

Electronic Journal of Polish Agricultural Universities is the very first Polish scientific journal published exclusively on the Internet, founded on January 1, 1998 by the following agricultural universities and higher schools of agriculture: University of Technology and Agriculture of Bydgoszcz, Agricultural University of Cracow, Agricultural University of Lublin, Agricultural University of Poznan, Higher School of Agriculture and Teacher Training Siedlce, Agricultural University of Szczecin, and Agricultural University of Wrocław.



**ELECTRONIC
JOURNAL
OF POLISH
AGRICULTURAL
UNIVERSITIES**

**2000
Volume 3
Issue 2
Series
ANIMAL HUSBANDRY**

Copyright © Wydawnictwo Akademii Rolniczej we Wrocławiu, ISSN 1505-0297

KUCZAJ M., KRUSZYŃSKI W., PAWLINA E., AKIŃCZA J. 2000. RELATIONS BETWEEN MILK PERFORMANCE AND UDDER DIMENSIONS OF BLACK-WHITE COWS IMPORTED FROM HOLLAND *Electronic Journal of Polish Agricultural Universities*, Animal Husbandry, Volume 3, Issue 2.

Available Online <http://www.ejpau.media.pl>

RELATIONS BETWEEN MILK PERFORMANCE AND UDDER DIMENSIONS OF BLACK-WHITE COWS IMPORTED FROM HOLLAND

Marian Kuczaj, Wojciech Kruszyński*, Edward Pawlina*, Jerzy Akińcza**

Department of Cattle Breeding and Milk Production, Faculty of Biology and Animal Science, Agricultural University, Wrocław, Poland

**Department of Genetics and Animal Breeding, Faculty of Biology and Animal Science, Agricultural University, Wrocław, Poland*

***Department of Pig Breeding, Faculty of Biology and Animal Science, Agricultural University, Wrocław*

[ABSTRACT](#)
[INTRODUCTION](#)
[MATERIALS AND METHODS](#)
[RESULTS](#)
[DISCUSSION](#)
[CONCLUSIONS](#)
[REFERENCES](#)

ABSTRACT

Associations between performance of milk production and udder dimensions of 54 cows imported from Holland and kept in OHZ Kamieniec Ząbkowicki are described. Udder build of analysed animals scored very good but teats were slightly too short. Correlation coefficients between milk production performance traits and indices of udder dimensions were low and statistically insignificant.

Key words: cows, milk yield, udders, correlations

INTRODUCTION

The general appearance of dairy cow, especially its mammary system, is very important as breeding and production goal is concerned. The udder's shape influence milk production and efficiency of machine milking. Research [5, 10] had shown that udder dimensions are the best estimators of milk production potential of primiparous cows. Positive associations between udder traits and milk performance of dairy cows were reported in majority of literature from this field [1, 4, 6, 7, 8].

The aim of this research was to describe relations between udder dimensions and milk performance of young cows imported from Holland to Poland.

MATERIALS AND METHODS

The material consisted of 54 Black-White cows with a high share of HF genes (87,5 - 100%) which were bought in Holland and in the years 1999 – 2000 have been performing as the primiparous dams in the Pedigree Breeding Centre (OHZ) Kamieniec Żąbkowicki.

Milk performance was defined as milk, fat and protein yield and milk fat and milk protein content for 305 days lactation. More detailed description of milk performance of these cows was included in the paper of Kuczaj et al. [3].

Udder dimensions were measured once, between 100 and 180 day of lactation, two hours before milking. The length of udder attachment, horizontal length, fore and rear udder width, depth of foreudder, length and diameter of teats, placement of teats and their distance from the floor were measured.

Collected data were described statistically (\bar{x} , sd, minimum and maximum) and phenotypic correlations were calculated between milk production traits and udder dimensions.

RESULTS

Cows imported from Holland ([tab. 1](#)) characterised with the udders which were long (horizontal length - 44,1 cm and length of attachment - 47,8 cm), broad (foreudder and rear udder width - respectively: 29,3 and 21,0 cm) and deep (depth of foreudder - 24,7 cm). The length of front and rear teats averaged 4,9 and 3,9 cm, respectively. Average teat diameter was 2,7 cm; distance between front and rear teats was 12,5 cm and spacing of front and rear teats reached respectively 13,0 and 5,2 cm.

