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ANALYSIS OF THE EFFECT OF THE ORDER OF CALVING, CALF SEX AND MILK YIELD OF COWS ON GROWTH PARAMETERS OF LIMOUSIN CALVES

ANALIZA WPŁYWU KOLEJNOŚCI WYCIELENIA, PŁCI CIEŁĘCIA ORAZ MLECZNOŚCI MATEK NA WYNIKI PRODUKCYJNE CIEŁĄT RASY LIMOUSINE

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Streszczenie. Badania przeprowadzono w stadzie bydła rasy limousine w województwie zachodniopomorskim. Badaniami objęto 226 cieląt czystorasowych urodzonych w latach 2011–2014. Dane, dotyczące odchowu i płci cieląt, a także mleczości matek, zebrano z dokumentacji hodowlanej prowadzonej w gospodarstwie. Celem pracy była analiza wpływu kolejności wycielenia, płci cielęcia oraz mleczości matek na wyniki produkcyjne cieląt rasy limousine. Analiza wykazała istotny ($P \leq 0,05$, $P \leq 0,01$) wpływ kolejności wycielenia na masę ciała rodzających się cieląt. Cielęta pochodzące z pierwszego wycielenia charakteryzowały się istotnie mniejszą masą ciała (32,4 kg) po urodzeniu niż cielęta z kolejnych wycieleń (2–4) – wynosiła ona odpowiednio: 36,5, 37,3, 37,9 kg. W przypadku masy ciała po odsadzeniu w 210. dniu życia oraz w przyrostach dobowych stwierdzono różnice istotne ($P \leq 0,01$) pomiędzy buhajkami a jałówkami. Wskaźniki te kształtowały się u buhajków na poziomie odpowiednio: 267,3 kg i 1093,3 g, natomiast u jałówek na poziomie odpowiednio 256,3 kg i 1048,7 g. Odnotowano istotny wpływ mleczości matek na masę ciała oraz przyrosty dobowe cieląt. Cielęta, których matki charakteryzowały się wyższą wydajnością mleka (>2000 kg), uzyskały odpowiednio 268,3 kg masy ciała w 210 dniu życia oraz przyrosty dobowe sięgające 1000,5 g. Natomiast w grupie cieląt, których matki cechowały się niższą mleczością (1501–2000 kg), wskaźniki wynosiły odpowiednio 244,8 kg i 993,2 g.

Key words: calves, Limousin, milk yield of cows, growth parameters.

Słowa kluczowe: cielęta, limousine, mleczość matek, parametry wzrostu.

INTRODUCTION

The most numerous beef breed in Poland as in previous years is Limousin (71.24% of total beef cattle in 2014). The next places are occupied by: Charolais, Hereford, Red Angus, Black Angus and Simmental (PZHiPBM 2014). Limousin breed is most commonly used for cross-breeding with other beef and dairy cattle. Unquestionable advantages of this breed are very good fertility, ease calving, good maternity qualities and good milk yield. Many factors have an impact on normal growth and rearing of calves, among others: course of cows'

parturitions, calf sex, age and genotype of the mother and management systems. In addition, that beef cattle and its crossbreeds are using grazing lands very effectively, both in lowlands and mountainous and they also are fattening very well in indoor livestock farming (Trela and Choroszy 2011).

In beef cattle herds it could be observed some regularities for that kind livestock farming, as keeping calves with their mothers for about 6 months or longer, seasonal insemination and calving, a small proportion of concentrated feedingstuffs or using permanent grassland, which significantly reduces costs (Litwińczuk et al. 2001). These factors and climatic conditions prevailing in Poland allowed for keeping cattle outside throughout the year or for most of the year (Makulska and Węglarz 2003).

Profitability of breeding beef cattle is associated with obtaining from healthy cows normal and healthy calves. This is the reason of systematic improvement of calves rearing indicators and reproductive parameters of cows are economic importance (Szabó et al. 2006; Wójcik and Bilik 2008; Kotnik et al. 2009).

