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THE LEVEL OF SELECTED MILK PERFORMANCE TRAITS OF IMPORTED AND HOME-BRED MONTBÉLIARDE COWS BORN IN DIFFERENT SEASONS AND CALVING AT DIFFERENT AGES

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Abstract. The aim was to analyse milk performance traits of Montbéliarde cows imported from France as pregnant heifers and those born in Poland, taking into account season of birth and age at first calving. Daily yield, content of fat, protein and lactose, fat-to-protein ratio, and somatic cell count in milk were analysed. Born in Poland cows had higher daily milk yields and a better fat-to-protein ratio than cows imported from France. The latter produced milk with better chemical composition. In terms of daily yield, calving ages at 855–915 days were most beneficial in both imported and home-bred cows. Age at first calving had a greater effect on yield of born in Poland cows than on that of imported ones. In each range of age at first calving, higher fat and protein contents in the milk of imported cows as compared to cows born in Poland were noted. The somatic cell count in the milk may indicate somewhat better udder health in the born in Poland cows. In the case of both imported and home-bred cows, the spring/summer season of birth was associated with higher somatic cell count. In conclusion, the acclimatization process may have had a negative effect on the performance of cows imported as pregnant heifers from France.

Key words: Montbéliarde breed, imported and home-bred cows, milk performance, season of birth, age at first calving

INTRODUCTION

Recent years have seen growing interest the Montbéliarde breed of cattle in Poland. The breed's native country is France, where the largest population of these cattle is raised. It is a dual-purpose (meat and dairy) breed [Trela 2003]. The

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Montbéliarde breed was officially registered in 1889, but its history dates back to 1872. These cattle come from the Franche-Comté region situated in the continental climate zone. The breed is considered easy to raise. Cows are resistant to mastitis, fertile and long-lived, and calve easily. Moreover, they adapt quickly to new environment, tolerate severe climate conditions and heat waves, and can consume large quantities of roughage [The Montbéliarde breed 15.09.2016].

In the native country of Montbéliarde cattle, their population in 2015 was second in size after Holstein-Friesians. Milk performance assessment included nearly 440,000 cows, which was 17.2% of the active population, and their mean yield was 7079 kg of milk with 3.87% fat and 3.29% protein. Heifers first calved at the age of 33 months, which indicates a late-maturing breed. The mean calving interval for Montbéliarde cows assessed in France was 399 days, and became longer in successive calvings. Cattle of this breed can be considered long-lived, as cows that had calved five or more times accounted for 18.5% of assessed cows [Résultats de contrôle laitier... 2015].

Montbéliarde cows were brought into Poland from France in 1995, and in 2001 the Ministry of Agriculture and Rural Development authorized the opening and maintenance of herd books [Gołębiewski and Brzozowski 2009]. In 2008, use value assessment in Poland included 952 Montbéliarde cows with average yearly milk yield 7092 kg [Januś and Borkowska 2010]. During next four years, the active population of Montbéliarde cows in Poland increased nearly twofold. In 2015 there were 2839 cows subject to milk performance evaluation (0.38% of all cows assessed), and their mean yield was 7529 kg of milk with 3.95% fat and 3.51% protein [Polish Federation of Cattle Breeders and Dairy Farmers 2016]. Montbéliarde heifers reared in Poland calved earlier than those raised in France did. Their age at first calving was 888 days (29.1 months), i.e. only 66 days more than in the case of Polish Black-and-White Holstein-Friesians (822 days). The fertility of Montbéliarde cows can also be highly rated in terms of the length of the calving interval, which average lasted 420 days compared to 435 days for Polish Black-and-White Holstein-Friesians [Polish Federation of Cattle Breeders and Dairy Farmers 2016].

The aim of the study was to analyse milk performance traits of imported and born in Poland Montbéliarde cows, taking into account the season of birth and age at first calving.

MATERIAL AND METHODS

The study was conducted on the one of largest farms in Poland specialized in breeding of purebred Montbéliarde cattle. In 2015, the herd on the farm numbered

329 cows, with mean yield 9765 kg of milk [Polish Federation of Cattle Breeders and Dairy Farmers 2016], containing 3.49% fat and 3.57% protein.

