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THE COMPARISON OF DAIRY PERFORMANCE AND SOME REPRODUCTIVE PARAMETERS OF HOLSTEIN COWS IMPORTED FROM SWEDEN AND THEIR POLISH AGE MATES

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Abstract

CZERNIAWSKA-PIĄTKOWSKA, E., SZEWCZUK, M., KAMIENIECKI, H., ADAMSKI, M, BRUŚ, A., FALTA, D.: *The comparison of dairy performance and some reproductive parameters of holstein cows imported from Sweden and their Polish age mates*. Acta univ. agric. et silvic. Mendel. Brun., 2007, LV, No. 1, pp. 39–44

The general aim of the present work was to compare dairy performance and some reproductive parameters of Holstein-Friesian (HF) cows imported from Sweden as an in-calf heifers, and their age mates in Poland. The animals were kept freely on the deep litter on the farm owned by Agro-company "Witkowo" and feeding was based on TMR (total mixed ration) system during whole year. All ration's ingredients (bulky feed, concentrate, miscellaneous additives) were mixed and fed as all-mash. The feed ration depended from the physiological condition of a cow and it was composed of corn and grass ensilage, mash concentrate, crushed corn meal, brewer's grains and beet pulp.
Cows imported from Sweden as in-calf heifers obtained higher milk, fat and protein yield in both lactations comparing to home cows. Significant statistical differences were observed for kg of milk, kg of protein, for FCM ($P<0.01$) and for kg of fat ($P<0.05$) in 2nd lactation. Fat and protein content in milk was in average higher for home cows ($P<0.01$). Big differences ($P<0.01$) were observed in SBT (proportion of protein to fat content) and RTB (difference between concentration of fat and protein) at imported cows in 2nd lactation. As far as reproduction parameters (gestation interval, calving interval, insemination index) are concerned was cows from Sweden better too. Heifers from Sweden calved earlier. The usage of high genetic potential of imported cows is possible only with providing them optimum living conditions suitable to their needs.

import, cows, Holstein (HF), milk yield

The artificial insemination of cows and heifers with the semen from Holstein-Friesian bulls has been used in Poland on a large scale since the second half of the 80´s. It has lead to cardinal changes in Polish population of black-white cattle. Nowadays, almost 90% of tested black-white heifer cows in Poland are hf crossbreeds, and half of them possess over 50% of HF genes. The improvement of home cattle has had an influence on animals body conformation and their milk yield, what in consequence is leading to the transformation of this population into unilateral dairy type (LITWIŃCZUK and GULIŃSKI, 2000).

PILARCZYK et al. (2004) suggest that the import of HF heifers with the highest genetic potential is a quicker method to improve dairy yield. In a shorter period of time, providing good management and feeding conditions, we can obtain intended effects.

The new milk quotes system, which was put into

execution on April 1, 2004, demands from the cattle breeders to take efforts leading to the increase of milk production by the rise in individual milk yield (crossbreeding of home cattle with hf cattle) and by the increase of foundation stock size (import of replacement heifers from EU countries) (KUCZAJ, 2004).

Nowadays, cattle breeders from all countries share the opinion that genetic potential has bigger impact on dairy yield than feeding and management (DYMNICKI et al., 2003; KUČERA et al., 2002).

MATERIALS AND METHODS

The purpose of the research was to compare the diary performance with some of the reproduction parameters of Holstein-Friesian cows imported from Sweden as in-calf heifers with their age mates in Poland.

The research was conducted on two groups of heifer cows. Group I – Holstein-Friesian cows imported from Sweden in April and May 2002 (100 animals). Group II – home cows with 100% of HF genes (100 animals).

The animals were kept freely on the deep litter on the farm owned by Agro-company "Witkowo". The removal of manure was performed once in two months with the use of the frontal manure loaders TUR type. The fodder was given three times an day using mash trolley Kverneland KD 714 (capacity 3.5 tons). Cows had a constant access to water using the automatic drinkers.

Heifer's feeding was based on TMR (total mixed ration) system during a whole year. All ration's ingredients (bulky feed, concentrate, miscellaneous additives) were mixed and fed as all-mash. The feed ration depended from the physiological condition of a cow and it was composed of corn and grass ensilage, mash concentrate, crushed corn meal, brewer's grains and beet pulp. The automatic milking was performed in ALPRO system, and cows were milked three times a day.

The comparative analyses of milk yield was based on A_4 method of official dairy performance assessment, including the milk, fat and proteins yield (in kg) and their percentage content in milk. The differences between those components were also determined (RTB – difference between concentration of fat and proteins, SBT – proportion of protein to fat content). To compare the results of the research from two consecutive 305-days lactations, the standard yield of milk with 4% of fat content was counted (FCM – fat corrected milk).