The aim of this work was to analyze the effect of order of calving, calf sex and milk yield of cows on growth parameters of Limousin calves.

MATERIAL AND METHODS

The study was taken in the farm located in West Pomerania province where Limousin cattle were bred. Herd is consisted of 150 individuals, of which 79 are the cows. The study included a total of 226 Limousin calves in purity of breed, which were born between 2011–2014. Data relating to the rearing of calves were obtained from breeding documentation carried out on the farm by the Polish Beef Breeders and Producers Association. The data comprised the following information: live body weight of calves at birth [kg], on day 210 of life (weaning weight) [kg] and daily gain [g], cows' milking, calf sex. Estimations were made of the effect on the body weight and daily body gain of calves of the following factors: order of calving (1, 2, 3, 4), calf sex (heifers and bulls) and milking of cows (1501–2000 kg, > 2000 kg). The material was analyzed statistically using Statistica®10 PL (StatSoft, Inc. 2011) software. The one-way analysis of variance was used and the significance of differences between the group means was determined with the Duncan's test.

RESULTS AND DISCUSSION

Table 1 describes the results of calves rearing depending on the order of calving and calf sex. Analysis showed significant ($P \leq 0.05$, $P \leq 0.01$) impact of subsequent calving on birth weight of calves. Calves born at first calving achieved a significantly lower birth weight (32.4 kg) than calves born further (2–4) (respectively: 36.5, 37.3, 37.9 kg). In Krzywda et al. (2002) study birth weight of Limousin calves at first calving was greater about 6.2 kg than in examined herd.

Table 1. Analysis of the effect of the order of calving and calf sex on production traits of Limousin calves
 Tabela 1. Analiza wpływu kolejności wycielenia oraz płci cielęcia na cechy produkcyjne cieląt rasy limousine

Trait Cecha	n	Order of calving Kolejność wycielenia				Calf sex Płeć cielęcia	
		1	2	3	4	bulls buhajki	heifers cieliczki
Birth weight Masa urodzeniowa [kg]	\bar{x} SD	32.4 ^{ABC} 2.9	36.5 ^{ACa} 2.2	37.3 ^B 1.9	37.9 ^{Ca} 2.01	36.9 3.3	36.1 2.9
Weaning weight Masa ciała po odsadzeniu [kg]	\bar{x} SD	262.3 21.9	264.1 14.2	261.6 15.9	259.6 14.8	267.3 ^A 19.2	256.3 ^A 11.3
Daily gain, Przyrost dobowy [g]	\bar{x} SD	1086.8 69.9	1083.1 67.3	1068.2 75	1055.2 68.02	1093.3 ^A 79.5	1048.7 ^A 52.02

a – differences significant at $P \leq 0.05$ – różnice istotne na poziomie $P \leq 0,05$.

A, B, C – differences significant at $P \leq 0.01$ – różnice istotne na poziomie $P \leq 0,01$.

In own study there was no significant impact of calving order on weaning weight. Weaning weight of calves from all four calving were on the same level, but the greatest weaning weight received calves from second calving (264.1 kg). In Pilarczyk et al. (2011) studies the highest weaning weight also was found in Aberdeen Angus calves from the second calving (237.1 kg).

The highest daily gains were obtained by calves from first calving (1086.8 g) while Pilarczyk et al. (2011) reported that the highest daily gains were obtained by calves from second calving (967 g). In own study there was no significant effect of calving order on daily gains. According to Przysucha et al. (2002a) daily gains are dependent on birth weight of calves. Higher birth weights can result in higher daily gains of calves during their rearing, particularly birth weight exceeding 40 kg. The lowest value of daily gains was recorded in the groups of calves whose birth weight did not exceed 30 kg.