The data for the study were obtained from RW-2 reports on the results of milk performance evaluations of cows and from breeding documentation conducted on the farm. The data consisted of 18,170 records of test-day milking (10,530 from imported cows and 7640 from cows born and reared in Poland) conducted since March 2008 to June 2015. The following were taken into account: daily milk yield, content of fat, protein and lactose in the milk (%), fat-to-protein ratio, and somatic cell count (in thous. $\cdot$ mL^{-1}). The date of birth of each cow and age at first calving were noted as well.

The test-day milking results were used to calculate the daily yield of FPCM (fat and protein corrected milk) according to the following formula [Subnel et al. 1994]:

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

The values for somatic cell count in the milk were converted to a natural logarithm in Excel software, as the trait does not meet the conditions for normal distribution.

Statistical analysis in StatSoft Inc. STATISTICA software ver. 6. [2003] was performed, and significance of differences between means was estimated using Duncan's test. The statistical model took into account the effect of the following factors on the traits analysed:

- origin of the cows-imported (born, reared and impregnated in France, imported to Poland as pregnant heifers) or home-bred (born and reared on the farm analysed);
- season of birth (spring/summer – March–August, autumn/winter – September–February);
- age at first calving ($\leq$ 854, 855–915, 916–1038 or $>$1038 days).

RESULTS AND DISCUSSION

The data in Table 1 show that the mean daily yield of the Montbéliarde cows was 29.7 kg of milk. Converted to FPCM, the yield was similar – 29.4 kg. The milk contained on average 3.67% fat, 3.51% protein and 4.81% lactose. As the Montbéliarde breed is characterized by high protein content, the fat/protein ratio was 1.05. Research carried out by other authors have shown that the milk of the Montbéliarde breed is more favorable by chemical composition than the milk of Polish Black-and-White Holstein-Friesians, the most popular breed in Poland [Trela 2003, Januś et al. 2013]. It contains significantly more fat (by 0.05 p.p.) and

protein (by 0.38 p.p.) [Januś et al. 2013], and has a more favourable fat/protein ratio [Gołębiewski and Brzozowski 2008, Barłowska et al. 2010, Januś et al. 2013]. The chemical composition of milk produced by Montbéliarde cows in France is comparable to that obtained from the Prim'Holstein breed [Résultats de contrôle laitier... 2015]. However, due to the specific character of the cows' diet, milk from Montbéliarde cows is largely used for production of long-ripened cheeses (such as Comté) [The Montbéliarde breed 15.09.2016].

Table 1. Daily yield, chemical composition and somatic cell count in milk of imported and home-bred Montbéliarde cows

Tabela 1. Dobowa wydajność, skład chemiczny oraz liczba komórek somatycznych w mleku importowanych i krajowych krów rasy montbeliarde

Traits – Cechy	Origin of cows – Pochodzenie krów				Total Ogółem (n = 18,170)	
	Imported importowane (n = 10,530)		home-bred krajowe (n = 7640)			
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Daily milk yield, kg – Dobowa wydajność mleka, kg	27.2*	10.7	31.4*	9.2	29.7	10.3
Daily FPCM yield, kg – Dobowa wydajność FPCM, kg	27.9*	11.2	30.3*	8.9	29.4	9.9
Content in milk, % – Zawartość w mleku, %						
fat – tłuszczu	3.92*	0.91	3.58*	0.91	3.67	0.91
protein – białka	3.61*	0.38	3.47*	0.32	3.51	0.35
lactose – laktozy	4.80	0.30	4.83	0.28	4.81	0.29
Fat/protein ratio – Stosunek tłuszcz/białko	1.09*	0.23	1.03*	0.19	1.05	0.20
SCC, thous. · mL^{-1} – LKS, tys. · ml^{-1}	614*	989	487*	848	567	904
LNSCC – LnLKS	12.11	1.44	12.03	1.03	12.08	1.21

n – number of test-day milking records; * – means in rows significantly different at $P \leq 0.01$.
n – liczba próbnych udojów; * – średnie w wierszach różnią się istotnie przy $P \leq 0{,}01$.

