

## **LEVEL OF REPRODUCTION TRAITS OF EWES IN BLACKHEAD SHEEP AND GROWTH OF THEIR OFFSPRING**

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**Abstract.** The investigations were carried out in a sheepfold located in the Pomeranian Province, Poland. Sheep were evaluated in terms of reproduction traits of ewes, nursing success, and the weight at birth of their lambs. The herd achieved a generally high level of reproduction traits, similar to reference values for the breed published by the Polish Sheep Breeding Association for the years 2005–2009. The mean fertility index for the studied period remained at a level 78.2%, prolificacy 133.8%, and lamb nursing success 86.8%, whereas the mean index of reproduction performance was 90.8%. Equally high values were observed for the growth of the offspring. Until 75 days of age, both body weight and daily gains of singles were higher compared to those of lambs born from multiple births. The ram lambs attained higher body weight and daily gains as compared to the ewe lambs of the same age.

**Keywords:** blackhead sheep, lamb rearing and growth, reproduction performance

### **INTRODUCTION**

In recent years, lamb slaughter livestock has become the main direction in the use of sheep. Currently, it is the main source of income in sheep farming.

It should be stated that lamb meat is hardly available in Polish stores, and a barrier impeding the demand is high price. It is, however, necessary to be aware that biological efficiency of lamb meat production is lower than production efficiency of poultry, beef and cow milk, therefore, the manufacturing costs are relatively higher [Gawlik 2006].

Nowicki et al. [2001] and Niedziółka et al [2003] believe that nowadays, the only way leading to improvement in profitability of sheep raising and breeding in Poland is an intensive increase in production of lamb meat and slaughter livestock, mainly by way of increase in prolificacy of sheep and the number of raised lambs. Under Polish conditions, twin litters are the most beneficial. For this reason, it is pursued to obtain plural pregnan-

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cies with constant size. For breeders, twin pregnancies are more beneficial than incidentally smaller litters [Nowicki *et al.* 2001].

With the direction of our sheep farming to lamb meat production, reproduction utility is of extreme importance. Prolificacy of Polish sheep varieties has been remaining for many years at the level of 120–140%, which is a low size at the present economic situation. Another factor of anxiety is also a high death rate of lambs during raising (6–10%), resulting in the fact that reproduction utility, being a measure of production effectiveness, does not exceed the value of 1.3 lamb obtained from one ewe from the basic herd [Gruszecki *et al.* 2000].

The purpose of the study was analysis of features of reproduction utility of ewes, black-headed variety, and increase in their offspring.

## MATERIAL AND METHODS

Research material were black-headed sheep at the age from 2 at 7 years and the average body weight 65–70 kilogrammes, from a sheepfold in the Pomeranian province.

Sheep were maintained in an extensive system. Summer feeding consisted in using, first of all, green growth from pastures, while during the winter animals were kept in rooms with access to cattle-yards, basing mainly on hay and silage. The basis for feeding young lambs was mother's milk, and from 14th day – good quality hay and oats, and later- green growth from pastures. Sheep had a constant access to water and deer lick.

Assessment of effects of reproduction utility of assessed mothers was conducted in the period 2004–2007, specifying the following indicators for the whole herd: fertility, prolificacy, raising of lambs and reproduction utility, according to formulas specified by the Polish Sheep Farming Association [2005–2009].

For calculations, data from breeding documentation of the analyzed herd were used.

The type of birth and sex of borne and raised lambs were specified taking account of size of losses in breeding seasons 2005/2006 and 2006/2007.

Based on obtained body mass of lambs aged 21, 42 and 63 days, average daily gains of animals were calculated.

Statistical preparation of data was conducted using programs Microsoft Office Excel<sup>®</sup> and Statistica<sup>®</sup>9.0 PL with the use of t-Student test for independent samples.

## RESULTS AND DISCUSSION

Table 1 presents results of reproduction of ewes and raising of their offspring in the period 2004–2006.

