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COMPARISON OF LIMOUSIN AND SIMMENTAL PRIMIPAROUS COWS BASED ON THE VARIABILITY OF AGE AT FIRST CALVING, BODY WEIGHT AND THE ANALYSIS OF THEIR GROWTH AND DEVELOPMENT

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ABSTRACT

The aim of this study was to compare Limousin (195) and Simmental (326) primiparous cows based on the variability of age at first calving and body weight as well as to compare some fertility indices, lactation yield and selected zoometric measurements. The research was conducted on the farm located in the West Pomerania Province. Limousin primiparous cows had a significantly higher ($P \leq 0.05$) body weight than did Simmentals. Limousin individuals were characterized by a later age at first calving ($P \leq 0.01$). Calving interval (CI) was significantly ($P \leq 0.01$) shorter in Simmental females. Simmental animals were characterized by a significantly ($P \leq 0.01$) higher estimated lactation yield as well as significantly ($P \leq 0.01$) higher values of zoometric parameters (hip height and chest girth) compared with Limousin primiparous cows.

Key words: Limousin, Simmental, body weight, calving interval, age at first calving, zoometric measurements

INTRODUCTION

One of the basic goals of beef cattle breeding is obtaining a large number of well-reared and well-muscled calves. To achieve this, good fertility of cows and their high milk production should be combined, which, consequently, may improve economic and breeding indices. The most important reproduction indices include the date of first breeding, whereas age and body weight are the criterions qualifying heifers for reproduction. Determination of the optimal breeding date for beef heifers is of fundamental importance, since premature or too late beginning of reproduction in cows has a negative effect on their further utilization and economic results [1, 11].

The aim of this study was the evaluation of the variability of age at first calving and body weight as well as comparison of some fertility indices, lactation yield and selected zoometric measurements of the studied animals.

MATERIAL AND METHODS

The study (2008-2009) was conducted in the West Pomerania Province at the Witkowo Farming Cooperatives. The research material consisted of Limousin (195 individuals) and Simmental (326 individuals) beef cattle.

The housing system on the farm was based on keeping the animals without livestock buildings all the year round.

Summer feeding was entirely based on green forage ingested from the good pasture. Cows with their calves started grazing in May and stayed on the pasture until the end of October. In winter, the diet consisted of maize and grass silage, haylage and hay supplemented with minerals and vitamins. Calving cows were additionally fed the B-1 concentrate mixture. The animals had permanent access to water, whereas feed was given directly on a raised feeding place.

The service period in beef cattle herds was based on the group mating and artificial insemination and began between February 1 and June 15 in order to obtain seasonality of calvings. Calvings occurred from November to March each year. The calves were weaned at the age of 7.5–8 months. Cows and heifers underwent oestrus synchronization; artificial insemination was performed in approximately 50% of all animals in February and March each year. There were approximately 20 cows per one bull in a group mating system.

In the present study, the variability of age at first calving (AFC, [days]), calving interval (CI, [days]), heifer cows' body weight [kg], lactation yield [kg] (Journal of Laws 47 1999), hip height [cm], as well as chest girth in Limousin and Simmental breeds were evaluated. The lactation yield of beef cows was calculated based on the following formula:

$$ELY = (ABW * 1700) / AAW \text{ (Journal of Laws 47 1999),}$$

where: ELY – estimated lactation yield of calving, ABW – actual body weight of calf at weaning, AAW – actual age of calf at weaning.

The data were analyzed using MS Office Excel software. The obtained results are presented in tables and figures. Mean values (\bar{x}), standard deviation (S), minimum (Min) and maximum (Max) values as well as coefficient of variation (V%) were calculated. The significance of differences was verified using one-way analysis of variance and Duncan's multiple range test by means of Statistica®9 PL software.

RESULTS AND DISCUSSION

As can be seen in Fig. 1, most animals had the body weight at first calving ranging between 551 kg and 575 kg for both analysed breeds. In both populations, the proportion of primiparous cows with the body weight of less than 525 kg and over 600 kg was the smallest.