An increase in the somatic cell count in milk, as an immune response to invasion of the udder by pathogenic bacteria, is the most commonly used indicator of mastitis [Sender 1998, Malinowski 2001]. The somatic cell count in milk has been the subject of research in Poland, but mainly been conducted on the Polish Holstein-Friesian breed [Sawa et al. 2000]. The somatic cell count in the milk of Montbéliarde cows suggests subclinical inflammation in some of the animals, the data in Table 1 show the mean SCC was 567,000 · mL^{-1} of milk, and the natural logarithm of this trait was 12.08. Gołębiewski and Brzozowski [2007] report that Montbéliarde cows are highly resistant to mastitis, because their milk contains less somatic cells (from 23–38%) than that of Holstein-Friesians.

Statistical analysis showed that the origin of the cows significantly ($P \leq 0.01$) influence the analysed milk performance traits. Only in the case of lactose content and LNSCC the differences between imported Montbéliarde cows and those born in Poland were not statistically significant. Higher daily yield (both in kg of milk and FPCM) was noted in born in Poland cows. The lower productivity of the cows born in France may be resulted their acclimatization to Polish farming conditions.

The data in Table 1 indicate that cows imported as pregnant heifers produce milk with a more favourable chemical composition, surpassing born in Poland cows in terms of fat and protein content. The values for these traits were 3.92% and 3.61%. Cows born and reared in Poland produced milk in which the content of these components was lower by 0.34 p.p. and 0.14 p.p. In the case of lactose content, 0.03 p.p. more of this component was noted in the milk of the born in Poland cows. It also had a more beneficial fat-to-protein ratio (1.03 vs. 1.09).

The milk of imported cows contained on average 614,000 somatic cells per mL, while that of born in Poland cows contained 487,000 · mL^{-1}, which may indicate slightly better udder health in the cows born and reared in Poland. The tendencies noted may also indicate that the acclimatization process may have had a negative effect on the performance of cows imported as pregnant heifers from France. LNSCC values were similar for both groups of cows (12.11 – imported, 12.08 – born in Poland). In a study by Borkowska and Januś [2010], the mean somatic cell count in the milk of Montbéliarde cows was 465,000 · mL^{-1}, and 76.3% of samples contained up to 400,000 · mL^{-1}. The somatic cell count and the percentage of samples indicate a deterioration in the quality of the milk increased in successive lactations and periods after calving, and decreased with increased daily yield and in the winter months.

Analysis of the effect of birth season revealed that in the case of both the spring/summer and autumn/winter, daily milk yield in kg and expressed as FPCM was higher in the cows born and reared in Poland (Table 2). Home-bred cows born in the spring and summer months produced on average 31.9 kg of milk (30.6 kg FPCM), while those born between September and February produced 31.1 kg of milk (29.8 kg FPCM). In the case of spring and summer births of imported cows, the values for these traits were lower by 5.1 kg and 3.4 kg FPCM, while in the case of autumn and winter births the differences in comparison with home-bred cows were 3.6 kg and 1.5 kg FPCM. In both groups distinguished by origin, the season of birth did not affect daily yield in kg or FPCM. In the literature on animal science, the milk performance of cows in connection with season of birth has not recently been a subject of broader discussion. There have, however, been studies published on the effect of the season of birth on the weight of calves [West 2003, Linden et al. 2009], and these have found that calves born during a period of lower temperatures were heavier than calves born in warmer months (June–August). This is consistent with results obtained earlier by Wolfenson et al. [1988], which indicate that cows housed before calving in buildings with a cooling system gave birth heavier calves. According to McCorquodale et al. [2013], calves with lower weight are less viable, more sensitive to infections and more often require treatment. Sick calves use a lot of energy to fight their disease and thus are unable to gain as much weight as their healthy counterparts. In the case of heifers,

this affects the body weight at first calving what in turn may influence the later performance. A study by Carson et al. [2002] showed a relationship between the body weight of heifers at first calving and their productivity in the first lactation. Their study indicates that the combined yield of fat and protein was lower (at $P \leq 0.05$) in the case of lower body weight at first calving.