When analyzing values of fertility ratio in the analyzed herd, it was stated that it was low and was on average 78.2%. In own research, the lowest value of this ratio (74.7%) was recorded in 2005, in the following year it amounted to only 76.5%. In the opinion of Niżnikowski [1994], the value of this ratio should not fall below 90%.

Table 1. Mean body weight and daily weight gain of lambs in the reproductive season 2005/2006

Tabela 1. Średnia masa ciała oraz średnie przyrosty dobowe jagniąt pochodzących z sezonu 2005/2006

Specification Wyszczególnienie	Statistical measures Miary statystyczne	Body weight, kg of age, days Masa ciała, kg w wieku, dni			Daily weight gain, g per day Przyrosty dobowe, g na dzień		
		21	42	63	21–42	42–63	21–63
Ram lambs Tryczki	n	56	48	47	48	47	47
	$\bar{x}$	8.0 <sup>A</sup>	14.0 <sup>B</sup>	21.6 <sup>a</sup>	287 <sup>C</sup>	361 <sup>b</sup>	324
	sd	1.11	1.99	2.50	70.90	70.34	45.27
	V, %	13.9	14.2	11.6	24.7	19.5	14.0
Ewe lambs Jarki	n	68	62	62	61	61	61
	$\bar{x}$	6.9 <sup>A</sup>	12.7 <sup>B</sup>	20.6 <sup>a</sup>	275 <sup>C</sup>	367 <sup>b</sup>	323
	sd	1.09	2.14	2.30	75.28	74.43	47.92
	V, %	15.8	16.8	11.2	27.3	20.3	14.8
Total average Średnia ogólna	$\bar{x}$	7.4	13.3	21.1	281	364	323
Singles Pojedyncze	n	60	58	58	58	58	58
	$\bar{x}$	7.7	13.6	21.4	279	374 <sup>D</sup>	326 <sup>c</sup>
	sd	1.26	2.21	2.53	73.66	70.97	44.49
	V, %	16.4	16.3	11.8	26.4	19.0	13.6
Twins Bliźniacze	n	64	52	51	52	51	51
	$\bar{x}$	7.3	13.1	20.7	274	360 <sup>D</sup>	319 <sup>c</sup>
	sd	1.01	2.12	2.37	77.86	71.83	48.78
	V, %	13.8	16.3	11.4	28.4	19.9	15.3
Total average Średnia ogólna	$\bar{x}$	7.5	13.3	21.0	276	367	322

A, B – statistically significant differences at  $P \leq 0.01$ ; A, B – różnica istotna na poziomie  $P \leq 0.01$ .  
a, b – statistically significant differences at  $P \leq 0.05$ ; a, b – różnica istotna na poziomie  $P \leq 0.05$ .

Average prolificacy of mothers from three births was 133.8% and was higher than the national average (115.1%) specified by the Polish Sheep Farming Association [2005–2009] for this breed. The highest value of this ratio was recorded in 2005 – 149.1%. According to Niżnikowski [2003], to gain satisfactory profitability, one mother should “produce” not less than 1.3–1.5 of lamb in a season. Nowicki et al. [2001] state that depending on the term of reproduction, the desired prolificacy in the herd of black-headed sheep should be 120–170%. It means that the analyzed herd, owing to a low value of this ratio, can be considered as of average prolificacy.

Raising of lambs and reproduction utility of ewes are two inseparable indicators associated with each other.

In the analyzed herd, the number of raised, ready for sale lambs aged 75 days was at the level of 86.8% and varied in the analyzed period from 79.5% to 93.5%. The obtained values were close to values specified by the Polish Sheep Farming Association [2005–2009] in the same period – 87.2%.

In the opinion of Niżnikowski [1994], the value of this ratio should not be lower than 95%, and in herds with high prolificacy ratios, an adverse antagonism occurs. A higher level of loss in lambs more numerous obtained per one mother is indicated. In addition, Niżnikowski et al. [2007] noticed a significant impact of suckling in litter on characteristics of raising of black-headed lambs. Ratio of raising and survival of young specimens achieved the most beneficial values in the groups of twin and single litters, it was significantly reduced at triplets, and the lowest values were indicated in the case of quintuplets and quadruplets. Researchers concluded that the type of litter with more than three lambs should be eliminated from breeding practice.

