

Analysis of growth rate of lambs of synthetic BCP and SCP prolific meat lines

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The objective of the present study was to assess the growth rate of lambs of two synthetic prolific meat lines, BCP and SCP, after a 10-year period of breeding. The observations were carried out in the sheep facility at the Small Ruminants Teaching and Research Station in Bezek (University of Life Sciences, Lublin). A total of 1,151 lambs were studied over a period of 4 consecutive years. Lamb growth was monitored by weighing at birth and at the age of 28, 56 and 70 days, and the data collected were used to calculate daily weight gain. The research results show that the breeding efforts produced two similar synthetic lines of lambs characterized by good growth parameters, and significantly, well adapted to the conditions of eastern Poland.

KEY WORDS: synthetic line / lamb growth / BCP / SCP

The crisis in Polish sheep farming at the start of the 1990s forced a shift from raising sheep for wool to their use for meat. The economic efficiency of producing lambs for slaughter is determined by daily weight gain, feed consumption, the quality of the meat obtained, and reproductive indicators [1]. Due to unsatisfactory reproduction parameters in native populations, the 'National programme to improve prolificacy in sheep' was introduced, and was later included as an integral part of the 'Programme to improve the size of the sheep population by 2010.' [6]. The main goal was to improve reproductive rates in sheep herds by introducing a 25% share of genes from a prolific breed into the genotype of native sheep. The sheep obtained as a result of implementation of the programme were intended to be used in commercial cross-breeding with rams of meat breeds in order to produce meat of good quality. Unfortunately, in the conditions of Polish sheep farming the technological solutions planned would not be implemented for farming on a mass scale. An alternative means of improving the economics of lamb production was the creation of synthetic lines

of sheep. This type of breeding work had previously been conducted in many countries, including Canada, New Zealand, Australia, and European countries as well [5, 13, 16]. In Poland, such measures have resulted in the creation of populations of a White Head and Black Head meat line, prolific line 09, prolific dairy Koluda sheep, Merinofin sheep, and the synthetic prolific meat line 08 [4, 7, 15].

In the Lublin region the potential of sheep produced as a result of the ‘National programme to improve prolificacy in sheep’ became the inspiration for the creation of synthetic lines combining good meat characteristics with high reproduction parameters. In the year 2000, breeding work conducted at the Department of Small Ruminant Breeding and Agricultural Advisory of the University of Life Sciences in Lublin, in cooperation with the Regional Union of Sheep and Goat Farmers in Lublin, led to the creation of two synthetic lines, BCP and SCP, which currently make up about 10% of the sheep population in the Lublin region. These animals have earned recognition among local farmers, but further improvement and popularization of these populations require continual analysis of the outcomes of breeding work.

The aim of the study was to evaluate the growth of lambs of two synthetic prolific meat lines, BCP and SCP, after an approximately 10-year period of breeding work.

Material and methods

The observations were conducted at the Small Ruminants Teaching and Research Station in Bezek, belonging to the University of Life Sciences in Lublin. The material for the study consisted of animals of two synthetic prolific meat lines, BCP and SCP. The observations covered a combined 1,151 lambs over a period of four consecutive calendar years. Detailed data on the numbers of lambs in each group are presented in Table 1.

During the observation period the animals were housed indoors, all in the same conditions. All groups of lambs involved in the experiment were fed in the same manner, using feed currently available on the farm. The diet was based on meadow hay, haylage and cereal grain as concentrate feed. Growth of the lambs was monitored by weighing at birth and on days 28, 56 and 70 of age. The data collected were used to calculate daily weight gain in each period of growth.

The results were analysed statistically by two-way analysis of variance (ANOVA), using the Statistica data analysis software system, version 6 [14]. The analysis was carried out separately for male and female lambs from single and twin births, according to the following mathematical model:

$$Y_{ijkl} = \mu + L_i + R_j + (L \times R)_{ij} + e_{ij}.$$

where:

- Y_{ijkl} – level of the feature tested
- μ – mean value of the feature for the population
- L_i – constant effect of line (BCP, SCP)
- R_j – constant effect of year
- $(L \times R)_{ij}$ – interaction between year and lines
- e_{ij} – random error

Table 1
Number of lambs in the study

Type of birth of lambs	Synthetic line	
	BCP	SCP
		Ewes
Single	47	58
Twins	235	246
Total	282	304
		Rams
Single	39	53
Twins	229	244
Total	268	297
		Total
Single	86	111
Twins	464	490
Total	550	601

Results and discussion

The results presented in Table 2 characterizing the growth of lambs from single births show that body weight at birth in animals of both lines was similar for both females (5.11-5.28 kg), and males (5.52-5.85 kg). Slightly higher birth weight in both cases was noted for the lambs of the synthetic BCP line, but no statistically significant differences were confirmed. The year of the study, however, had a statistically significant effect on this characteristic ($P \leq 0.05$). On day 28 of life a slightly higher body weight was observed in the female (12.94 kg) and male (14.27 kg) lambs of the BCP line than in the SCP lambs. A similar tendency was observed on day 56, with higher body weight noted for the BCP lambs. The differences between male BCP (26.80 kg) and SCP (24.64 kg) lambs were statistically significant ($P \leq 0.05$). In this case as well a statistically significant effect of the year on the body weight of male lambs was observed ($P \leq 0.05$). Weighing on day 70, as on the earlier days, revealed higher body weight in both male and female lambs of the synthetic BCP line.

