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## COMPARISON OF MILK COMPOSITION DEPENDING ON SYSTEM OF MILKING

## PORÓWNANIE SKŁADU MLEKA KRÓW W ZALEŻNOŚCI OD SYSTEMU DOJU

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**Streszczenie:** Celem pracy była ocena jakości mleka krów rasy phf cb, pozyskiwanego w dwóch systemach doju mechanicznego: bańkowego i przewodowego w gospodarstwie rolnym na terenie województwa zachodniopomorskiego. W pracy wykorzystano wyniki z próbnymi udojów, przeprowadzonych metodą AT4, zebranych z dokumentacji hodowlanej i dokumentacji wynikowej systemu Symlek. Uwzględniono dane z poszczególnych miesięcy od września 2007 do października 2009 roku, dotyczące zawartości tłuszczu (%) i białka (%) oraz liczby komórek somatycznych (tys. · ml<sup>-1</sup>). Nie stwierdzono różnic istotnych w zawartości tłuszczu i białka (%) oraz w zawartości komórek somatycznych w mleku pomiędzy dwoma analizowanymi systemami udoju. Mleko pozyskiwane systemem bańkowym charakteryzowało się mniejszą liczbą komórek somatycznych (154,46 tys. · ml<sup>-1</sup>) w porównaniu z dojem przewodowym (173,19 tys. · ml<sup>-1</sup>).

**Key words:** contents of fat and protein, systems of milking.

**Słowa kluczowe:** systemy doju, zawartość tłuszczu i białka.

## INTRODUCTION

The milk is a food product, which is an indispensable nutrient source in the human diet. Only 14 g of the whey protein covered daily human demand for amino acids (Leman 2001). Whey protein also have the properties: immunoactive, antioxidant, antibacterial, antiviral and anti-cancer (McIntosh et al. 1998, Reklewska et al. 2003, Chatterton et al. 2006). Moreover, casein proteins are a rich source of calcium and phosphorus, and a biological value of casein proteins equals meat proteins and is much higher than the value of cereals and legumes proteins (Meisel 1998).

Referring to the above information should not be surprised that in 2011, demand for milk and its products has increased not only in the world but also in Poland, which contributed to the rise in prices (Sprawozdanie z działalności ARR w 2011 roku). Milk and dairy products will be enjoy constant popularity because of their the highest quality. According to Regulation of the Minister of Agriculture and Rural Development from 5.07.2002 total number of microorganisms in the 1 cm<sup>3</sup> of milk did not exceed 100 000 and the somatic cell count (SCC) in the 1 cm<sup>3</sup> of milk did not exceed 400 000.

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The suitability of milk for consumption and for processing is determined mainly by the quality of hygiene, which are determinants of the previously mentioned the total number of microorganisms and the somatic cell count (PN-A-86002:1995; European Union Directive 92/46 EEC). The number of somatic cells is influenced mainly by non-genetic factors. The variability of the number of somatic cells depends mainly on the health of the mammary gland, the breed of cows, their age and the time of lactation and their performance, the time of the year and the conditions hygiene of obtaining of milk (Kovacs et al. 2001, Fahr 2002, Guliński et al. 2002, Skrzypek 2002).

The aim of this work was to compare the quality of milk from Polish Holstein-Fresian var. Black-and-White cows depending on the system of milking.

## MATERIAL AND METHODS

Quality evaluation of the raw milk has been made on the basis of breeding and resulting documentation one of the farm, which is evaluated in the AT4 system and keeping 22 (the bucket milking)-25 (the pipeline milking) Polish Holstein-Fresian var. Black-and-White cows and is located in the West Pomerania. In this analysis included data concerning fat (%) and protein content (%) and the somatic cell count (SCC) (thousand · ml<sup>-1</sup>) from each month from September 2007 to October 2009.

Animals were fed and kept in the same environmental conditions, in the tie stall barn, used grazing in spring and summer time. Food doses were individually matched for each cow. Diet composition was as follows: maize silage, grass-hay silage, beetpulp, high-protein concentrates, rape seed extracted and soya middlings extracted, straw, hay, grinding grain. Enrichment additives of food doses were: fodder chalk, sodium bicarbonate, prefix of the buffer and yeast. In order to supplement the requirements of animals for minerals used salt licks. Cows during the first 40 days of lactation received a dose of glycerin as a supplement to energy.

Collected data were analyzed due to the milking system, ie the bucket (from September 2007 to September 2008) and the pipeline (October 2008 to October 2009).

The material analyzed statistically using StatSoft Inc. Statistica® ver. 10.0. Average values (and standard deviation (SD) were calculated and examined if there were any significant differences by Duncan's multiple range test.

## RESULTS AND DISCUSSION

Use of modern milking systems, such as milking parlor affects the quality of the milk produced. In a study by Barłowska et al. (2012) was examined that using a milking parlor achieved the highest milk fat and protein and high microbiological quality. But the cytology quality is getting worse. Each farm adapts system of milking to the size of the herd and the amount of received milk. In the analyzed farm the bucket milking was changed to pipeline milking due to the increase in the amount of milk produced and the number of cows to 25 animals. The somatic cell count in milk in both milking systems was not different significantly (somatic cell count for pipeline 173.19 thousand · ml<sup>-1</sup>, for bucket milking system 154.46 thousand · ml<sup>-1</sup>). Milk obtained in both milking systems were the extra class.