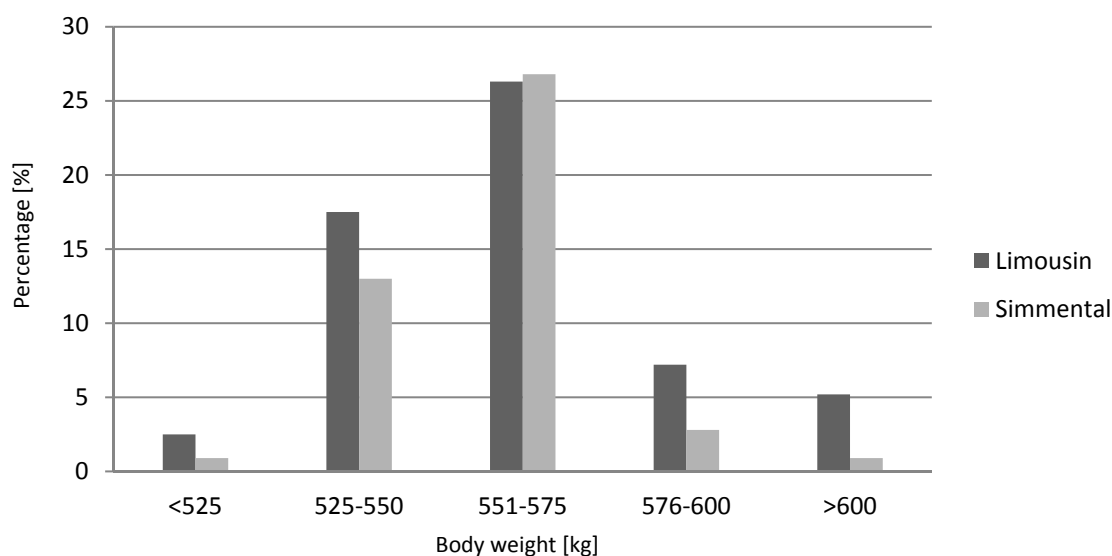


Fig. 1. The distribution of body weight of Limousin and Simmental primiparous cows

Oder research receive Pogorzelska et al. [8], the body weight of Limousin heifers at first calving ranged from 500 to 540 kg. Trela and Jodko [13] report that the body weight at calving for heifers imported from France was 420 – 630 kg, whereas Stanek [11] found that most Limousin primiparous cows had the body weight of 400–600 kg. High variability of body weight in beef cows was observed by Przysucha et al. [10]. These authors showed that the body weight ranged from 326 kg to 990 kg.

Age in connection with body weight and body conformation of cows is one of the factors affecting the course of calving. Age at first calving (AFC) is a direct consequence of the moment of starting reproduction in heifers. The measure is the level of their development, most often expressed as the appropriate body weight gained at a given age. Premature breeding of heifers delays the overall development of an organism, whereas a too late one leads to overconditioning, which in both cases results in calving difficulties [5,2,9].

The variability of age at first calving (AFC) in Limousin and Simmental primiparous cows is presented in Fig. 2. The analysis of data shows that the first calvings in Limousin primiparous cows occurred later than those in Simmentals. Simmental individuals calved most frequently at 33.1 to 34 months of age, whereas animals in the Limousine population calved at 35.1 to 36 months of age. In both analysed herds, calvings occurring at 29.1 to 31 months of age and those occurring at 39.1 to 40 months of age were the least frequent.

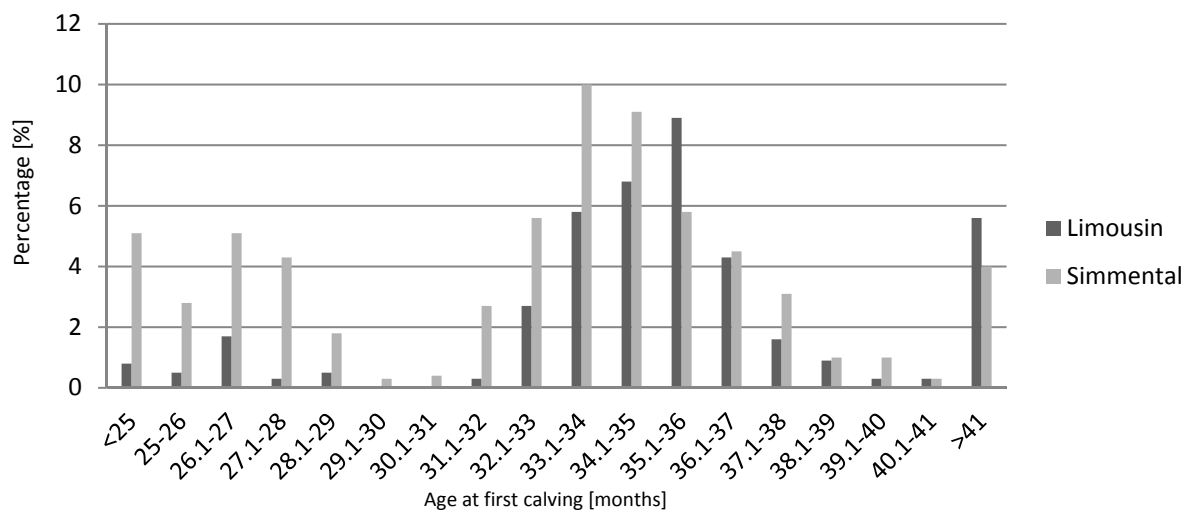


Fig. 2. The distribution of age at first calving in Limousin and Simmental primiparous cows

Somewhat different results were obtained by Stanek [11]. This author found that most females in the herd of Limousin primiparous cows calved for the first time at 23 to 26 months of age. The cited author observed at the same time that the next large percentage of calvings comprised those that occurred at 28 – 33 months of age. Calvings occurring at the ages of over three years and less than 23 months accounted for the marginal part of all calvings in the heifer herd.

Stanek [11] obtained a calving pattern analysing the animal population in Hereford herd. According to this author, most animals calved before the age of 26 months, whereas a definite minority calved at 28 to 30 months of age.

Litwińczuk et al. [4] conducting similar research and taking into account calving season showed that the age at first calving in beef heifers ranged between 27 and 29 months of age.

