable for sale.

Table 1
Composition of milk replacer used in lamb feeding (according to producer's label)

Constituents	Content (in 1 kg)
1	2
Crude protein (%)	21.0
Crude fat (%)	15.0
Crude fibre (%)	1.0
Crude ash (%)	8.6
Lactose (%)	35.0
Calcium (%)	0.6

1	2
Phosphorus (%)	0.55
Sodium (%)	0.605
Magnesium (%)	0.2
Manganese (mg)	75.0
Zinc (mg)	135.0
Iron (mg)	180.0
Copper (mg)	15.0
Cobalt (mg)	2.0
Iodine (mg)	1.8
Selenium (mg)	0.45
Vitamin A (IU)	50 000
Vitamin D_3 (IU)	8000
Vitamin E (mg)	100.0
Vitamin C (mg)	150.0
Vitamin K_2 (mg)	4.0
Vitamin B_1 (mg)	10.0
Vitamin B_2 (mg)	8.0
Vitamin B_6 (mg)	8.0
Vitamin B_{12} (mcg)	50.0
Niacin (mg)	40.0
Pantothenic acid (mg)	30.0
Folic acid (mg)	1.0
Biotin (mcg)	100.0
Choline chloride (mg)	750.0
Probiotics	+

Of 244 lambs born, 42 required supplementary feeding (17.2%). These lambs were selected on the basis of their behaviour with the ewe (persistent sucking and interest in the udder, constant bleating, weakness and apathy that could indicate malnutrition). The condition of the mammary gland of the ewes was evaluated as well. The final test of the need for supplementary feeding was an attempt to give the lamb cow milk from a bottle with a nipple. If the lamb eagerly drank the milk, this indicated malnutrition due to insufficient milk production by the ewe.

The lambs that qualified for supplementary feeding were kept by their mothers throughout the rearing period. In addition to their mother's milk, they additionally received milk from a bottle for 35 days. After consuming the colostrum, for four days the lambs received fresh cow milk heated to 36°C, and then Linomilk Babystar 6212 milk replacer. The lambs were fed the milk replacer four times a day at fixed times, each time receiving from 125 ml to 250 ml (the amount was increased as they grew). The composition of the milk replacer is given in Table 1. All lambs from the age of 14 days had access to solid feed, i.e. good quality hay and compound concentrate feed.

The lambs were weighed on days 2, 28, 56 and 100 of life. On this basis, daily weight gains were calculated in each period of life. Reproductive and rearing parameters were determined based on data obtained from breeding documentation kept for the flock.

The results were analysed statistically by Student's t-test for comparison of two groups, using the SPSS statistics package (2013).

Results and discussion

Analysis of the size distribution of litters showed that the vast majority of lambs (84.5%) came from twin and triple births (Figure 1). The average litter size in the group of lambs reared using the milk replacer was higher ($P \leq 0.01$) than in the group that was reared traditionally. This may indicate that it was primarily lambs from multiple litters that were eligible for supplementary feeding. However, no significant differences were found between the average rearing rates in the two groups (Table 2). The values obtained were over 80%, although better results were obtained in the group of lambs reared without supplementary feeding.

A lower survival rate (71%) in a group of artificially reared lambs of meat breeds was obtained by Peters and Heaney [15]. Similarly, in a study by Emsen et al. [2] carried out on Awassi lambs, the rearing rate was lower (75%) than in the group reared with the use of a milk replacer in the present study. Even higher mortality rates in artificially reared lambs were obtained by Oztabak and Ozpinar [14] and by Ocak and Cankaya [11] – 35.5% and 45%, respectively.

Analysis of the birth type of the Polish Heath lambs showed that lambs from single births did not require supplementary feeding. The percentage of lambs from twin litters that required supplementary feeding was small (14.1%), whereas half of the triplets required feeding with the milk replacer (Figure 2).

