

COMPARISON OF SELECTED PERFORMANCE CHARACTERISTICS OF PRIMIPAROUS MONTBÉLIARDE COWS IMPORTED AS IN-CALF HEIFERS FROM FRANCE AND THEIR DAUGHTERS BORN IN POLAND

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Abstract. The aim of the study was to compare selected performance characteristics of primiparous Montbéliarde cows imported as in-calf heifers from France (194 heifers) and their daughters born in Poland (93). The analysis took into account the level of culling during the first lactation, age at first calving, milk yield over 100 and 305 days of lactation and complete lactation, and changes in daily milk yield over the course of lactation. The analysis included 283 complete lactations and 3550 results of test-day milking carried out since 2006. The performance of the primiparous Montbéliarde cows imported from France as in-calf heifers was shown to be less favourable than that of their daughters born in Poland. In the imported heifers the level of culling after the first calving was higher (by 10.1%), milk production began significantly later (by 95 days) and lactations lasted longer (by 88 days). The home-bred cows also had more favourable indices for yield of milk (from 297 to 1535 kg, depending on the period of lactation), fat, protein, and dry matter, and their lactations were more persistent. It was determined that the acclimation process may have had a negative effect on the performance of the cows imported from France as in-calf heifers.

Key words: imported and home-bred primiparous cows, Montbéliarde, performance

INTRODUCTION

In mid-1995, in-calf Montbéliarde heifers were imported from France to a Polish farm for the first time. In subsequent years more of these animals were

brought in to other farms as well. In 1998, the average milk yield of this breed in Poland was 5153 kg of milk containing 4% fat and 3.4% protein [Trela 2003]. In subsequent years the population of Montbéliarde cows has systematically increased, as has their productivity. In 2013 the average yield of the 2428 Montbéliarde cows included in the use value assessment in Poland was 7224 kg of milk, with a good chemical composition (4.03% fat and 3.50% protein) [PFCB and DF 2014]. In comparison with the Holstein-Friesian breed, the milk of Montbéliarde cows contained more protein and fat and had a more beneficial ratio of these components [Gołębiewski and Brzozowski 2008, Januś et al. 2013]. Moreover, it had a higher food energy value, lower somatic cell count and greater stability of its basic components [Januś and Borkowska 2011]. The fertility of Montbéliarde cows is also high. The calving interval of this breed was 417 days, and the calving-to-conception interval 125 days. These indicators were less favourable in Polish Black-and-White Holstein-Friesians – 438 and 156 days, respectively, in 2013 [PFCB and DF 2014]. According to the domestic breeding programme for Montbéliarde cattle in Poland, breeding work should be carried out exclusively at the level of herds. All of the semen required for this is imported [PFCB and DF 2010].

Since 2005 Montbéliarde cattle have been kept on the MONTAGRO Sp. z o.o. farm in the Lublin Voivodeship. The herd has been systematically enlarged, first with imported animals, and since 2008 also with the female offspring of cows imported as in-calf heifers. In successive years the average milk yield of the cows on this farm has increased as well. The systematic increase in the number of Montbéliarde cows in Poland necessitates research concerning various aspects of the breed's performance.

The aim of the study was to compare selected performance characteristics of primiparous Montbéliarde cows imported as in-calf heifers from France and their daughters born in Poland.

MATERIAL AND METHODS

The study was carried out on the MONTAGRO Sp. z o.o. farm, which in 2013 kept a herd of 286 Montbéliarde cows with average yield of 9315 kg of milk [PFCB and DF 2014]. The animals were housed in a free-stall barn on deep litter and fed total mixed rations (TMR), the composition of which was balanced according to DLG norms. The feed ration was based on maize silage, haylage and hay. Concentrate feeds consisted of spent grain, barley (ground meal) and soybean and rapeseed meal. The feed mix was supplemented with vitamin and mineral additives and other nutritional supplements, the type and amount of which depended on the feeding group. The cows were divided into 6 groups according

to the stage after calving, their physiological condition, and their daily milk yield. They were milked twice a day in a side-by-side milking parlour (2×8).

The data constituting the basis for the study were obtained from RW-2 reports on milk performance evaluations (AT4 method) and from breeding documentation conducted on the farm. These were data pertaining to milk yield and chemical composition in 283 lactations and 3550 results of test-day milking carried out since 2006. The performance of primiparous cows imported from France as in-calf heifers (n = 194) was compared with that of their daughters born in Poland (n = 93). The analysis took into account yield over 100 and 305 days and over a complete lactation. Also calculated were age at first calving and the culling rate during the first lactation. On the basis of the results of test-day milking, daily FPCM (fat and protein corrected milk) yield was calculated for successive months of lactation (1, 2, 3, ... 10, 11–18 and >18) according to the following formula [Subnel et al. 1994]:

$$\text{FPCM (kg)} = [0.337 + 0.116 \times \text{fat (\%)} + 0.06 \times \text{protein (\%)}] \times \text{milk (kg)}$$

These results were used in a graphic presentation and characterization of the course of lactation in the imported primiparous cows and their daughters born in Poland.

