

## **Comparison of milk utilization of the cows imported from France and their Polish Holstein-Friesian contemporaries**

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**The results of the present study showed that the cows imported from France, as compared to Polish Holstein-Friesian contemporaries were utilized for a longer period of time and were characterized by significantly higher yields of milk, fat, protein, lactose and dry solids. The concentrations of major milk components were comparable in the both groups, with the exception of fat content which was significantly higher in the group of the imported cows. Milk from domestic cows had a lower urea content and lower somatic cell count (SCC).**

**KEY WORDS: Holstein-Friesian cows / milk composition / lifetime yields**

Genetic upgrading of Black-and-White cattle using Holstein-Friesian bulls has contributed to a considerable improvement in the productive potential of the Polish cattle population. As a result of large-scale mating programmes the cattle population has been transformed from dual purpose performance to single purpose milking performance [15].

In the case of population improvement through selection the expected results may be obtained only after a long time of breeding work. In order to rapidly increase profitability of their farms milk producers from the Warmia and Mazury region (Poland) were importing Holstein-Friesian heifers from the EU. Many authors in their studies [2, 4, 5, 6, 10, 11, 13, 16, 18, 19] compared milking performance traits of pure-bred HF cows imported to Poland with those of their age mates of the domestic Black-and-White breed by analysing either only the first or the first three lactations. Nevertheless, no definite indication was provided whether it is profitable to import pure-bred HF cows from France. For this reason it seems advisable to compare the productive value of Holstein-Friesian cows imported from France with their Polish age mates over their entire productive life, i.e. from calving to culling.

## Material and methods

Analyses were conducted on a farm located in the Warmińsko-Mazurskie province (north-eastern Poland). They included 119 Holstein-Friesian cows imported in 1997 from France as in-calf heifers and their 124 age mates of the Polish Holstein-Friesian Black-and-White breed with an average 69% share of HF genes in their genotype (PHF HO).

Cows were kept in a freestall combi cubicle barn in the shallow litter system. Up to 3 months after calving milking was performed three times a day and afterwards - until drying-off - cows were milked twice a day in a 20-stall herringbone milking parlour using MilkMaster clusters.

The animals were fed partial mixed rations (PMR) twice a day using a fodder mixing wagon. The basal ration was based on roughage produced on the farm and consisted of grass and lucerne haylage, maize silage, sugar beet pulp ensiled in silage bags and hay. It was sufficient to meet the basal maintenance requirements and to produce 15-16 kg milk. Cows were given the balanced concentrate from feeding stations depending on their milk yields (1 kg feed per each additional 2 kgs of milk).

All cows were included in the milk recording scheme. Test milkings were performed following the  $A_4$  method. Contents of milk fat, protein, lactose, dry matter and urea in collected samples were recorded. Analyses were conducted by infrared spectrophotometry using a MilkoScan apparatus at the Laboratory of the Regional Animal Breeding Centre in Olsztyn. Somatic cell counts were determined with a Fossomatic 5000 analyser.

Quantitative data were obtained from RW-1 and RW-2 result reports as well as breeding records available on the farm (herd records, individual heifer/cow cards). Collected quantitative data were accumulated taking into consideration the origin of the animals.

Quantitative source data were characterised based on the arithmetic mean  $\bar{x}$  and the coefficient of variation (V). Results were compared statistically. Differences between the means were verified using Student's t-test with the Statistica ver. 10.0 programme.

## Results and Discussion

Mean life span of the analysed cows (Table 1) was 1870 days (5.12 years). Cows imported from France lived on average 1904 days (5.22 years), while their PHF HO age mates – 1809 days, i.e. by 95 days less. A longer life span of imported cows in comparison to their domestic counterparts, irrespective of their culling date, was recorded by Czaplicka et al. [7, 8] in their earlier studies (for imported cows 2240 and 1547 days, respectively, i.e. 6.14 and 4.24 years, while for Polish cows it was 2120 and 1339 days, i.e. 5.81 and 3.67 years).