Some reproduction parameters like calving interval (CI), gestation interval (GI), artificial insemination index (AII) and age at first calving were also analyzed.

The data were subject to statistical analysis and the mean values ($\bar{x}$), standard deviation (s_x) and coefficient of variation (V%) were calculated. The significance of differences between means of the groups was defined by Duncan's test with the use of Statistica PL software.

RESULTS AND DISCUSSION

Table I presents the comparison of milk, fat and protein yield of animals imported from Sweden and home cows in the first and the second lactation. Imported cows in the first lactation obtained 5926 kg of milk, 238 kg of fat and 186 kg of protein, and in the second lactation 7917 kg, 301 kg and 252 kg, respectively. That means that in the first, as well as in the second lactation imported cows had better yield than home cows. However, the difference in Swedish cows favour decreased after FCM calculation and was 184 kg in the first and 750 kg in the second lactation. The difference between milk yields was smaller for home cows. The milk yield advantage of home cattle in second lactation was 1253 kg while for imported cows 1991 kg. The difference between fat and protein yield in 1st and 2nd lactation was as follows: imported cows – 63 kg of fat and 66 kg of protein, home cows – 45 kg and 39 kg, respectively. Significant statistical differences were observed for kg of milk, for kg of protein, for FCM ($P<0.01$) and for kg of fat ($P<0.05$) in 2nd lactation. Table I also showed that estimation coefficients for relationships between 1st and 2nd lactation was 1.33 for Sweden (group I) cows and 1.22 for home (group II) cows. This founds for home cows are similar with than that published CHLÁDEK and KUČERA (2002 a) for Holstein cows (1.175) or CHLÁDEK and KUČERA (2002 b) for Czech Pied cows (1.171). In opposite founds for Sweden cows are rather high.

CZERNIAWSKA-PIĄTKOWSKA (2004) found out, that mother cows from Sweden exceed their daughters imported to Poland in yield of milk (of about 2415 kg), fat (86 kg) and protein (87 kg). KUCZAJ and BLICHARSKI (2001) reported that cows imported from Holland to Poland exceed their mothers in yield of milk (505 kg), fat (26.4 kg) and protein (8.7 kg). In the 1st lactation they gained 7795 kg of milk, 342 kg of fat and 260 kg of protein. However PILARCZYK et al. (2004) stated that Dutch mother cows exceeded their daughters imported to Poland in yield of milk by 1986 kg, fat 88.5 kg, and protein 65.2 kg. Those differences were statistically confirmed ($P<0,01$). Cows-daughters in first lactation gained 5463 kg of milk, 237 kg of fat, and 193 kg of protein.

SABLIK et al. (2001) revealed that cows imported from France showed in following four lactations higher milk, fat, and protein yield comparing to home cows. In the study of GNYP et al. (2001) home cows and cows imported from Holland, comparing to cows imported from Germany and France, gained higher yield of milk and its components in 1st and 2nd lactation. The growth of milk yield in 2nd lactation comparing

to the 1st one in home cows and these imported from Holland increased from 20 to 21%. In the research of KUCZAJ (2002) cows imported from Holland, which were kept in the same conditions as Polish age mates black and red-white, gained in 1st lactation less milk (8214 kg), but fat yield was higher (424 kg) and a little bit higher protein yield (271 kg).

I: *Milk, fat and protein yield in first and second 305 days lactation in cows from Sweden (Group I) and home cows (Group II)*

Group	Statistics	1st Lactation – Yield (kg)				2nd Lactation – Yield (kg)			
		Milk	Fat	Protein	FCM	Milk	Fat	Protein	FCM
I	$\bar{x}$	5926	238	186	5941	7917 A	301a	252 A	7683 A
	s_x	1008.22	40.20	31.56	982.95	1731.01	69.81	52.77	1701.44
	V%	17.01	16.89	16.90	16.54	21.86	23.18	20.91	22.14
II	$\bar{x}$	5658	232	183	5757	6911 A	277a	222 A	6933 A
	s_x	1244.63	50.97	36.66	1216.85	1508.23	58.87	44.63	1425.93
	V%	22.00	21.88	19.95	21.13	21.82	21.18	20.03	20.57

A... upper case letters within columns denote differences significant at $P \leq 0.01$
a... lower case letters within columns denote differences significant at $P \leq 0.05$

Table II presents the percentage of fat content in 1st and 2nd lactation (duration 305 days) and relations between milk components. The average percentage of fat (4.17%) and protein (3.26%) content in 1st and the 2nd lactation (3.99% and 3.21%, respectively) was higher for home cows comparing to imported cows. Significant differences were proved ($P<0.01$) excluding protein content in 2nd lactation. In 2nd lactation cows from Sweden obtained better protein to fat proportion (SBT) in milk by 0.04 and differences between the percentage of fat and protein content (RTB) in milk by 0.18%. Those differences were proved statistically ($P<0.01$).