Table 1. Conformation traits of udders of primiparous cows of Black-White breed imported from Holland

Trait [cm]	\bar{x}	sd	Minimum	Maximum
Horizontal length	44.1	3.9	38.0	54.0
Length of attachment	47.8	3.8	40.0	57.0
Foreudder width	29.3	3.0	23.0	35.0
Rear udder width	21.0	1.7	18.0	25.0
Depth of foreudder	24.8	1.7	22.0	28.0

Rear teats distance to the floor	59.2	2.9	52.0	66.0
Front teats distance to the floor	58.8	2.7	53.0	66.0
Length of front teats	4.9	0.6	3.5	6.0
Length of rear teats	4.0	0.5	3.0	5.0
Diameter of front teats	2.7	0.2	2.2	3.2
Diameter of rear teats	2.7	0.2	2.2	3.2
Distance between front teats	13.0	2.3	8.0	18.0
Distance between rear teats	5.2	1.5	3.5	10.0
Distance between front and rear teats	12.5	1.9	7.5	18.0

Correlation coefficients between udder and teat dimensions and milk production traits of cows were low and statistically insignificant (tab. 2). For example, relations obtained between lactation milk yield and mammary system measurements were as follow: with udder length ($r = 0,01$), with foreudder width and depth (consequently: $r = 0,16$ and $0,25$), with the distance between front and rear teats ($r = 0,16$); for the remaining traits studied correlations were weaker. Correlation between the fat yield per lactation and foreudder depth was found to be $r = 0,21$. Similarly, for the protein yield per lactation positive correlations were stated with the width and depth of foreudder (consequently: $r = 0,21$ and $r = 0,32$) and with the distance between front and rear teats ($r = 0,11$). Positive associations with milk fat content were found for two udder traits only: the distance of rear teats from the floor ($r = 0,02$) and the distance between front and rear teats ($r = 0,08$); other relations were negative. Positive correlations with the milk protein content were found for: the horizontal length of udder ($r = 0,19$), the length of udder attachment ($r = 0,26$), width and depth of foreudder (consequently: $r = 0,13$ and $r = 0,19$) and the distance of front teats to the floor ($r = 0,12$).

Table 2. Correlation coefficients between udder conformation traits and milk performance traits for 305 days lactation

Traits	Yield of:			Milk content of:	
	milk	fat	protein	fat	protein
Horizontal length	0.01	- 0.07	0.07	- 0.10	0.19
Length of attachment	- 0.01	- 0.02	0.07	- 0.02	0.26
Foreudder width	0.16	- 0.04	0.21	- 0.29	0.13
Rear udder width	0.02	- 0.03	0.02	- 0.09	0.02
Depth of foreudder	0.25	0.21	0.32	- 0.02	0.19
Rear teats distance to the	-	-	-0.02	0.02	0.03

floor	0.03	0.03			
Front teats distance to the floor	- 0.03	- 0.07	0.02	- 0.04	0.12
Length of front teats	- 0.05	- 0.16	-0.03	- 0.11	0.11
Length of rear teats	- 0.13	- 0.17	-0.13	- 0.06	-0.01
Diameter of front teats	0.02	- 0.05	-0.07	- 0.10	-0.26
Diameter of rear teats	0.04	- 0.04	-0.07	- 0.10	-0.29
Distance between front teats	0.00	0.01	0.04	- 0.04	0.11
Distance between rear teats	- 0.10	- 0.01	-0.11	0.08	-0.02
Distance between front and rear teats	0.16	0.03	0.11	- 0.15	-0.16

DISCUSSION

All primiparous cows tested in the present research had correct udder conformation. Similar observations were documented by other authors [4, 8, 11] who stated that hybrids of Black-White and Red-White cattle with HF breed were characterised with longer, wider and more strongly attached udders than purebred contemporaries of Polish origin. Cows imported from Germany and France characterised with slightly smaller dimensions of udders when results of present study were compared with data cited by Puchajda et al. [6]. Cows of German and French origin had shorter udders (respectively by 2,5 and 4,0 cm), more narrow (respectively by 0,2 and 5,3 cm) and with less depth (ca 2,0 cm) when compared to cows in the present study. Analysed cows imported from Holland had shorter teats (front ones by 0,4 and rear ones by 0,6 cm) when compared to native primiparous hybrids of Black-White cattle with high share (87,5 - 100%) of HF genes [9].

Distances of teats to the floor of primiparous cows (front ones 58,8 and rear ones 59,2 cm) shown in the present study were similar in values to ones reported for cows of French origin but shorter (by ca. 3,0 cm) when compared to cows of German origin [6]. When compared to hybrids of Red-White x HF cattle [5] distances between teats and the floor reported here were longer by ca 10 cm. As shown by Kozanecki [2] values of these measurements have important implications - bacterial infections are least common when teats are 5,6 - 6,5 cm long and their distance to floor exceeds 50 cm.

Values of phenotypic correlation coefficients obtained between udder measurements and milk performance for the first 305 days lactation, in the present study, were low and negative. These results are in agreement with ones reported by Borkowska et al. [1], who found that correlations between the length, width and depth of udder and milk fat content ranged ca - 0,1. As researched by Szarek et al. [7] correlations between milk fat and protein content and udder measurements in the population of Black-White cows reached very low values, too.