Similar tendencies as in the case of the lambs from single births were noted in the analysis of the body weight of twin lambs (Tab. 3). An exception was male SCP lambs on days 56 and 70 of life, but in this case the differences were not confirmed statistically. The results for the growth of male lambs were not confirmed in females, in which

Table 2

Body weight of lambs from single births (kg)

Body weight	BCP		SCP		Effect of year
	\bar{x}	S	\bar{x}	S	
Ewes					
At birth	5.28	0.91	5.11	0.82	*
28th day	12.94	2.65	12.36	2.49	NS
56th day	23.60	5.67	22.26	4.60	NS
70th day	26.72	5.74	25.41	4.75	NS
Rams					
At birth	5.85	0.84	5.52	0.86	*
28th day	14.27	2.74	13.58	2.00	NS
56th day	26.80 ^a	5.95	24.64 ^b	4.39	*
70th day	29.98	5.97	28.02	4.52	NS

 \bar{x} – arithmetic mean; S – standard deviationSignificance of differences between BCP and SCP lines designated with different letters: a, b at $P \leq 0.05$ Effect of year: * – statistically significant at $P \leq 0.05$, NS – not significant

during all periods analysed the animals of the BCP line had higher body weight than the SCP lambs. In most of the cases considered the differences were statistically highly significant ($P \leq 0.01$); only in the case of body weight on day 70 were they significant ($P \leq 0.05$). Similar results to those obtained in the present study were reported by Gruszecki and Lipecka [3], Lipecka et al. [8] and Raj et al. [12], who noted higher body weight in male lambs with a contribution of the Suffolk breed in their genotype. These observations indicate that in planning fattening of male lambs for higher body weight there should be a preference for animals with a contribution of the Suffolk breed in their genotype.

Analysis of weight gain in the lambs of both sexes and from both types of birth showed practically no statistically significant differences between daily weight gains in the two synthetic lines (Tab. 4, 5). An exception was the daily weight gain noted in female lambs from twin births in the period from birth to 28 days of age, in which the differences between BCP and SCP lambs were confirmed statistically ($P \leq 0.05$). In this case the daily weight gains ranged from 196 g (SCP) to 210 g (BCP). In all cases higher daily weight gains during the periods from birth to 28 days of age and from 28 to 56 days were noted in the lambs of the BCP line.

Table 3

Body weight of lambs from twin births (kg)

Body weight	BCP		SCP		Effect of year
	\bar{x}	S	\bar{x}	S	
Ewes					
At birth	4.35 ^A	0.77	4.01 ^B	0.71	NS
28th day	10.24 ^A	2.13	9.51 ^B	1.97	NS
56th day	19.13 ^A	4.62	17.91 ^B	3.78	NS
70th day	22.05 ^a	4.79	20.98 ^b	4.16	NS
Rams					
At birth	4.66 ^A	0.85	4.34 ^B	0.83	*
28th day	10.37	2.11	10.35	2.29	NS
56th day	19.12	4.51	19.39	4.43	NS
70th day	22.13	4.90	22.56	4.81	NS

\bar{x} – arithmetic mean; S – standard deviation

Significance of differences between BCP and SCP lines designated with different letters: A, B at $P \leq 0.01$, a, b at $P \leq 0.05$

Effect of year: * – statistically significant at $P \leq 0.05$, NS – not significant

Table 4

Daily weight gain in lambs from single births (g)

Gains	BCP		SCP		Effect of year
	\bar{x}	S	\bar{x}	S	
Ewes					
Birth – 28th day	274	80	259	76	*
28-56th day	430	135	413	125	NS
56-70th day	223	161	224	146	NS
Rams					
Birth – 28th day	301	80	289	59	*
28 -56th day	491	138	469	99	NS
56-70th day	227	194	242	169	NS

\bar{x} – arithmetic mean; S – standard deviation

Effect of year: * – statistically significant at $P \leq 0.05$, NS – not significant

Table 5
Daily weight gain in lambs from twin births (g)

Gains	BCP		SCP		Effect of year
	\bar{x}	S	\bar{x}	S	
Ewes					
Birth – 28th day	210 ^a	66	196 ^b	60	*
28-56th day	341	103	326	85	NS
56-70th day	208	168	220	159	NS
Rams					
Birth – 28th day	215	67	204	68	*
28-56th day	337	108	352	98	NS
56-70th day	215	157	226	163	NS

\bar{x} – arithmetic mean; S – standard deviation

Significance of differences between BCP and SCP lines designated with different letters: a, b at $P \leq 0.05$

Effect of year: * – statistically significant at $P \leq 0.05$, NS – not significant

It is worth noting the contrasting tendencies in daily weight gains in the period from 56 to 70 days of life. The reduction in daily weight gain during this time in the BCP lambs may have been due to differences in their mothers' milk production and length of lactation, as well as to behavioural differences in the lambs. The Berrichon du Cher breed, used to obtain the BCP line, is more temperamental than the Suffolk breed used to obtain the SCP line, which may explain the lower daily weight gain in the synthetic BCP line during this period. Another reason may be the earlier maturation of BCP lambs. The available literature contains studies confirming the relationship between the activity of animals and weight gain. In study by Pajor et al. [9, 10, 11] calmer sheep were found to have higher average daily weight gains than more nervous sheep. Differences in weight gain between lambs having a contribution of the Berrichon breed in their genotype may also be due to greater reactivity to their handlers. The significance of this factor is pointed out by Dodd et al. [2]. It should be emphasized, however, that despite the slight differences noted in body weight and weight gain, the synthetic lines BCP and SCP are characterized by similar growth parameters. These data, together with information regarding the similar reproductive parameters in the two lines, i.e. 94.5% and 94.7% fertility, 170.6% and 169.3% prolificacy, 87.3% and 87.5% lambs reared, and 140.8% and 140.3% reproductive performance [7], lead to the conclusion that breeding work has resulting in two similar synthetic lines of animals, characterized by good growth and

reproductive parameters, and what is particularly significant, adapted to the conditions of eastern Poland.

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