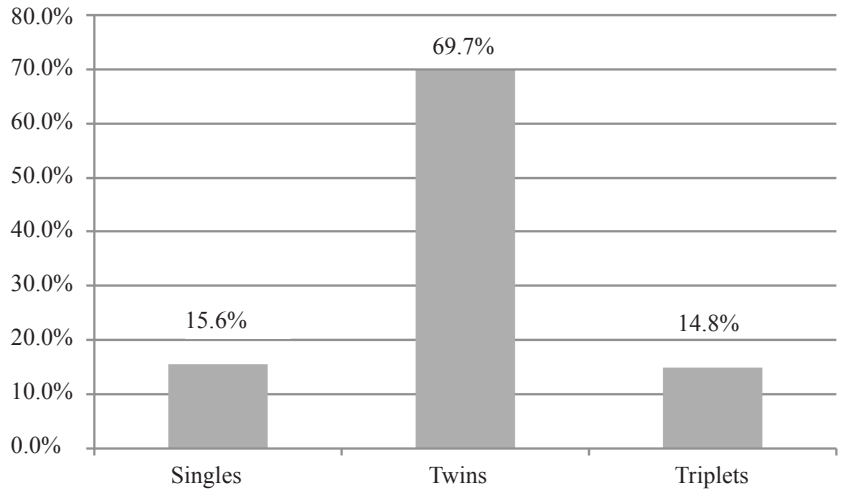

Fig. 1. Birth type distribution in lambs

Table 2
Litter size and lamb survival rate in study groups

Traits	Rearing without supplementary feeding (n=200)		Rearing with supplementary feeding (n=44)		Statistical significance
	LSM	SE	LSM	SE	
Litter size	1.78	0.04	2.45	0.07	**
Lambs survival rate (%)	86.0	3.2	81.8	5.3	NS

LSM – least square mean; SE – standard error; **P≤0.01; NS – non-significant

Analysis of the survival rate of lambs during rearing showed the lowest mortality rate in the group of twins that did not receive supplementary feeding, while the highest mortality rate (33.3%) was noted in the group of traditionally reared triplets (Figure 3). It should be emphasized that the use of the milk replacer in this group substantially improved the rearing rate, which increased to above 80%. The most deaths among lambs were recorded up to the 56th day of life, irrespective of the type of birth and rearing.

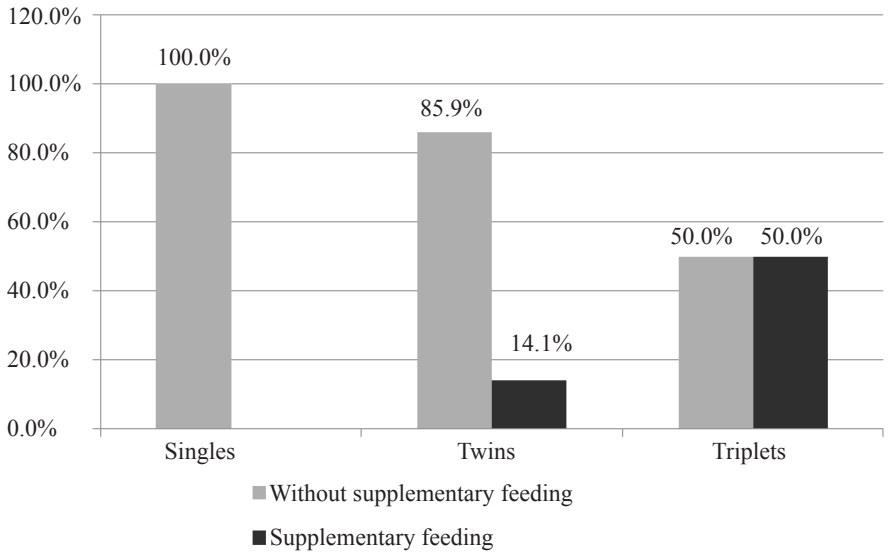

Fig. 2. Percentage of lambs receiving supplementary feeding in relation to litter size