Statistical analysis was performed using the statistical package SAS [SAS 2006]. The significance of differences between means calculated for the imported primiparous cows and their daughters born in Poland was estimated using Duncan's test (PROC GLM) at $P \leq 0.01$.

RESULTS AND DISCUSSION

Of the total of 287 primiparous cows, in 32 cases lactation did not end with drying out but with culling (Table 1). The culling rate was substantially higher (by 10.1%) in the primiparous cows imported as in-calf heifers than in those born in Poland. Of the 28 animals imported and culled after the first lactation, 25 (89.3%) were culled due to sterility, compared to only one of those born in Poland (25.0%). The higher culling rate among the imported cows in comparison with the home-bred cows may have been due to problems with acclimation. During the first 10 months of lactation a total of 8 cows were culled, which was 2.79% of the total number. A higher level of culling up to 305 days after calving was noted in the primiparous cows born in Poland (3.24%). It is noteworthy that in this group cows were culled during the first and second trimester after calving. Among the 194 primiparous cows imported as in-calf heifers, none was culled during the first trimester of lactation, and only one during the second 100 days after calving (0.52%).

This may have been due to the farm's breeding policy, according to which an effort was initially made to increase the number of cows, in part by limiting culling.

Table 1. Age at first calving of heifers born in France and in Poland, culling of primiparous cows and length of complete lactation

Tabela 1. Wiek przy pierwszym wycieleniu jałowic urodzonych we Francji i w Polsce, brakowanie pierwiastek oraz długość ich pełnej laktacji

Analysed parameters Badane parametry	Country of birth – Kraj urodzenia			
	France – Francja		Poland – Polska	
	\bar{x}	SD	\bar{x}	SD
Number of calved heifers – Liczba wycielonych jałowic	194	–	93	–
Number (%) of culled primiparous cows – Liczba (%) wybrakowanych pierwiastek including – w tym:	28 (14.4)		4 (4.3)	
– in 1st trimester of lactation – w I trymestrze laktacji	0 (0)		2 (2.16)	
– in 2nd trimester of lactation – w II trymestrze laktacji	1 (0.52)		1 (1.08)	
– >200 days of lactation – >200 dni laktacji	4 (2.06)		0	
– due to sterility (total) – z powodu jałowoci (łącznie)	25 (89.3)		1 (25.0)	
Age at first calving, days – Wiek przy I wycieleniu, dni	983 ^A	105	888 ^B	60
Number of lactations analysed – Liczba analizowanych laktacji	193	–	90	–
Length of complete lactation, days – Długość pełnej laktacji, dni	424 ^A	100	336 ^B	63

A, B – differences significant at $P \leq 0.01$.

A, B – różnice istotne przy $P \leq 0,01$.

In a study by Koç [2011], the age at first calving in Montbéliarde heifers was 952 days. According to Trela [2003], heifers of this breed imported from France calved for the first time at the age of 985 days. The primiparous cows imported to the MONTAGRO farm calved at a similar age (983 days). It is worth noting the high standard deviation (105 days), which on the one hand may indicate substantial differences in the age at which the cows began their reproductive lives in France, but on the other hand may suggest problems with impregnation. Milk production in the heifers born in Poland began 95 days earlier, as the mean age at first calving was 888 days. The difference between the groups was significant at $P \leq 0.01$. These data indicate that on the farm analysed the reproductive life of heifers begins earlier than in French herds. This is confirmed by PFCB and DF [2014] data, which indicate that the first calving in Montbéliarde heifers in Poland in 2013 occurred at the age of 873 days. Earlier calving in home-bred Holstein-Friesian heifers in comparison with imported ones has been reported by Skrzypek and Szukalski [2006] and Czerniawska-Piątkowska et al. [2009]. Nilforooshan and Edriss [2004], Krężel-Czopek and Sawa [2008] and Teke and Murat [2013] demonstrated that when milk production is begun too early (≤ 22 months) or too

late (particularly after 30 months), lifetime performance is substantially reduced; moreover, culling due to low milk yield and diseases of the udder increases.

The first complete lactation in the cows born in Poland was on average 88 days shorter than in their imported mothers. The difference between the means calculated for the two groups was significant at $P \leq 0.01$. Prolongation of lactation beyond the standard 305 may indicate problems with fertility. In the case of the imported cows, these disorders may have been linked to acclimation. A study by Sawa and Bogucki [2010] showed that when the first lactation was extended beyond 365 days, all performance indicators deteriorated, particularly fertility.