The length of productive life for cows of both groups was related with their life span (Table 1). In this study their productive life was on average 1377 days, i.e. 3.77 years. Imported cows had longer productive lives (1417 days, i.e. 3.88 years) in comparison to their Polish age mates (1338 days, i.e. 3.67 years). A comparable productive life of cows was reported by Zdziarski et al. [21], a longer one – by Czaplicka et al. [7] (imported cows with 1517 days, i.e. 4.16 years vs. Polish cows with 1408 days, i.e. 3.86 years), while a shorter length was given by Sawa [20]. According to Reklewski [17], excessively short productive life results in unsatisfactory production efficiency even at high milk yields.

**Table 1**

Life span and herd life and milk yield per day of life and per day of herd utilization of cows

Specification		Cows	
		imported from France	domestic
Life span (days)	$\bar{x}$	1904	1809
	V	29.38	26.54
Herd life (days)	$\bar{x}$	1417	1338
	V	11.48	11.27
Milk yield per day of life (kg)	$\bar{x}$	14.43	12.92
	V	35.26	36.61
Milk yield per day of utilization (kg)	$\bar{x}$	19.70	17.47
	V	21.44	26.61

Mean milk yield per 1 day of life was 13.69 kg (Table 1). This value in the group of imported cows amounted to 14.43 kg, while for their PHF HO age mates it was 12.92 kg. The superior productivity of imported cows was a consequence of their greater lifetime productivity and longer productive life. Lower milk yields per 1 day of productive herd life were observed in their studies by Cichocki et al. [3], while those per 1 day of life – by Antkowiak and Kliks [1] and Zdziarski et al. [21].

Mean lifetime yields of milk, fat, protein, lactose and dry matter of the analysed cows (Table 2) were 25 593 kg, 1085.14 kg, 862.48 kg, 1238.70 kg and 3414.11 kg, respectively. Significantly higher ( $P \leq 0.01$ ) yields of milk and milk components were recorded for imported cows. The values were higher by 4536 kg milk, 215.17 kg butterfat, 155.65 kg protein, 211.63 kg lactose and 615.36 kg dry matter. Comparable lifetime yields of milk and its components were reported in their study by Juszcak et al. [12].

**Table 2**

Lifetime production of cows

Specification		Cows	
		imported from France	domestic
Milk (kg)	$\bar{x}$	27 908 <sup>A</sup>	23 372 <sup>B</sup>
	V	52.59	57.94
Fat (kg)	$\bar{x}$	1194.46 <sup>A</sup>	979.29 <sup>B</sup>
	V	54.10	58.39
Protein (kg)	$\bar{x}$	943.29 <sup>A</sup>	787.64 <sup>B</sup>
	V	52.92	56.73
Lactose (kg)	$\bar{x}$	1345.17 <sup>A</sup>	1133.54 <sup>B</sup>
	V	52.41	57.33
Dry matter (kg)	$\bar{x}$	3728.51 <sup>A</sup>	3113.15 <sup>B</sup>
	V	52.83	57.45

Values followed by capital letters (A, B) differ significantly at  $P \leq 0.01$

**Table 3**

Basic chemical composition and urea and somatic cell count in milk from cows

Specification		Cows	
		imported from France	domestic
Fat content (%)	$\bar{x}$	4.28 <sup>a</sup>	4.19 <sup>b</sup>
	V	8.22	8.83
Protein content (%)	$\bar{x}$	3.38	3.37
	V	5.14	5.11
Lactose content (%)	$\bar{x}$	4.82	4.85
	V	2.42	4.32
Dry matter content (%)	$\bar{x}$	13.36	13.32
	V	3.88	3.63
Urea content (mg/l)	$\bar{x}$	445	286
	V	72.36	75.47
Somatic cell count (thous./ml)	$\bar{x}$	248	216
	V	120.21	127.03

Values followed by small letters (a, b) differ significantly at  $P \leq 0.05$

Table 3 gives average contents of fat, protein, lactose, dry matter and urea as well as somatic cell counts in milk of analysed cows over the entire study period. Milk of imported cows contained mean 4.28% fat, i.e. by 0.09 percentage points (pp) more than milk of their Polish age mates. This difference was confirmed statistically at  $P \leq 0.05$ .