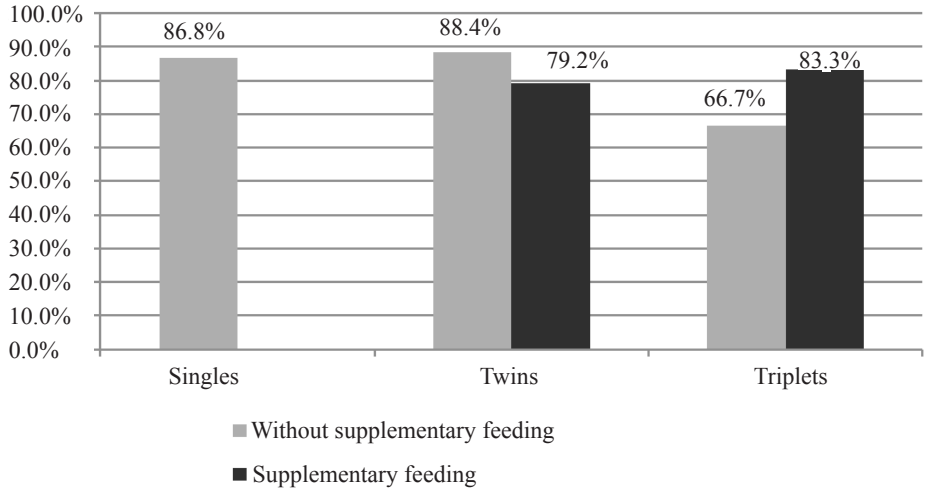

Fig. 3. Lamb survival rate in relation to rearing type and birth type

The average birth weight was similar in lambs reared traditionally and those receiving the milk replacer. However, the lambs requiring supplementary feeding grew more slowly. Lambs fed only on their mother's milk had higher (P≤0.05) body weights on days 28 and 56. At weaning at 100 days of age, lambs fed with the milk replacer were 3.73 kg lighter than their traditionally reared counterparts, although the differences were not confirmed statistically (Table 3). The differences in body weight between groups of lambs were confirmed in the analysis of daily weight gains, which were lower (P≤0.05) in individual periods of life in the lambs requiring supplementary feeding (Table 3).

Research by other authors has also found lower growth rates in lambs not reared in the traditional manner. Emsen et al. [2] found that artificially reared Awassi lambs achieved lower growth rates (115 g vs. 127 g body weight gain/day) than naturally fed lambs. Similarly, Rodriguez et al. [16], in research on Assaf lambs, reported a higher growth rate

Table 3
Body weight gain in lambs in relation to rearing type

Trait	Rearing without supplementary feeding (n=202)		Rearing with supplementary feeding (n=42)		Statistical significance
	LSM	SE	LSM	SE	
Birth body weight (kg)	2.97	0.05	2.39	0.13	NS
Body weight on day 28 (kg)	7.03	0.15	5.67	0.34	*
Body weight on day 56 (kg)	11.10	0.26	8.91	0.60	*
Body weight on day 100 (kg)	16.15	0.42	12.42	1.06	NS
Daily gain:					
days 1-28 (g)	145.30	4.18	120.81	9.60	*
days 1-56 (g)	144.08	4.05	119.94	9.29	*
days 1-100 (g)	131.43	3.95	101.91	9.99	*
days 28-56 (g)	140.43	6.79	119.87	7.65	*
days 28-100 (g)	116.86	6.27	103.53	7.16	*
days 56-100 (g)	100.90	7.84	86.08	8.95	NS

LSM – least square mean; SE – standard error; **P≤0.05; NS – non-significant

(307 g/day) in the group of animals that did not receive supplementary feeding and a lower growth rate (253 g/day) in those that did. Differences in weight gain were also demonstrated by Lanza et al. [5] in lambs of the Barbaresca breed. Weight gain up to 42 days of age in traditionally and artificially reared lambs was 189 g and 159 g a day, respectively. Niżnikowski et al. [8], in research on lambs of the Zelaznenska variety of Polish Lowland sheep and Polish Heath sheep, also found a higher growth rate in lambs that did not receive supplementary feeding during the entire rearing period with their mothers. Napolitano et al. [6], on the other hand, reported a similar growth rate in lambs of the native Comisana breed irrespective of how they were reared. Contrasting results to those discussed above and those obtained in the present study were reported by Ocak and Cankaya [11], who showed that lambs reared using a milk replacer achieved higher daily gains (238 g vs. 181 g) than lambs reared traditionally, i.e. only on their mother's milk.