Irrespective of the period of lactation, significantly ($P \leq 0.01$) higher yield of milk, protein and dry matter were noted in the primiparous cows born in Poland (Table 2). These cows produced nearly 300 kg more milk than the imported ones in the first trimester after calving. The difference was 1535 kg in standard lactation

Table 2. Productivity in 1st lactation of cows imported from France as in-calf heifers and their daughters born in Poland

Tabela 2. Produkcyjność w I laktacji krów importowanych z Francji jako jałowice cielne oraz ich córek urodzonych w Polsce

Productivity during lactation Produkcyjność w okresie laktacji	Country of birth Kraj urodzenia	Yield, kg Wydajność, kg				kg of milk per day of lactation kg mleka na dzień laktacji	Content in milk, % Zawartość w mleku, %		
		milk mleka	fat tłuszczu	protein białka	dry matter suchej masy		fat tłuszczu	protein białka	dry matter suchej masy
In first 100 days W pierwszych 100 dniach	France – Francja	2 618 ^A	111	87 ^A	345 ^A	26.2 ^A	4.25 ^A	3.34 ^A	13.19
	Poland – Polska	2 915 ^B	118	100 ^B	383 ^B	29.1 ^B	4.03 ^B	3.47 ^B	13.16
305 days 305-dniowej	France – Francja	6 686 ^A	284 ^A	238 ^A	893 ^A	22.0 ^A	4.26 ^A	3.57	13.37 ^A
	Poland – Polska	8 221 ^B	325 ^B	295 ^B	1083 ^B	27.5 ^B	3.95 ^B	3.60	13.19 ^B
Complete Pełnej	France – Francja	8 120 ^A	346	292 ^A	1085 ^A	19.3 ^A	4.27 ^A	3.61	13.39 ^A
	Poland – Polska	8 988 ^B	357	325 ^B	1188 ^B	26.7 ^B	3.97 ^B	3.62	13.22 ^B

A, B – differences significant at $P \leq 0.01$.

A, B – różnice istotne przy $P \leq 0,01$.

and 868 kg for complete lactation (despite significant differences in lactation length). The differences in protein yield between groups were 13.57 and 33 kg, and in the case of dry matter, 38.19 and 103 kg, respectively. Milk yield per day of lactation in the imported cows was also significantly ($P \leq 0.01$) lower than in those born in Poland. In the first trimester of lactation daily yield was lower than in the home-bred cows by 2.9 kg, during standard lactation by 5.5 kg, and during complete lactation by 7.4 kg of milk. The lower productivity of the primiparous cows imported from France in comparison with their daughters born in Poland may have been due to acclimation problems. According to Trela [2003], however, Montbéliarde cattle imported from France to Poland adapt well after a longer pe-

riod spent in the new conditions. Acclimation problems resulting in lower milk yield in imported primiparous Holstein-Friesians in comparison with home-bred cows have been shown in other studies [Wroński et al. 2001, Kuczaj 2004, Kuczaj et al. 2008]. Borkowska and Januś [2001] and Skrzypek and Szukalski [2006] demonstrated that milk yield in primiparous cows imported from the Netherlands was not lower than in home-bred cows. These studies indicated the inexpediency of importing breeding material from Germany. Our own study found that the milk of primiparous cows born in Poland, in comparison with milk obtained from imported animals, contained significantly less fat (from 0.22 to 0.31%), and in standard and complete lactation had lower content of dry matter (by 0.17–0.18%). In the first trimester after calving the milk of imported primiparous cows contained significantly less protein.

One of the factors influencing milk yield in cows is the shape of lactation curves. Cows whose lactations are characterized as persistent produce more milk from calving to dry period. This applies to both total milk production during lactation and to successive test-day milking results [Borkowska 2005]. In the first month after calving, the imported and home-bred primiparous cows had similar FPCM (fat and protein corrected milk) yield (Fig. 1).