The average protein content in milk of the cows over their lifespan was 3.37% and it was comparable in both examined groups. For the cows imported from France the average lifetime milk lactose content was 4.82% and it was by 0.03 pp lower than that recorded for their domestic age mates.

Dry matter contents recorded in milk of the analysed cows was on average 13.34%. Milk of imported cows contained slightly higher contents of milk solids (by 0.04 pp).

A lower urea level was recorded in milk of Polish cows (286 mg/l) in comparison to that of imported animals (445 mg/l), with the differences being statistically non-significant. Somatic cell counts in milk of analysed cows did not exceed 250 thousand/ml, which shows high quality of produced milk.

The main reasons for culling of imported cows and PHF HO cows are given in Table 4. During the analysed period a total of 243 cows were culled. The most frequent cause of culling, irrespective of cows' origin, was sterility (32.51%). Accidents accounted for 26.34% culling cases, diseases of the udder – 15.23%, low productivity – 9.88%, milk fever (paresis puerperalis) – 7.41% and old age – 4.94%, respectively. A total of 9 cows were sold for further breeding: 7 imported and 2 of Polish origin. Results reported by other authors [7, 9, 14] also showed that sterility was the most common cause for culling.

In conclusion it may be stated that animals imported from France as in-calf heifers had longer productive herd lives and statistically higher lifetime yields of milk, fat, protein, lactose and dry matter than their domestic age mates.

**Table 4**  
Reasons of culling in cows

Specification	Cows			
	imported from France		domestic	
	head	%	head	%
Sterility	36	30.26	43	34.68
Accidents (including leg diseases)	35	29.41	29	23.39
Udder diseases	17	14.29	20	16.13
Low yield	10	8.40	14	11.29
Paresis puerperalis	8	6.72	10	8.06
Advanced age	6	5.04	6	4.84
Sale for further breeding	7	5.88	2	1.61
Total	119	100.00	124	100.00

Contents of basic milk components were comparable in both groups. An exception was found for butterfat content in milk, which was statistically significant greater in the group of imported cows. In turn, milk of Polish cows had non-significantly lower urea contents and somatic cell counts. Sterility was the most frequent cause for culling in both analysed groups of cows.

#### REFERENCES

1. ANTKOWIAK I., KLIKS R., 1998 – Długość użytkowania i wydajność życiowa kilku genotypów krów w Wielkopolsce. *Roczniki Akademii Rolniczej w Poznaniu* CCCII, 3-7.
2. BOGUCKI M., SAWA A., NEJA W., BEMBNISTA M., 2009 – Użytkowość mleczna krów rasy holsztyńsko-fryzyjskiej pochodzenia krajowego i zagranicznego. *Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego* 5 (4), 21-31.
3. CICHOCKI M., WIELGOSZ-GROTH Z., KIJAK Z., 1996 – Wydajność mleka i tłuszczu krów użytkowanych w regionie północno-wschodniej Polski. Sympozjum Naukowe „Hodowla bydła w Polsce. Historia i przyszłość”, Olsztyn 12-13.09.1996, 157-164.
4. CICHÓŁOWICZ E., CZERNIAWSKA-PIĄTKOWSKA E., SZEWCZUK M., 2010 – Ocena produktywności krów rasy holsztyńsko-fryzyjskiej importowanych ze Szwecji i Niemiec. *Acta Scientiarum Polonorum, Zootechnica* 9 (3), 9-18.
5. CZAPLICKA M., CZERNIEWICZ M., PUCHAJDA Z., KRUK A., SZALUNAS T., 2002 – Ocena ilości i jakości mleka krów holsztyńsko-fryzyjskich i czarno-białych. *Zeszyty Naukowe Przeglądu Hodowlanego* 55, 183-192.