Analyzing calf sex it was found that heifers were characterized by a lower average birth weight about 3.1 kg compared to the results of Przysucha and Grodzki (2007). Calf sex is the trait that determines the body weight during calving. Typically birth weights of bulls is higher in comparison with heifers as a result of longer pregnancy in case of bulls (Makulska and Węglarz 2003; Czerniawska et al. 2015). In own study mean birth weight of bulls was 36.9 kg. Much higher birth weight of Limousin bulls was recorded by Krzywda et al. (2002) (46.5 kg). Different results were obtained by Wróblewska et al. (2007). The researchers reported that average birth weight of bulls was 33.42 kg.

Significant differences ($P \leq 0.01$) were found between bulls and heifers in case of weaning weight and daily gain. In Pilarczyk et al. (2010) work the highest weaning weight and daily gain were found in pure-bred bulls (respectively 259.2 kg and 1048 g) while in analyzed work the results were higher for bulls (respectively 267.3 kg and 1093.3 g). According to Przysucha and Grodzki (2007) daily gains of bulls ranging above 900 g are very beneficial, because after a short complementary fattening animals could be sold for export at body weight approximately 300 kg or intended for intensive fattening.

Significant differences were found between groups analyzing the impact of milk yield of cows (1501–2000 kg, > 2000 kg) on weaning weight and daily gains (Table 2). The highest weaning weight and daily gain achieved calves whose mothers characterized by higher milk yield (> 2000 kg) (respectively 268.3 kg, 1000.5 g). However, in the group of calves whose mothers milk yield was between 1501 and 2000 kg were respectively 244.8 kg and 993.2 g. On direct relationship between milk yield of mothers with calves rearing results also indicate Przysucha et al. (2002b).

Table 2. The impact of cows' milking on weaning weight and daily gain of Limousine calves
Tabela 2. Wpływ mleczności matek na masę ciała cieląt rasy limousine w 210 dniu oraz na ich przyrosty dobowe

Trait Cecha		Cows' milking Mleczność matki [kg]	
		1501-2000	> 2000
Weaning weight Masa ciała po odsadzeniu [kg]	\bar{x} SD	244.8 4.9	268.3 14.6
Daily gain Przyrost dobowy [g]	\bar{x} SD	993.2 27.5	1100.5 57.5

CONCLUSIONS

Summing up the results of this study it should be pointed to a significant effect ($P \leq 0.05$, $P \leq 0.01$) subsequent calving on the birth weight of calves, but there was no relationship between the subsequent calving and weaning weight and daily gains. Results confirmed the differences in weaning weight and daily gains ($P \leq 0.01$) between bulls and heifers. Bulls in both factors were characterized by better results.

In the tested herd analysis of Limousin calves rearing born between 2011 and 2014 showed upward trends in birth weight of calves with the next calving and high daily gains of calves. These results may indicate a positive changes in environmental and nutritional conditions. Consequently, it is expected to further improve the economics of beef cattle breeding based on pure-bred Limousin cattle.

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Abstract. The study was taken in the farm located in West Pomerania province where Limousine cattle in purity of breed were kept. The study included a total of 226 Limousine calves in purity of breed, which were born between 2011 and 2014. Data relating to the rearing of calves were obtained from breeding documentation carried out on the farm. Aim of work was to analyze the effect of order of calving, calf sex and milk yield of cows on growth parameters of Limousin calves. Analysis showed a significant ($P \leq 0.05$, $P \leq 0.01$) impact of subsequent calving on birth weight of calves. Calves born in the first calving achieved a significantly lower birth weight (32.4 kg) than calves born in next calving (2–4) (respectively, 36.5 kg, 37.3 kg, 37.9 kg). In the case of weaning weight and daily gains were found significant differences ($P \leq 0.01$) between bulls and heifers. These factors in bulls were: 267.3 kg and 1093.3 g, while in heifers, respectively, 256.3 kg, 1048.7 g. There has been a significant impact of milk yield of cows on weaning weight and daily gains of calves. Calves whose mothers were characterized by higher milk yield (> 2000 kg) gained respectively 268.3 kg weaning weight and daily gain 1000.5 g. In the group of calves whose mothers were characterized by a lower milk yield (1501–2000 kg), these factors were respectively 244.8 kg and 993.2 g.