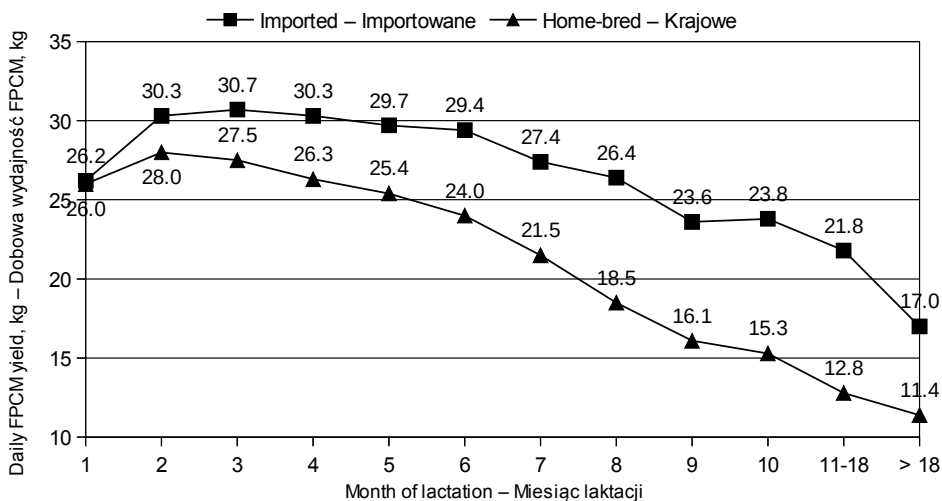


Fig. 1. Changes in daily yield of fat and protein corrected milk (FPCM) during lactation in primiparous Montbéliarde cows imported from France as in-calf heifers and their daughters born in Poland

Rys. 1. Zmiany dobowej wydajności FPCM w przebiegu laktacji pierwsiastek rasy montbéliarde importowanych jako jałowice cielne z Francji i ich córek urodzonych w Polsce

In the second month the milk yield of the cows born in Poland increased by 4.1 kg FPCM (13.5%) in comparison with the first month, but in the imported cows by only 2.0 kg (7.1%). Lactations of primiparous cows born in Poland were more persistent, as FPCM yield remained greater than 30 kg until the fourth month after calving. The yield of the cows imported as in-calf heifers was highest in the second month after calving, decreasing systematically in successive months until the end of lactation, and was significantly lower than in the cows born in Poland. In the analysis of the data in Figure 1 it is also noteworthy that the difference between the yield of primiparous cows born in Poland and that of imported cows increased systematically from 2.3 kg in the 2nd month to 8.5 kg FPCM in the 10th month after calving. From the peak of lactation the yield of the cows born in Poland decreased by 22.5%, and in the imported cows by as much as 45.4%. These results indicate greater persistence of the lactations of cows born and used in the same environmental conditions. These animals did not undergo an adaptation process. Different correlations were found in a study by Wroński et al. [2001], which showed more persistent lactations in imported primiparous Holstein-Friesians than in home-bred ones. These animals produced from 3.7 to 6.1 kg more milk per day from the 5th to the 10th month of lactation.

CONCLUSION

To sum up, the primiparous Montbéliarde cows imported from France as in-calf heifers had lower performance indicators than their daughters born in Poland. The culling rate after the first calving was higher in these cows, their milk production began significantly later (by 3 months) and their lactations lasted longer. The primiparous cows born in Poland also had better indices for yield of milk, fat, protein and dry matter, and their lactations were more persistent. The results indicate that the acclimation process may have had a negative effect on the performance of cows imported from France as in-calf heifers.

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PORÓWNANIE WYBRANYCH CECH UŻYTKOWOŚCI PIERWIASTEK RASY MONTBELIARDE IMPORTOWANYCH JAKO JAŁOWICE CIELNE Z FRANCJI ORAZ ICH CÓREK URODZONYCH W POLSCE

Streszczenie. Celem badań było porównanie wybranych cech użytkowości pierwiastek rasy montbeliarde importowanych jako jałowice cielne z Francji (194 krów) z ich córkami urodzonymi w Polsce (93 krów). Analizie poddano poziom brakowania w pierwszjej laktacji, wiek rozpoczynania użytkowania mlecznego, wydajność za 100, 305 dni i pełną laktację oraz zmiany w dobowej wydajności mleka w przebiegu laktacji. W badaniach uwzględniono 283 pełne laktacje oraz wyniki 3550 próbnych udojów przeprowadzonych od 2006 roku. Wykazano, że pierwiastki montbeliarde importowane z Francji jako jałowice cielne, w porównaniu z ich córkami urodzonymi w kraju, charakteryzowały się gorszą użytkowością. Wyższy był w przypadku tych zwierząt (o 10,1%) poziom brakowania po pierwszym wycieleniu, istotnie później (o 95 dni) rozpoczynano ich użytkowanie mleczne i dłużej trwały ich laktacje (o 88 dni). Pierwiastki krajowe uzyskiwały także korzystniejsze wskaźniki w zakresie wydajności mleka (w zależności od okresu laktacji od 297 do 1535 kg), tłuszczu, białka i suchej masy, a ich laktacje charakteryzowały się większą wytrzymałością. Stwierdzono, że proces aklimatyzacji mógł mieć negatywny wpływ na użytkowość krów importowanych jako jałowice cielne z Francji.

Słowa kluczowe: pierwiastki importowane i krajowe, rasa montbeliarde, użytkowość

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