Stronger to obtained in the present research relations between 305 days lactation milk yield and some udder dimensions were reported by other authors [1, 6, 10]. Puchajda et al. [6] obtained statistically highly significant values of correlations between milk protein content and yield and depth of rear udder (respectively: $r = 0,47$ and $r = 0,39$) in the population of cows of French origin. These authors stated also strong relation between the milk fat content and the depth of rear udder of cows of German origin ($r = 0,38$). According to the work of Wójcik and Czaja [10] correlations between the width of udder and yields of milk, fat and protein reached value ca 0,4. Within native population of primiparous cows - hybrids with HF breed genes share above 50%, relations between the fore and rear udder attachment and yields of milk, fat and protein were from $r = 0,21$ to $r = 0,27$.

CONCLUSIONS

1. Udder build of tested primiparous cows of Dutch origin was correct but teats were slightly too short.
2. Relations between milk performance traits and udder dimensions were weak and statistically insignificant.

REFERENCES

1. Borkowska D., Tarkowski J., Gajewska A. (1995). Interdependence between certain traits of conformation and milk yield of breeding cows in three successive lactations. *Ann. Univ. MS-C. Lubl., sec. EE, XIII, 8*: 57-61 [in Polish].
 2. Kozanecki M., Grabowski R., Ściubisz A., Długołęcki L. (1985). Relationship between the udder conformation and the milking ability of cows on the one hand and thier susceptibility to mastitis on the other. *Zesz. Probl. Post. Nauk Rol., 300*: 137-143 [in Polish].
 3. Kuczaj M., Pawlina E., Kruszyński W., Akińcza J. (2000). Relations between body frame and milk performance of Black-White cows imported from Holland. *Electronic Journal of Polish Agricultural Universities, Volume 3, Issue 2, Series Animal Husbandry* [in Polish].
 4. Pawlina E., Białek G. (1991). Some dependences between dimensions of udders and milk yield in the first lactation of breed cows. *Rocz. Nauk. Zoot. Monogr., 27*: 51-65 [in Polish].
 5. Pawlina E., Kruszyński W., Kuczaj M. (2000). An investigation of changes in udder size of Red and White cows in first and third lactation. *Med. Weter., 56*: 672-674 [in Polish].
 6. Puchajda Z., Czaplicka M., Szymańska A.M., Filipiska A. (1999). Correlation between the traits of milking performance and udder size of HF cows imported from France and Germany. *Rocz. Nauk. Zoot., 26, 3*: 49-58 [in Polish].
 7. Szarek J., Mazur A., Węglarz A. (1994). Relationship between the morphological structure of the udder and milk performance of Polish Friesian cows. *Zesz. Nauk. Prz. Hod., PTZ Warszawa, 14*: 77-86 [in Polish].
 8. Szulc T., Michalski Z., Dobicki A. (1991). Changes in the body conformation and milking capacity of cows with different share of genes of the Holstein-Friesian cattle. *Rocz. Nauk. Roln. B-107, 4*: 167-178 [in Polish].
 9. Wójcik P., Czaja H. (2000). The possibility of using conformation testing to predict future performance of Black-and-White cows. *Rocz. Nauk. Zoot., Supl., 6*: 145-151 [in Polish].
 10. Wójcik P., Trela J., Czaja H., Adamik P. (1996). Tendencies of changes in the type and conformation of Polish Cattle over the last years in the light of research by the Institute of Animal Production. *Wyd. ART Olsztyn, Mat. Symp. Nauk. "Hodowla Bydła w Polsce - historia i przyszłość"*: 213-220 [in Polish].
 11. Żółkowski J., Grodzki H. (1991). Improvement of Black-and-White cattle through crossbreeding with Holstein-Friesian bulls and other Friesian strains. *Rocz. Nauk Roln. B-107, 3*: 97-108 [in Polish].
-

Submitted:

Marian Kuczaj
Department of Cattle Breeding and Milk Production
Faculty of Biology and Animal Science
Agricultural University of Wrocław
Kożuchowska 5b; 51-631 Wrocław, Poland
e-mail: kuczaj@khhb.ar.wroc.pl

Wojciech Kruszyński, Edward Pawlina
Department of Genetics and Animal Breeding
Faculty of Biology and Animal Science
Agricultural University of Wrocław
Kożuchowska 7; 51-631 Wrocław, Poland

Jerzy Akińcza
Department of Pig Breeding
Faculty of Biology and Animal Science
Agricultural University of Wrocław
Chełmońskiego 38d; 51-631 Wrocław, Poland

[Responses](#) to this article, comments are invited and should be submitted within three months of the publication of the article. If accepted for publication, they will be published in the chapter headed 'Discussions' in each series and hyperlinked to the article.
