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## **EFFECT OF THE AGE AT FIRST CALVING ON MILK PERFORMANCE IN SIMENTAL COWS**

## **WPŁYW WIEKU PIERWSZEGO WYCIELENIA NA PRODUKCYJNOŚĆ MLECZNĄ KRÓW RASY SIMENTALER**

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**Streszczenie.** Badaniami objęto 88 krów rasy simentaler, które utrzymywane były w gospodarstwie na terenie województwa zachodniopomorskiego. Oszacowano wpływ wieku w dniu pierwszego wycielenia na produktywność w kolejnych trzech 305-dniowych laktacjach. Najwyższą wydajności mleka, tłuszczu i białka w laktacji trzeciej charakteryzowały się krowy, których WPW przypadał na 26–29 miesięcy, a w laktacji pierwszej i drugiej <26 miesięcy. Największą zawartość tłuszczu i białka stwierdzono w mleku krów najpóźniej wycielonych – po 29. miesiącu życia. Nie stwierdzono jednoznacznych zależności między wiekiem pierwszego wycielenia a badanymi cechami mleczności w laktacjach.

**Key words:** age at first calving, milk performance of cows, Simental.

**Słowa kluczowe:** produktywność krów, simentale, wiek pierwszego wycielenia.

### **INTRODUCTION**

Research conducted in the USA (Lucy 2001, Washburn et al. 2002) on the beginning of 20th century about reproductive efficiency have shown merit of concerns about the decline in fertility of HF cows. There have been observed significantly longer calving interval and increase number of breeding for lactation. Declines in reproductive efficiency reduces the percentage of animals that are at peak of production, which leads to poor performance of the herd. Poor reproductive increases the cost of breeding and leads to culling. Unsatisfactory reproductive efficiency is the primary reason of culling in each of the three lactation (Norman et al. 2007).

Declines in reproductive efficiency in dairy cattle are not only occurring in the USA. In Poland breeders are faced with the same problems. Constant selection for increased milk production has been very successful, but it began to cause shortening of useful life of cows, poor reproductive efficiency and problems with udder's health.

An important factor which influence on fertility, length of useful life and milk performance is the age of the first calving (Brzozowski et al. 2001). The appropriate choice of the first breeding time shortens the unproductive period, influences on length of time maintaining cows in the herd, and even reduces the occurrence of hard parturitions.

Many authors (Juszczak et al. 2001, Sitkowska et al. 2009, Nałęcz-Tarwacka et al. 2011, Salazar-Carranza et al. 2014) have tried to determine the optimal age of the first calving and its relationship with milk performance of dairy cows. However, there is lack of consistent and unambiguous guidelines in the conclusions about the appropriate time of reproductive inception of dairy cows and its effect on milk performance.

The aim of the work was to determine the effect of the age at first calving on milk performance of Simmental cows in the first, second and third 305-day lactation in one of the farms of West Pomerania.

## MATERIAL AND METHODS

The study was taken in the farm specializing in milk production located in West Pomerania province with 120 Simmental dairy cattle. The animals were kept in loose housing barns and fed TMR system.

The study included 88 individuals that in 2008–2014 were kept in a analyzed herd and completed third lactation. Data on milk performance, milk fat and protein yield, and fat and protein content and the age of first calving – AFC were obtained on the basis of the farm breeding documentation run by Polish Federation of Cattle Breeders and Dairy Farmers. The cows were classified into three groups in respect of the age of the first calving (I – <26.0, II – 26.0–29.0, III – >29.0).

Based on collected data the effect of the age of first calving on milk performance of cows in three following 305-day lactations was determined. The significance of differences between the groups means was determined using Tukey's test for unequal frequencies. The material analyzed statistically using the program Statistica®10 PL (StatSoft, Inc. 2011).

## RESULTS AND DISCUSSION

The highest milk, fat and protein yield and fat content in the first and second lactation was characteristic for cows calving under the 26 month of age. In the third lactation the highest milk, fat and protein yield was characteristic for cows calving between 26 and 29 month of age (respectively 7963 kg, 328 kg and 278 kg). Which calved late – after the age 29 months. In each lactation significant difference between mean value of fat yield for cows calved under the 26 months of age and between 26 and 29 month of age was observed ( $P \leq 0.05$ ). In terms of the protein content in the milk of cows the highest results were obtained by cows which calved late – after 29 months of age in all three lactations (respectively 3.46, 3.55 and 3.60%) and the highest fat content was also found in the milk of cows which calved late - after 29 months of age in the third lactation (4.18%) (Table 1).