The farm which was analyzed is a typical family farm, where the number of cows not exceed 25 dairy cows. According to Gnyp et al. (2005) in a typical family farms where the number of cows was kept to 15 and 15 to 30 animals, owners and family members are more involved in work, surrounding animals of individual care, which allows for quick intervention in case the animal is sick. These farms are characterized by a high share of healthy cows (Gnyp et al. 2005). These factors could affect the quality of milk on the farm.

Content of fat and protein in milk did not significantly different and the content of fat and protein in milk was higher in the bucket milking was (respectively 4.19% and 3.18%) compared to pipeline (4.09% and 3.17%) (Table 1).

Table 1. The influence of the system of milking for fat, protein and somatic cell content  
Tabela 1. Wpływ systemu doju na zawartość w mleku tłuszczu, białka i komórek somatycznych

Specification Wyszczególnienie		System of milking System doju	
		Bucket Bańkowy	Pipeline Przewodowy
Number of samples Liczba prób		180	188
Fat (%) Tłuszcz (%)	$\bar{x}$ SD	4.19 0.58	4.09 0.63
Protein (%) Białko (%)	$\bar{x}$ SD	3.18 0.32	3.17 0.37
Somatic cell count (thousand · ml <sup>-1</sup> ) Liczba komórek somatycznych (tys. · ml <sup>-1</sup> )	$\bar{x}$ SD	154.46 129.72	173.19 150.73

A similar relationship in fat and protein content in the bucket milking was observed by Gnyp et al. (2006) (respectively 4.30% and 3.41%) compared to pipeline milking (respectively 4.28% and 3.40%). On the contrary Sablik et al. (1999) reported that the fat and protein in the pipeline milking (respectively 4.33% and 3.45%) was higher than in the bucket milking (respectively 4.11% and 3.49%). Also Stenzel et al. (2003) have found significant differences ( $p \leq 0.01$ ) in fat content between pipeline and bucket milking (4.33% and 4.15% respectively). Barłowska et al. (2012) have also noticed slight differences between the bucket and pipeline milking in fat and protein content. The authors reported that the fat and protein content in the bucket milking amounted to 4.06% and 3.27% and 4.07% and 3.26% in the pipeline respectively.

The suitability of milk for processing decide among others the somatic cell count (SCC). In the analyzed herd there was no significant difference in the somatic cells count between compared milking systems (bucket 154.46 thousand · ml<sup>-1</sup>, pipeline 173.19 thousand · ml<sup>-1</sup>). In the pipeline milking, which is more modern than bucket the somatic cells count was slightly higher. On the number of somatic cells count affected by non-genetic factors and its variability depends, among others on udder health condition, cows age, the lactation period, milk yield, milking frequency and hygienic conditions for obtaining milk (Sawa 2004, Czerniawska-Piątkowska et al. 2012). The authors pointed out that hygiene should be provided and maintained at all stages of obtaining milk and its preliminary processing in the barn to consequently obtain high-quality milk for further processing.

Barłowska et al. (2012) compared the manual milking to mechanical (bucket, pipeline, milk parlour). Authors have found that with more modern milking systems increase the number of somatic cells count in milk. The lowest number of somatic cell count they have found for manual milking 108.63 thousand  $\cdot \text{ml}^{-1}$  and successively for bucket 194.15 thousand  $\cdot \text{ml}^{-1}$ , pipeline 248.58 thousand  $\cdot \text{ml}^{-1}$  and milk parlour 251.91 thousand  $\cdot \text{ml}^{-1}$  ( $p \leq 0.01$ ). Similar in present study a lower SCC were found in the bucket milking than in the pipeline milking. Danków et al. (2004) analyzing the impact of the milking system the somatic cells count reported that the most of somatic cells count was found in milk obtaining in manual milking ( $p \leq 0.01$ ) and the cytological quality of milk obtained in farms equipped in pipeline and milk parlour was significantly higher ( $p \leq 0.01$ ) compared to milk from manual milking ( $p \leq 0.05$ ), in contrast to the results of Barłowska et al. (2012). However, Gnyp et al. (2006) have found the lowest somatic cell count in milk from pipeline milking 400 thousand  $\cdot \text{ml}^{-1}$ , while in the bucket 556 thousand  $\cdot \text{ml}^{-1}$  ( $p \leq 0.01$ ). Similar results were obtained by Sablik et al. (1999), Stenzel et al. (2003) and Sawa (2004).

## CONCLUSION

In the analyzed farm can not tell if the change of milking system (bucket into pipeline) had influenced on the quality of obtained milk. Results of fat and protein content were only slightly differ between examined milking systems and the somatic cell count was also slightly higher in the pipeline milking compared to bucket milking.

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**Abstract.** The aim of this work was to evaluate the quality of milk obtained diverse systems of milking: a bucket and a pipeline on a farm in the province of West Pomerania. In the analysis were used information from the milking tests made by AT4 method of breeding documentation. The data from each month from September 2007 to October 2009 concerning fat (%) and protein (%) content and somatic cell count (thousand  $\cdot$  ml<sup>-1</sup>) were considered. There were no significant differences in the content of fat and protein and the somatic cell count (SCC) in milk between these two systems of milking. The milk obtained from the bucket milking contained 154.46 thousand  $\cdot$  ml<sup>-1</sup> somatic cell count and the milk obtained from pipeline milking contained 173.19 thousand  $\cdot$  ml<sup>-1</sup> somatic cell count.