Table 2. Daily yield of imported and home-bred Montbéliarde cows in relation to the season of birth and age at first calving

Tabela 2. Dobowa wydajność mleka importowanych i krajowych krów rasy montbeliarde z uwzględnieniem sezonu urodzenia i wieku przy pierwszym wycieleniu

Factors – Czynniki	Origin of cows – Pochodzenie krów					
	imported – importowane			home-bred – krajowe		
	n	Daily yield, kg Dobowa wydajność, kg		n	Daily yield, kg Dobowa wydajność, kg	
		milk – mleka	FPCM		milk – mleka	FPCM
Season of birth – Sezon urodzenia						
spring/summer – wiosenno-letni	4382	26.8^{**}	27.2^{a**}	4125	31.9^{**}	30.6^{**}
autumn/winter – jesienno-zimowy	6148	27.5^{**}	28.3^{b**}	3515	31.1^{**}	29.8^{**}
Age at first calving, days						
Wiek przy pierwszym wycieleniu, dni						
≤ 854	1041	27.9^{**}	28.4	2765	29.9^{A**}	28.9^{A}
855–915	2374	28.0^{a**}	28.7^{**}	2920	31.5^{AB**}	31.4^{B**}
916–1038	4827	27.3^{b**}	27.8^{**}	1621	30.0^{B**}	30.2^{C**}
>1038	2288	26.7^{*}	27.1^{*}	334	25.1^{C*}	24.7^{D*}
Total and mean – Ogółem i średnio	10,530	27.2^{**}	27.9^{**}	7640	31.4^{**}	30.3^{**}

n – number of test-day milking records; significance of differences: between means in a group of cows: capital letters at $P \leq 0.01$, lower-case letters at $P \leq 0.05$, between means in rows: ** – at $P \leq 0.01$, * – at $P \leq 0.05$.
n – liczba próbnych udojów; istotność różnic: pomiędzy średnimi w danej grupie krów: wielkie litery przy $P \leq 0{,}01$; małe litery przy $P \leq 0{,}05$, pomiędzy średnimi w wierszach: ** – przy $P \leq 0{,}01$, * – przy $P \leq 0{,}05$.

Studies by many authors [Nogalski 2004, Gołębiewski and Brzozowski 2008, Krężel-Czopek and Sawa 2008] show that age of heifers at calving is a factor determining lifetime production parameters in dairy cows, such as fertility, yield, or efficiency of milk production. According to Nogalski [2004], reducing the age at first calving makes it possible lowering the costs of heifers rearing, which account for about 15–20% of all milk production costs. A study by Szewczuk et al. [2015] on a herd of Simmental cattle showed that the age at first calving significantly influenced only the yield of primiparous cows. Krężel-Czopek and Sawa [2008] showed that beginning milk production either too soon ($\leq$ 22 months) or too late (especially after 30 months) results in a considerable reduction in the lifetime efficiency of milk production; furthermore, culling due to low milk performance and udder disease is increased. Table 2 shows that the age at first calving had a greater effect on the yield of home-bred cows than that of imported cows. In the latter group, the only significant difference with respect to this factor was noted

for daily milk yield in kg between cows calving at 855–915 days and those that calved at the age of 916–1038 days.

Cows born and reared in Poland surpassed imported cows in terms of daily yield in kg in the case of calving up to the age of 854 days (a difference of 2.0 kg), between 855 and 915 days (3.5 kg), and between 916 and 1038 days (2.7 kg). All of these differences were statistically significant. An advantage of born in Poland cows over imported ones was also noted in the case of yield in kg FPCM (an exception was the group that calved at >1038 days), though in the case of calving at 854 days the difference was statistically insignificant. In the case of the latest calving age (>1038 days), higher yield in kg and expressed as FPCM (both differences significant at $P \leq 0.05$) was noted in the imported cows. Thus, in this case the acclimatization process had no negative effect on productivity. It should also be emphasized that in both imported and born in Poland cows that calved between the age of 855 and 915 days attained the highest yield in kg and in kg FPCM. In a study by Svensson and Hultgren [2008] cows that calved at >930 days produced 875 kg more milk than those first calved at an age of up to 783 days. Hoffman et al. [1996] also reported a negative effect of too early calving on the yield of cows in first lactation.