When analyzing losses of lambs, the largest ones were recorded in 2005 (20.5%), and the smallest in 2006 (6.5%).

It has been stated that the largest animal losses were related to twin births, and were not connected with gender of the assessed animals (Fig. 1). Notwithstanding the type of birth and gender of animals, body mass at birth is of crucial importance for their further growth and results of raising [Buttery 2007].

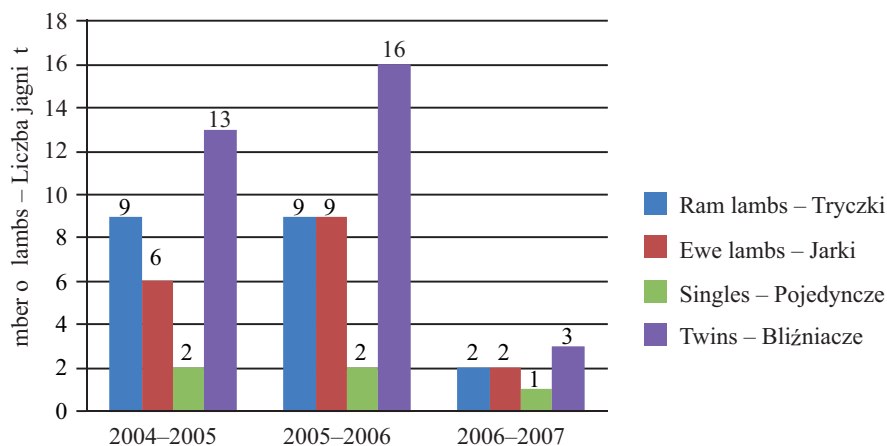


Fig. 1. Lambs mortality depending on type of birth

Rys. 1. Upadki jagniąt w zależności od typu urodzenia

Raising of lambs and reproduction utility of ewes are two inseparable indicators. Their values sum up the production level of the herd and work of shepherds. In the assessed herd, average reproduction utility for the years 2004/2006 was 90.8%. It ranged from 80.6% in 2006 to 99.1% in 2004. Comparing the results obtained with those specified by the Polish Sheep Farming Association for black-headed sheep in the same period, they should be considered high.

In the opinion of Niżnikowski et al. [2002], extensive conditions of maintenance may have an insignificant, but adverse impact on the value of survival rates and rate of raising of lambs, especially from plural pregnancies.

The conducted research proved (Table 2) that ram lambs reached substantially ( $P \leq 0.01$ ,  $P \leq 0.05$ ) higher body mass on 21st, 42nd and 63rd day of life (accordingly 8.0 kg; 14.0 kg, 21.6 kg) as compared to ewe lambs (6.9 kg; 12.7 kg, 20.6 kg) in season 2005/2006.

Table 2. Mean body weight and daily weight gain of lambs in the reproductive season 2006/2007

Tabela 2. Średnia masa ciała oraz średnie przyrosty dobowe jagniąt pochodzących z sezonu 2006/2007