According to CZERNIAWSKA-PIĄTKOWSKA (2004) percentage of protein content in milk from cows kept in Sweden was higher (of 0.1%) than in milk from their daughters imported to Poland. They also had lower RTB (of 0.28%). Inversely, the percentage of fat content in milk, and STB was better (by 0.18 and 0.07%, respectively) for daughters.

Observations of mother cows in Holland made by KUCZAJ and BLICHARSKI (2001) led to conclusion that cows had higher protein content in milk (0.11%), better STB (0.03) and RTB (0.17%).

In KUCZAJ's (2004) study Dutch heifer cows, comparing to black-white and red-white Polish cows, gained higher percentage of fat content in milk (5.18%) by 1.1% and 1.68% and just a bit higher protein content (3.32%), by 0.07% and 0.05% in 305 days lactation. GNYP et al. (2001) stated that cows from France, comparing to animals from Holland, Germany and Poland, had significantly the lowest percentage of fat content in milk in 1st (3.64%) but also in 2nd (3.61%) lactation. However, German cows obtained higher content of this components in milk (4.16 and 4.34%). Statistical differences concerning the percentage of fat content in milk in 1st and 2nd lactation between home animals and cattle imported from Holland were not significant. The authors noted significant differences ($P<0.01$) in 2nd lactation, comparing home cows

II: *Percentage of fat and proteins in first and second 305 days lactation and relations between those components in milk*

Group	Statistics	1st Lactation – Content %		SBT	RTB(%)	2nd Lactation – Content %		SBT	RTB(%)
		Fat	Protein			Fat	Protein		
I	$\bar{x}$	4.03 A	3.15 A	0.79	0.87	3.81 A	3.20	0.85 A	0.61 A
	s_x	0.28	0,15	0.05	0.25	0.36	0.17	0.08	0.33
	V%	6.92	4.75	6.63	28.68	9.41	5.24	8.93	53.26
II	$\bar{x}$	4.17 A	3.26A	0.79	0.90	3.99 A	3.21	0.81 A	0.79 A
	s_x	0.40	0.21	0.05	0.29	0.41	0.20	0.08	0.38
	V%	9.59	6.45	6.86	32.33	10.27	6.27	10.13	48.39

A... upper case letters within columns denote differences significant at $P \leq 0.01$

with cows imported from Germany. Home and Dutch cows had higher proteins content in milk (1st lactation 3.22% and 2nd 3.31%, and 3.26 and 3.35%, respectively) than German and French cows. The differences were statistically significant (P<0.01).

Table III contains an average age of first calving of Swedish (916 days) and home cows (928 days). Statistically important differences were not stated. KAMIENIECKI et al. (2000) announce that the first calving should take place at age 2.5 years (910 days). Cows imported from Sweden and home cows differed slightly from this standard.

III: *Average age at first calving of cows from Sweden (Group I) and home cows (Group II)*

Statistics	Group I	Group II
$\bar{x}$	916 days 31 months	928 days 31 months
s_x	113.59	128.43
V%	12.40	13.83

WROŃSKI et al. (2001) stated that Holstein-Friesian heifers imported from Holland calved on the 815th day of life, and home cows were 74 days older at first calving. WIELGOSZ-GROTH and GROTH (2002) published, that cows from Holland calved at age 811 days for the first time, and home cows at the age of 786 days. PIECH and TARKOWSKI (2003) stated that yield and length of performance is correlated with the age of first calving. The longest performance had cows with first calving taking place till 25th month of life, the shortest- cows which calved after 30th month of life.

Table IV shows the mean values of some fertility parameters of cows from Sweden and home cows. The gestation interval lasts 127 days for imported cows and 7 days longer for home cows. According to KAMIENIECKI et al.(2002) the optimum period is between 70 and 100 days. WROŃSKI et al. (2001) obtained similar results (at cows imported from Holland 128 days, at home cows 90 days).

IV: *Mean values of some fertility parameters of cows from Sweden (Group I) and home cows (Group II)*

Group	Statistics	GI (days)	CI (days)	AII
I	$\bar{x}$	127	409	1.15 A
	s_x	63.03	61.51	0.39
	V%	49.60	15.04	33.9
II	$\bar{x}$	134	416	1.3 A
	s_x	70.43	72.47	0.61
	V%	52.32	17.42	46.9

A... upper case letters within columns denote differences significant at $P \leq 0.01$
GI – gestation interval
CI – calving interval
AII – artificial insemination index

KRZYŻEWSKI et al. (2004) ended up with a conclusion, that in case of high milk yield (over 8 000 kg in lactation) there is no possibility (without hormonal treatment) of 12-months gestation interval. This interval usually lasts 111 days in spite of proper feeding and good environment conditions.