In the case of both spring/summer births and autumn/winter births cows origin had a significant effect on the chemical composition of the milk (Table 3). Milk obtained from cows imported from France, both those born in spring and summer and those born in autumn or winter, had higher concentrations of fat and protein. Lactose content and fat/protein ratio at both seasons of birth were more favourable in the born and reared in Poland cows.

In the group of imported cows, no differences associated with the season of birth were noted for the protein and lactose contents in the milk. In the case of both spring/summer births and autumn/winter births the milk contained on average 3.61% protein. The fat/protein ratio was identical in both seasons as well (1.09). In the case of born in Poland cows, the season of birth affected the content of lactose (at $P \leq 0.05$) and fat (at $P \leq 0.01$). The milk of cows born in the spring and summer months had higher fat content. Higher lactose content and a more favourable fat/protein ratio were associated with autumn/winter births of home-bred cows. In a study by Barash et al. [1996], production of milk, fat and protein in the first lactation was lowest in cows born in early spring and highest in those born in autumn.

The differences in fat, protein and lactose concentration in the milk and in the fat/protein ratio between imported and home-bred cows that calved in the same age ranges were generally statistically more significant. In each range of age at first calving higher fat content was noted in the milk of the imported Montbéliarde cows than in that of cows born in Poland. For fat content in the milk of both

Table 3. Chemical composition of the milk of imported and home-bred Montbéliarde cows in relation to the season of birth and age at first calving

Tabela 3. Skład chemiczny mleka importowanych i krajowych krów rasy montbeliarde z uwzględnieniem sezonu urodzenia i wieku przy pierwszym wycieleniu

Factors – Czynniki	Origin of cows – Pochodzenie krów							
	imported – importowane				home-bred – krajowe			
	Content in milk, % Zawartość w mleku, %			fat/protein ratio stosunek tłuszcz/białko	Content in milk, % Zawartość w mleku, %			fat/protein ratio stosunek tłuszcz/białko
	fat tłuszczu	protein białka	lactose laktozy		fat tłuszczu	protein białka	lactose laktozy	
Season of birth – Sezon urodzenia								
spring/summer – wiosenno-letni	3.95^{**}	3.61^{**}	4.81	1.09^{**}	3.60^{A**}	3.50^{**}	4.82^{a}	1.03^{**}
autumn/winter – jesienno-zimowy	3.91^{**}	3.61^{**}	4.80^{**}	1.09^{**}	3.51^{B**}	3.45^{**}	4.85^{b**}	1.02^{**}
Age at first calving, days								
Wiek przy pierwszym wycieleniu, dni								
≤ 854	3.94^{**}	3.62^{**}	4.87^{A*}	1.09^{**}	3.47^{Aa**}	3.42^{**}	4.91^{A*}	1.01^{A**}
855–915	3.86^{A**}	3.59^{**}	4.79^{B**}	1.08^{**}	3.60^{Ab**}	3.43^{**}	4.88^{**}	1.04^{AB**}
916–1038	4.01^{B**}	3.63^{**}	4.78^{B}	1.10^{*}	3.72^{B**}	3.49^{**}	4.79^{B}	1.07^{B*}
>1038	3.91^{**}	3.58	4.75^{B**}	1.09^{**}	3.57^{**}	3.52	4.80^{**}	1.01^{A**}
Total and mean – Ogółem i średnio	3.92^{**}	3.61^{**}	4.80	1.09^{**}	3.58^{**}	3.47^{**}	4.83	1.03^{**}

Significance of differences: between means in a group of cows: capital letters at $P \leq 0.01$, lower-case letters at $P \leq 0.05$, between means in rows: ** – at $P \leq 0.01$, * – at $P \leq 0.05$.
Istotność różnic: pomiędzy średnimi w danej grupie krów: wielkie litery przy $P \leq 0{,}01$; małe litery przy $P \leq 0{,}05$, pomiędzy średnimi w wierszach: ** – przy $P \leq 0{,}01$, * – przy $P \leq 0{,}05$.

imported and home-bred cows, the most beneficial age at first calving was 916–1038 days. A study by Bortacki et al. [2016] showed no clear relationship between age at first calving and fat content in milk.