Specification Wyszczególnienie	Statistical measures Miary statystyczne	Body weight, kg of age, days Masa ciała, kg w wieku, dni			Daily weight gain, g per day Przyrosty dobowe, g na dzień		
		21	42	63	21–42	42–63	21–63
Ram lambs Tryczki	n	31	29	29	31	29	29
	$\bar{x}$	8.6	15.2	24.0	315	420	367
	sd	1.42	2.25	3.86	84.10	114.08	84.28
	V, %	16.5	14.8	16.0	26.7	27.2	22.9
Ewe lambs Jarki	n	31	29	29	29	29	29
	$\bar{x}$	8.6	15.0	23.2	307	389	348
	sd	1.50	2.46	3.26	74.98	92.58	57.39
	V, %	17.5	16.4	14.1	24.5	23.8	16.5
Total average Średnia ogólna	$\bar{x}$	8.6	15.1	23.6	311	404.5	347.5
Singles Pojedyncze	n	46	45	45	45	45	45
	$\bar{x}$	8.7	15.6	24.0	327 <sup>A</sup>	403 <sup>B</sup>	365
	sd	1.36	1.99	2.99	74.50	104.41	66.14
	V, %	15.6	12.8	12.4	22.8	25.9	18.1
Twins Bliźniacze	n	16	13	13	13	13	13
	$\bar{x}$	8.5	14.7	22.7	146 <sup>A</sup>	381 <sup>B</sup>	336
	sd	1.44	2.66	3.61	39.53	82.48	61.51
	V, %	16.8	18.1	15.9	27.1	21.7	18.3
Total average Średnia ogólna	$\bar{x}$	8.6	15.1	23.3	236	392	350.5

A, B – statistically significant differences at  $P \leq 0.01$ ; A, B – różnica istotna na poziomie  $P \leq 0.01$ .  
a, b – statistically significant differences at  $P \leq 0.05$ ; a, b – różnica istotna na poziomie  $P \leq 0.05$ .

Lambs from a single type of birth were heavier than lambs from plural pregnancies. Average body mass of lambs on 21st day of life was higher at specimens from single births

and was on average 7.7 kg, as compared to lambs from twin births (7.3 kg) Also, in subsequent periods of raising, the body mass of animals from single births was higher and was on average 13.6 kg on 42nd day of life and 21.4 kg on 63rd day of life, while the body mass of lambs from twin births was lower and was accordingly 13.1 kg and 20.7 kg. It was noticed that heavier specimens were, at the same time, stronger and with a greater vigor.

In the opinion of many researchers [Unal and Akcapinar 2001, Babar et al. 2004, Yaqoob et al. 2004, Buttery et al. 2007, Niedziółka and Pieniak-Lendzion 2007, Simińska et al. 2008] borne ram lambs are heavier than their female peers. Also lambs from single births, as opposed to lambs from plural pregnancies, are borne heavier. Niedziółka and Pieniak-Lendzion [2007] noticed leveling of the body mass of Suffolk and Berrichone Du Jey breed at the end of period of raising, regardless of the type of birth of lambs.

In own research, at ram lambs substantially ( $P \leq 0.01$ ) higher average daily gains from 21st to 42nd day of life (287g), as compared to ewe lambs (275 g), were observed. A statistically reverse significant ( $P \leq 0.05$ ) relation was observed in the next analyzed period (from 42nd to 63rd day).

When analyzing average daily gains throughout the period of raising (from 21st to 63rd day of life), similar values at ewe lambs and ram lambs were recorded (323 g and 324 g). Taking account of the type of birth of lambs, it was diagnosed that in the first period of raising it had no impact on daily gains of animals. They were similar – single births 279 g and twin births 274 g. Differences were noticeable in subsequent periods. From 42nd to 63rd day of life and throughout the period of raising (21st – 63rd days), lambs from single birth were characterized by higher daily gains in the body mass in relation to specimens from twin births. Differences between the groups were significant ( $P \leq 0.01$ ;  $P \leq 0.05$ ).

Table 3 presents average body mass and daily gains of lambs in the period 2006/2007.

Notwithstanding the gender, body mass of animals on 21st day of life was running at the same level (8.6 kg). Small differences were noticed on 42nd and 63rd day of life, when the mass of ram lambs was higher (it was 15.2 kg and 24.0 kg accordingly) than body mass of ewe lambs (15 kg on 42nd day of raising and 23.2 kg on 63rd day of raising).

Average body mass of lambs from single births and twin births remained at constant level, while in later periods differences not confirmed statistically were noticeable. Lambs from single births reached greater body mass as compared to peers from twin births.