Body weight and body measurements as well as pelvic area are directly associated with the course of parturition. Heavier cows, with greater hip height and chest girth usually have fewer calving difficulties [6,7,14,10].

In Table 1 are presented the body weight and zoometric measurements of beef heifers, which indicate that Limousin primiparous cows had 3.58 kg higher body weight than did Simmentals. The observed differences were statistically significant ($P \leq 0.05$). Similar results were obtained by Przysucha et al. [10]. The cited authors found that Limousin animals had a higher body weight than did Hereford cows ($P \leq 0.01$). Different results were recorded by Stanek [11], who observed a higher body weight of Hereford cows compared with Limousin breed. In another study in this field, Wójcik et al. [15] showed that Limousin cows were characterized by a highly significantly lower body weight compared with Charolais individuals.

Table 1. The comparison of body weight and some zoometrical measurements in beef primiparous cows

Parameters	Limousin						Simmental					
	n	\bar{x}	Min.	Max.	S	V%	n	\bar{x}	Min.	Max.	S	V%
Body weight (kg)	195	586,79 ^a	540	650	21,91	3,73	326	583,21 ^b	550	670	14,96	2,56
Hip height (cm)	195	135,62 ^A	129	142	2,53	1,86	326	140,25 ^B	134	148	3,17	2,26
Chest girth (cm)	195	194,07 ^A	186	201	3,92	2,02	326	198,61 ^B	191	209	5,03	2,53

A, B – different letters show significance at $P \leq 0.01$
a, b – different letters show significance at $P \leq 0.05$

The present study (Table 1) indicates that Simmental cows were characterized by a significantly greater body size (hip height and chest girth) compared with Limousin cows ($P \leq 0.01$), whereas Przysucha et al. [10] found that Limousin animals had a greater hip height and chest girth compared with Hereford breed. This was confirmed by Stanek [12].

Litwińczuk et al. [3] analysed the body size of Limousin and Hereford primiparous cows in respect of an age at first calving. They found that the mean height at withers in Limousin heifers was higher than that in Herefords.

According to Przysucha and Grodzki [9], Limousin primiparous cows should calve at 24 months of age. This leads to a considerable reduction in rearing costs, facilitates obtaining annual production cycle and reproduction management (maintaining preferred calving seasonality). On the other hand, the first calvings of Simmental primiparous cows should occur at 26 to 28 months of age.

The present study (Table 2) shows that Limousin primiparous cows calved for the first time at 1082 days (34 months), whereas Simmentals calved at 996 days (32 months). The differences between the studied groups of animals were significant ($P \leq 0.01$). Similar results were obtained by Przysucha and Grodzki [9]. The cited authors reported that the heifers of both breeds (Limousin and Simmental) calved for the first time at the age of over 31 months.

Table 2. The comparison of selected fertility indices and lactation yield of beef cows

Parameters	Limousin						Simmental					
	n	\bar{x}	Min.	Max.	S	V%	n	\bar{x}	Min.	Max.	S	V%
Age at first calving (days)	195	1082 ^A	708	1890	177,21	16,37	326	996,91 ^B	448	2167	221,06	22,17
Calving interval (days)	195	457 ^A	308	1103	163,13	35,69	326	391,85 ^B	188	1065	100,60	25,67
Lactation yield (kg)	195	2011 ^A	733	2587	208,23	10,36	326	2312,78 ^B	848	2991	216,48	9,36

A, B – different letters show significance at $P \leq 0.01$

When comparing the mean calving intervals (CI) of primiparous cows from both analysed groups, it was found that Simmental individuals were characterized by a shorter CI compared with Limousins. These differences were significant ($P \leq 0.01$). Voriskova et al. [16] obtained different results. According to these authors, Limousin cows had shorter calving intervals than did Simmentals.

Wierzbowski and Żukowski [17] state that calving interval should correspond to the natural course of reproductive processes and last for approx. 12 months.

According to these authors, physiological “competitiveness” exists between fertility and lactation yield. A decrease in reproductive indices is associated with a lower milk yield in females. The authors emphasize that this, in turn, adversely affects rearing of calves. Based on Table 2, it was found that Simmental primiparous cows were characterized by more favourable reproductive parameters and a higher lactation yield (2313 kg), whereas Limousin females had a less favourable age at first calving and calving interval as well as lower milk yield (2011 kg). The differences between lactation yields in both analysed animal groups were significant ($P \leq 0.01$).

SUMMARY

In the analysed cow breeds, most animals gained the body weight at first calving of 550-575 kg. In both populations, the proportion of primiparous cows with the body weight of less than 525 kg and over 600 kg was the smallest, whereas the mean body weight was significantly higher ($P \leq 0.05$) in Limousin primiparous cows.

In Limousin, first calvings occurred later than those in Simmentals. The differences were significant ($P \leq 0.01$). Calving interval (CI) was significantly ($P \leq 0.01$) shorter in Simmental females. Simmental animals were characterized by a significantly ($P \leq 0.01$) higher estimated lactation yield and significantly ($P \leq 0.01$) higher values of zoometric parameters (hip height and chest girth) compared with Limousin primiparous cows.

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