Similar to our study the highest milk yield according to Sitkowska et al. (2009) was obtained by cows between 26 and 28 month of age in the 1st lactation and between 24 and 26 month of age in the 2nd lactation. Bilik (2001) reported that AFC between 26 and 29 month of age did not effect significantly on milk yield of cows in 1st lactation. Hare et al. (2006) stated that almost half of heifers in the USA calved for the first time between 23 and 27

month of age. In countries where cattle breeding and milk production is at a high level, we can observe the lowering of the age of first calving. Also in Poland, it can be observed that the average AFC in 2014 was 27.4 months (Polish Federation of Cattle Breeders and Dairy Farmers 2014). Currently in the USA in breeding programs the goal is that AFC was approximately 24 months (Pirlo et al. 2000). This is confirmed by Nilforooshan and Edriss research (2004), who found that the optimal age at first calving fluctuates between 23 and 25 months of age. In contrast, as optimal for the PHF cows age at first calving is considered between 24 and 27 month of age (Nałęcz-Tarwacka et al. 2011). Teke and Murat (2013) as the optimal age at first calving for Turkish hf cows reported 23 months of age, then the cows gained maximum milk yield in the first lactation. In contrast, Salazar-Carranza et al. (2014) found a significant effect of the age at first calving on milk performance of cows in the first lactation and reported that shortening of the AFC had a negative impact on the milk performance. The highest milk yield was observed for cows calving for the first time at the 33.6 months of age. Curran et al. (2013) reported that the age of first calving between 21 and 22 month of age was favorable for some of the analyzed farms, but can not be given as an universal age of first calving for all lifestocks.

Table 1. Milk yield and composition in three consecutive 305-days lactation of SM cows depending on the effect of age at first calving

Tabela 1. Wydajność i skład mleka w trzech kolejnych laktacjach 305-dniowych krów rasy sm w zależności od wpływu wieku w dniu pierwszego wycielenia

Lactation Laktacja	Age at first calving [months] Wiek pierwszego wycielenia [miesiące]	n	Trait – Cecha				
			Milk Mleko [kg]	Fat Tłuszcz [kg]	Fat Tłuszcz [%]	Protein Białko [kg]	Protein Białko [%]
			$\bar{x}$ Sd	$\bar{x}$ Sd	$\bar{x}$ Sd	$\bar{x}$ Sd	$\bar{x}$ Sd
I	<26	42	6102 897.48	243 <sup>a</sup> 39.05	3.99 0.4	209 33.48	3.44 0.19
	26–29	42	5749 888.44	224 <sup>a</sup> 31.90	3.92 0.38	196 28.42	3.42 0.17
	>29	4	5131 450.67	199 29.52	3.87 0.32	178 20.28	3.46 0.11
II	<26	22	7172 850.33	288 <sup>b</sup> 37.0	4.04 0.49	250 29.78	3.49 0.19
	26–29	18	6514 956.95	254 <sup>b</sup> 29.51	3.94 0.47	230 34.4	3.53 0.21
	>29	2	6628 1247.34	252 9.90	3.86 0.57	235 36.77	3.55 0.11
III	<26	10	7087 926.07	272 <sup>c</sup> 41.34	3.85 0.44	249 30.02	3.52 0.18
	26–29	12	7963 1111.84	328 <sup>c</sup> 44.32	4.13 0.27	278 35.46	3.50 0.14
	>29	3	6999 1843.12	290 62.31	4.18 0.33	248 45.18	3.60 0.38

Explanations: a,b,c – statistically significant difference at  $P \leq 0.05$ .

Objaśnienia: a,b,c – różnice istotne na poziomie  $P \leq 0,05$ .

## CONCLUSIONS

The highest milk, fat and protein yield in the third lactation was characteristic for cows calving between 26 and 29 month of age. The highest fat and protein content was observed in the milk of cows in the third lactation which calved late – after the age 29 months.

No clear evidence was found between the AFC and milk performance traits in lactations in this study, so it can not to be stated one optimal time of started milk use of dairy cows in the examined herd.

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**Abstract.** The studies included 88 Simmental cows which were kept on farm in the West Pomerania province. The effect of age at first calving depending on milk performance in subsequent 305-day lactations were determined. The highest milk, fat and protein yield in third lactation was characteristic for the cows calving between 26 and 29 month of age, whereas in the first and second lactations – for cows calving below 26 month of age. The highest fat and protein content was observed in milk of cows which calved late – after the age 29 months. No clear dependence was found between the age of first calving and milk performance traits in lactations.