When analyzing average values of daily gains, it was stated that ram lambs showed better daily gains as compared to ewe lambs. Daily gains in body mass of lambs from single births in relation to average daily gains of lambs from twin births were similar. Lambs from single births in the periods from 21st to 42nd day and from 42nd to 63rd day of breeding were characterized by significantly ( $P \leq 0.01$ ) higher average daily gains in relation to peers.

Table 3. Results of ewes reproduction and rearing their offspring over 2004–2006

Tabela 3. Wyniki rozrodu maciorek i odchowu ich potomstwa w latach 2004–2006

Specification Wyszczególnienie	Year Rok			Mean value over 2004–2006 Średnia wartość za lata 2004–2006	
	2004	2005	2006	$\bar{x}$	
Number of cover ewes Liczba maciorek stanowiących	110	79	72	87	
Number of lambing ewes Liczba maciorek wykończonych	91	59	55	68	
Litter size Liczba jagniąt w miocie	124	88	62	91	
Sex of lambs Płeć jagniąt	ram lambs tryczki	56	42	31	86
	ewe lambs jarki	68	46	31	48
Number of reading lambs till 75 day Liczba odchowanych jagniąt do 75. dnia	109	70	58	79	
Type of birth Typ urodzenia	singles pojedyncze	60	28	46	45
	twins bliźniacze	64	60	16	47
Fertility, % Płodność, %	82.7	74	76.5	78	
Prolificacy, % Plenność, %	119.7	122	107	116	
Lambs reading, % Odchów jagniąt, %	86	80	93	86	
Total mortality of lambs, % Upadki jagniąt ogółem, %	12.1	20.5	6.5	13	

The correct raising of lambs has a very strong impact on their productivity during adult age, and in the case of animals intended for fattening, it is decisive for its effectiveness, measured by daily gains in body mass and the use of feed.

## CONCLUSIONS

On the basis of conducted research, it should be concluded that results of reproduction of the assessed ewes, breed: black-headed, in 2004–2006, shaped at a generally high level. This is proven by a high average ratio of prolificacy (133.8%), good raising of lambs (86.8%) as well as a good ratio of reproduction utility (90.8%).

On the basis of the conducted analysis of average mass body and average daily gains in the period 2005/2006 and 2006/2007, it was stated that any obtained results remained

at a constant level, both in the group of ram lambs and ewe lambs, and lambs from single and twin births. An exception were daily gains in the period from 21st to 42nd day of raising, when lambs from twin pregnancies obtained substantially ( $P \leq 0.01$ ) higher daily gains of 146 g, as compared to lambs from single pregnancies of 327 g). It indicates a good growth rate of the assessed animals and a proper manner of their maintenance.

A further improvement in results of reproduction of mothers and growth in their offspring, keeping, at the same time, the present direction of breeding, should be traced back to improvement in environmental conditions.

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### **POZIOM CECH ROZRODU MACIOREK RASY CZARNOGLÓWKA ORAZ WZROSTU ICH POTOMSTWA**

**Streszczenie.** Badania przeprowadzono w owczarni zlokalizowanej w województwie pomorskim. Owce oceniono w zakresie cech rozrodu matek, odchovu i wzrostu ich potomstwa. Stado osiągnęło ogólnie wysoki poziom cech rozrodu, uzyskując wartości zbliżone dla tej rasy owiec podane przez Polski Związek Owczarski za lata 2005–2009. W badanym okresie średnia wartość wskaźnika płodności kształtowała się na poziomie – 78,2%, plenności – 133,8%, odchovu jagniąt – 86,8%, a średnia wartość wskaźnika użytkowości rozplodowej wynosiła 90,8%. Równie wysokie wartości obserwowano w zakresie wzrostu potomstwa ocenianych matek. Stwierdzono do 75. dnia życia, że masa ciała oraz dzienne przyrosty dobowe osobników z pojedynczego typu urodzenia były większe niż zwierząt z ciąży mnogich. Tryczki uzyskały większą masę ciała oraz większe przyrosty dobowe w porównaniu z jarkami w tym samym wieku.

**Słowa kluczowe:** czarnogłówka, odchów i wzrost jagniąt, użytkowość rozplodowa

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