The imported cows also surpassed (at $P \leq 0.01$) born in Poland ones in milk protein content, but this was only true for those that first calved no later than at the age of 1038 days. In cows born and reared in Poland, higher lactose content and a more beneficial fat-to-protein ratio was noted than in imported cows. This was true of all groups distinguished by age of first calving. In the study by Bortacki et al. [2016], calving before the age of 23 months was the most beneficial for protein content in milk. The present study found no clear relationship between age at first calving and protein content in milk. In the case of cows born and reared in Poland, higher content of this component was associated with calving at a later age. This association was not confirmed in the imported cows, as the least protein was noted in the milk of cows that first calved after the age of 1038 days, while the highest content of this component (3.63%) was observed in the milk of cows calved between 916 and 1038 days.

The data in Table 4 show that the origin of the cows influenced SCC in the case of spring/summer births and autumn/winter births (at $P \leq 0.05$) and for first calving at up to 854 days of age (at $P \leq 0.05$) and after 1038 days ($P \leq 0.01$). For SCC expressed as a natural logarithm, differences between cows of different

origin were noted in the case of autumn/winter births and for an age at first calving between 855 and 915 days and >1038 days (all differences significant at $P \leq 0.01$).

Table 4. Somatic cell count in the milk of imported and home-bred Montbéliarde cows in relation to the season of birth and age at first calving

Tabela 4. Liczba komórek somatycznych w mleku importowanych i krajowych krów rasy montbeliarde z uwzględnieniem sezonu urodzenia i wieku przy I wycieleniu

Factors – Czynniki	Origin of cows – Pochodzenie krów			
	imported – importowane		home-bred – krajowe	
	Somatic cell count – Liczba komórek somatycznych			
	thous. · mL^{-1} tys. · ml^{-1}	LNSCC LnLKS	thous. · mL^{-1} tys. · ml^{-1}	LNSCC LnLKS
Season of birth – Sezon urodzenia				
spring/summer – wiosenno-letni	645*	12.14^{A}	527^{A*}	12.10^{A}
autumn/winter – jesienno-zimowy	574*	12.03^{B**}	415^{B*}	11.94^{B**}
Age at first calving, days Wiek przy pierwszym wycieleniu, dni				
≤ 854	520*	12.01^{A}	375^{A*}	11.91^{Aa}
855–915	493^{A}	12.00^{A**}	581^{B}	12.13^{B**}
916–1038	677^{B}	12.24^{B}	511^{B}	12.14^{B}
>1038	628**	12.09^{B**}	290^{A**}	11.83^{Ab**}
Total and mean – Ogółem i średnio	614**	12.11	487**	12.03*

Significance of differences: between means in a group of cows: capital letters at $P \leq 0.01$, lower-case letters at $P \leq 0.05$, between means in rows: ** – at $P \leq 0.01$, * – at $P \leq 0.05$.
Istotność różnic: pomiędzy średnimi w danej grupie krów: wielkie litery przy $P \leq 0,01$; małe litery przy $P \leq 0,05$, pomiędzy średnimi w wierszach: ** – przy $P \leq 0,01$, * – przy $P \leq 0,05$.

Irrespective of season of birth, the milk of imported cows had a higher somatic cell count than home-bred cows (both in thous. · mL^{-1} and LNSCC). To some degree, particularly at the start of the imported cows' exploitation in Poland, this may be due to acclimatization for new conditions and the associated higher susceptibility to infection. Analysis of the effect of season of birth on SCC in the milk of cows of different origin revealed that in the case of both imported and born in Poland cows the spring/summer season of birth was associated with a higher somatic cell count.