Table 4
Body weight gain of twin lambs in relation to rearing type

Trait	Twins without supplementary feeding (n=146)		Twins with supplementary feeding (n=24)		Statistical significance
	LSM	SE	LSM	SE	
Birth body weight (kg)	2.65	0.05	2.47	0.12	NS
Body weight on day 28 (kg)	6.32	0.12	5.76	0.31	NS
Body weight on day 56 (kg)	9.99	0.21	9.05	0.53	NS
Body weight on day 100 (kg)	14.64	0.33	12.57	0.90	*
Daily gain:					
days 1-28 day (g)	131.1	3.2	117.6	8.2	NS
days 1-56 (g)	130.1	3.1	117.6	7.8	NS
days 1-100 (g)	119.6	3.1	100.8	8.2	*
days 28-56 (g)	131.1	3.2	117.6	8.2	NS
days 28-100 (g)	113.5	3.2	93.7	8.7	*
days 56-100 (g)	99.7	4.0	77.4	10.7	*

LSM – least square mean; SE – standard error; *P≤0.05; NS – non-significant

Table 5
Body weight gain of triplet lambs in relation to rearing type

Trait	Triplets without supplementary feeding (n=18)		Triplets with supplementary feeding (n=18)		Statistical significance
	LSM	SE	LSM	SE	
Birth body weight (kg)	1.98	0.10	2.19	0.10	NS
Body weight on day 28 (kg)	5.20	0.24	5.44	0.24	NS
Body weight on day 56 (kg)	8.42	0.41	8.69	0.41	NS
Body weight on day 100 (kg)	13.07	0.72	12.16	0.65	NS
Daily gain:					
days 1-28 day (g)	114.9	6.5	116.2	6.5	NS
days 1-56 (g)	114.9	6.5	116.2	6.5	NS
days 1-100 (g)	110.1	6.8	99.7	6.1	NS
days 28-56 (g)	114.9	6.5	116.2	6.5	NS
days 28-100 (g)	105.5	7.8	94.7	7.0	NS
days 56-100 (g)	95.2	11.5	83.3	10.4	NS

LSM – least squares mean; SE – standard error; NS – non-significant

Analysis of body weight development taking into account size of the litter showed that up to the 56th day of rearing, the average body weight and daily weight gains in the twins fed the milk replacer were no worse than the values achieved in the twins that did not receive supplementary feeding (Table 4). Body weight on day 100 and daily gains for the entire rearing period were lower in the twins receiving supplementary feeding ($P \leq 0.05$). The lack of significant differences in the initial growth period of lambs from twin litters may have been due to the fact that the lambs were only fed with the milk replacer until the 35th day of life. On the other hand, analysis of the growth rate of triplet lambs reared with and without the milk replacer showed no statistically significant differences in body weight or daily gains in any of the periods analysed (Table 5). The weight of the triplet lambs receiving the milk replacer was even higher in the early rearing period than in the lambs reared traditionally, although the differences were not statistically significant. Lambs from triplet litters, irrespective of how they were reared, may have had more equal chances. Although ewes rearing multiple litters usually produce more milk [10, 12], there is still less milk per

lamb. It should also be noted that the body weight development of twin and triplet lambs receiving supplementary feeding remained at a similar level. Differences between twins and triplets in body weight from birth to 100 days of life and in daily weight gains between the periods studied were small (Tables 4 and 5).

To sum up the results of the study, lambs from multiple litters required supplementary feeding. The use of the milk replacer substantially improved the rearing rate of triplet lambs. The growth of lambs receiving supplementary feeding was slower, although in lambs from triplet litters supplementary feeding did not significantly affect daily weight gains.

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