6. CZAPLICKA M., CZERNIEWICZ M., PUCHAJDA Z., KIEŁCZEWSKA K., KRUK A., SZALUNAS T., 2003 – Comparison of physical and chemical properties and technological value of milk local population of BW cows. *Polish Journal of Food and Nutrition Sciences* 12/53, 3, 63-66.
7. CZAPLICKA M., MOCZULSKA B., PUCHAJDA Z., 2007 – Porównanie niektórych cech użytkowości krów krajowych i importowanych z Francji. *Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego* 3 (4), 119-128.
8. CZAPLICKA M., PUCHAJDA Z., SZALUNAS T., 2002 – Porównanie przyczyn brakowania krów importowanych z Francji z miejscową rasą cb. *Roczniki Naukowe Zootechniki*, Supplement 15, 57-61.
9. CZAPLICKA M., PUCHAJDA Z., SZALUNAS T., 2004 – Długość użytkowania i przyczyny brakowania krów wysoko wydajnych. *Zeszyty Naukowe Przeglądu Hodowlanego* 72, 129-136.
10. CZERNAWSKA-PIĄTKOWSKA E., SZEWCZUK M., 2006 – Kształtowanie się cech użytkowości mlecznej krów pierwiastek krajowych oraz importowanych z Danii i Holandii. *Acta Scientiarum Polonorum, Zootechnica* 5 (2), 13-18.
11. CZERNAWSKA-PIĄTKOWSKA E., SZEWCZUK M., SOWA A., ŻYCHLIŃSKA-BUCZEK J., 2009 – Porównanie poziomu cech produkcyjnych krów rasy h-f importowanych z Niemiec z rówieśnicami krajowymi. *Acta Scientiarum Polonorum, Zootechnica* 8 (3), 3-10.
12. JUSZCZAK J., HIBNER A., TOMASZEWSKI A., 2001 – Dynamika zmian wskaźników użytkowych w stadzie krów krzyżowanych z rasą holsztyńsko - fryzyjską. *Medycyna Weterynaryjna* 57 (4), 284-287.
13. KUCZAJ M., 2004 – Analiza wartości użytkowej krów rasy czarno-białej importowanych z Holandii i ich rówieśnic ras czarno- i czerwono-białej odchowanych w kraju. *Medycyna Weterynaryjna* 60 (12), 1317-1319.
14. KUCZAJ M., ZIELAK A., Blicharski P., 2008 – Reasons for the culling of Polish Holstein-Friesian cows in a high yield herd. *Medycyna Weterynaryjna* 64 (10), 1205-1208.
15. Program genetycznego doskonalenia bydła rasy polskiej holsztyńsko-fryzyjskiej, 2009 – PFHBiPM, Warszawa.
16. PUCHAJDA Z., CZAPLICKA M., SZALUNAS T., 2003 – Wydajność i skład mleka krów holsztyńsko-fryzyjskich importowanych z Francji i ich rówieśnic krajowej rasy czarno-białej. *Roczniki Naukowe Zootechniki* 17/2, 885-888.
17. REKLEWSKI Z., 1998 – Doskonalenie bydła mlecznego w nawiązaniu do potrzeb rynku. *Zeszyty Naukowe Akademii Rolniczej we Wrocławiu* 331, 21-32.
18. SABLİK P., KAMIENIECKI H., GRZESIAK W., 2001 – Porównanie poziomu cech produkcyjnych i niektórych wskaźników rozrodczych krów holsztyńsko-fryzyjskich importowanych jako jałowice cielne z Francji z wynikami uzyskanymi od krów miejscowych. *Zeszyty Naukowe Polskiego Towarzystwa Zootechnicznego* 59, 239-246.
19. SABLİK P., SZARKOWSKI K., DYCHA S., KURPIK A., 2005 – Wartość użytkowa krów rasy holsztyńsko-fryzyjskiej importowanych z Francji i ich potomstwa urodzonego w Polsce. *Roczniki Naukowe Zootechniki* 22, 607-611.

20. SAWA A., 1998 – Życiowa użytkowość krów cb i mieszańców cb x hf w zależności od przyczyny brakowania. *Zeszyty Naukowe Akademii Rolniczej we Wrocławiu*, Konferencje 17, 181-187.
21. ZDZIARSKI K., GRODZKI H, NAŁĘCZ-TARWACKA T., BRZOZOWSKI P., PRZY-SUCHA T., 2002 – Wpływ systemu utrzymania i genotypu krów na długość ich użytkowania i życiową użytkowość mleczną. *Zeszyty Naukowe Przeglądu Hodowlanego* 62, 29-35.