According to KAMIENIECKI et al. (2002) the calving interval should last 365 days, but own researches did not prove this statement. MAŁECKI-TEPICHT et al. (2000) published that calving interval took 482 and 550 days (cows from France), 432 days (German cows) and 374 days (home cows).

DYMNICKI et al. (2003) noted that elongating calving interval, on every age stage, can lead to the increase of milk, fat and protein yield. Big differences were observed between heifers and older cows (lower level of parameters) starting from the second lactation. They found that the length of calving interval does not have an impact on the percentage of fat and protein content. And when this period lasts for 417 days (heifers) or 423 days (older cows) and milk production is closed to 7 000kg there can be some reproduction trouble.

According to KAMIENIECKI et al. (2002) the insemination index should be from 1.3 to 1.6. In the research by KAMIENIECKI et al. (2000), the insemination index of cows imported from Germany was 2.2. SABLIK et al. (2001) reported that this index in fourth lactation reached values from 3.59 to 3.99 (cows imported from France) and from 1.95 to 2.44 (home cows). MALECKI-TEPICHT et al. (2000) ascertained that insemination index was unprofitable and was 3.02–3.26 (cows imported from France), 2.58 (cows imported from Germany) and 1.79 (home cows). WIELGOSZ-GROTH and GROTH (2002) reported values of 2.1 (home cows) and 2.21 (Dutch cows).

According to SABLIK et al. (2001) environmental factors (stress, improper nourishment, wrong heat detection, etc.) caused low reproduction performance. They also allude about so called physiological infertility which can be observed in high yielding cows. PILARCZYK et al. (2004) stated that introducing of cows with potentially high production possibilities into unfavorable environment can lead to the small, with the reference to carried efforts, yield increase or even to its decrease.

Import of animals with high breeding value requires providing of suitable conditions of welfare and nourishment, otherwise obtained production results might be lowered.

SOUHRN

Porovnání mléčné užitkovosti a některých reprodukčních parametrů holštýnských krav importovaných ze Švédska s jejich vrstevnicemi v Polsku

V druhé polovině 80. let byla v Polsku velkoplošně prováděna umělá inseminace krav a jalovic semenem Holštýnsko-frízských (HF) býků, což mělo za následek významné změny v černostrakaté populaci. V současné době je téměř 90 % testovaných černostrakatých jalovic v Polsku kříženkami a polovina z nich má více než 50 % HF genů. Zušlechťování domácího skotu mělo vliv na utváření těla a na mléčnou užitkovost, což v konečném důsledku vedlo k převedení populace na jednostraně mléčný typ skotu.

Cílem této práce bylo porovnání mléčné užitkovosti a některých reprodukčních parametrů holštýnských krav importovaných ze Švédska s jejich vrstevnicemi v Polsku. Porovnání bylo provedeno na dvou skupinách prvotelek. První skupina (Group I) zahrnovala 100 prvotelek importovaných ze Švédska v období dubna až května roku 2002 a druhá skupina (Group II) rovněž 100 čistokrevných (H100) prvotelek původem z Polska. Dojnice byly celoročně krmeny směsnou krmnou dávkou (TMR) založené na bázi objemných krmiv (kukuřičná siláž, travní senáž), koncentrátů (kukuřičné zrno) a různých doplňků (pivovarské mláto, cukrovarské řízky). Dojení probíhalo třikrát denně. Analýza byla prováděna na základě kontroly užitkovosti krav metodou A_4. Mezi skupinami byly zjišťovány rozdíly v produkci mléka, produkci tuku a bílkovin a obsahu tuku a bílkovin. Byly analyzovány i rozdíly mezi složkami mléka pomocí poměru tuku a bílkovin (SBT) a rozdílu v koncentraci tuku a bílkovin (RBT) na 1. i 2. laktaci.

Dojnice importované ze Švédska dosáhly při porovnání s domácími vyšších hodnot v produkci mléka i produkci mléčných složek na obou laktacích. Statisticky průkazné rozdíly však byly prokázány pouze na druhé laktaci v produkci mléka, bílkovin a FCM ($P<0,01$) a v produkci tuku ($P<0,05$). Obsah tuku a bílkovin v mléce domácích krav (Group II) byl vysoce statisticky průkazně ($P<0,01$) vyšší. Vysoce průkazný rozdíl ($P<0,01$) byl zjištěn i u poměru tuku a bílkovin (SBT) a rozdílu v obsahu tuku a bílkovin (RBT) u krav na 2. laktaci ve prospěch importovaných krav (Group I). Pokud jde o některé reprodukční ukazatele (mezidobí, servis perioda, inseminační index), vykázaly krávy importované ze Švédska lepší hodnoty a otelily se dříve.

import, dojnice, holštýn, mléčná užitkovost

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