The age at first calving had a considerably greater influence on SCC in the milk of born and reared in Poland cows than in that of imported cows. In the latter group, the only significant difference in SCC was noted between cows that first calved at the age of 855–915 days and those that calved at 916–1038 days. Cows imported as pregnant heifers from France had a lower SCC and LNSCC only in the case of first calving between 855 and 915 days of age. These values were 493,000 · mL^{-1} and 12.00. The milk of born in Poland cows calving for the first time at the same age had a higher SCC by 88,000 (insignificant difference) and higher LNSCC by 0.13 (at $P \leq 0.01$). In the remaining ranges of age at first

calving, a lower SCC and LNSCC were noted in the home-bred cows. It is particularly worth noting the low mean SCC in the case of the latest calving ages (>1038 days) in the home-bred cows (290,000 · mL^{-1}), because such a low value was not found in any other case. It should be emphasized, however, that this value was calculated for only 334 milk samples.

CONCLUSIONS

To sum up, it should be emphasized that Montbéliarde cows born and reared in Poland had higher daily yield (both in kg and converted to FPCM) than those imported from France. This was true for cows born in the spring and summer and those born in the autumn and winter. Cows imported from France as pregnant heifers produced milk with a more favourable chemical composition. The milk of cows born and reared in Poland, on the other hand, had a more beneficial fat-to-protein ratio. In terms of daily yield, in both the imported and born in Poland Montbéliarde cows the most favourable age at first calving was between 855 and 915 days. In each range of age at first calving, higher fat content was noted in the milk of imported Montbéliarde cows than of those born in Poland. Imported cows also surpassed born in Poland ones in terms of protein content ($P \leq 0.01$), but this only applied to cows that first calved no later than at the age of 1038 days. The milk of cows imported from France, in the case of both spring/summer births and autumn/winter births, had higher concentrations of fat and protein. The mean SCC in the milk of the imported cows was higher than in the born in Poland cows. In both imported and home-bred cows, spring/summer births were associated with higher somatic cell count and its natural logarithm. This association may indicate that the acclimatization process may have a negative effect on the performance of cows imported from France as pregnant heifers.

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POZIOM WYBRANYCH CECH UŻYTKOWOŚCI MLECZNEJ IMPORTOWANYCH I KRAJOWYCH KRÓW RASY MONTBELIARDE URODZONYCH W RÓŻNYCH SEZONACH I CIELĄCYCH SIĘ W RÓŻNYM WIEKU

Streszczenie. Celem badań była analiza cech użytkowości mlecznej importowanych jako jałowice cielne z Francji i urodzonych w Polsce krów rasy montbeliarde, z uwzględnieniem sezonu urodzenia i wieku przy pierwszym wycieleniu. Analizie poddano dobową wydajność (w kg i przeliczoną na kg FPCM), zawartość tłuszczu, białka i laktozy, stosunek tłuszcz/białko i liczbę komórek somatycznych w mleku. Wykazano, że krowy urodzone i odchowane w Polsce charakteryzowały się wyższą dobową wydajnością oraz korzystniejszym stosunkiem tłuszczowo-białkowym w porównaniu do importowanych z Francji. Krowy importowane produkowały mleko o korzystniejszym składzie chemicznym. Stwierdzono także, że ze względu na dobową wydajność zarówno w przypadku importowanych, jak i krajowych krów montbeliarde najkorzystniejsze były wycielenia pomiędzy 855 a 915 dniem życia. Wiek przy pierwszym wycieleniu w większym stopniu różnicował wydajność krów krajowych, w porównaniu do krów importowanych. W każdym przedziale wieku przy pierwszym wycieleniu wyższą zawartość tłuszczu w mleku stwierdzano u krów importowanych w porównaniu do urodzonych w Polsce. Krowy importowane przewyższały krajowe również w zakresie zawartości białka, jednak prawidłowość ta dotyczyła tylko tych, których pierwsze wycielenia przypadały do 1038 dnia życia. Liczba komórek somatycznych w mleku może wskazywać na lepszy stan zdrowotny wymion krów urodzonych i odchowanych w Polsce. Zarówno w przypadku krów importowanych, jak i krajowych z wiosenno-letnim sezonem urodzeń związana była wyższa liczba komórek somatycznych. W podsumowaniu należy stwierdzić, że proces aklimatyzacji mógł mieć negatywny wpływ na użytkowość krów importowanych jako jałowice cielne z Francji.

Słowa kluczowe: rasa montbeliarde, krowy importowane i krajowe, użytkowość mleczna, sezon urodzenia, wiek przy pierwszym wycieleniu

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