

The effect of management system on lifetime productivity and somatic cell count in milk of black-and-white cows

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Abstract

The aim of the study was to investigate the effect of the management system on lifetime productivity and somatic cell counts in milk of Black-and-White cows. Loose housing of cows was more advantageous than the indoor keeping in terms of longevity, length of productive life, milking, as well as lifetime productivity and somatic cell counts in milk.

Key words: Black-and-White cattle, management system, longevity, yield of life, somatic cell count

Introduction

The aim of dairy cattle breeding nowadays is to improve production traits, including e.g. longevity and resistance to diseases. A cow in modern breeding needs to be healthy, live long and be productive for a long time, giving milk with an advantageous composition. It is more and more commonly assumed that in order to reduce the culling index of cows and extend their productive life, and thus increase their lifetime productivity, lactation should be extended and animals need to be properly fed and managed. Comfortable living conditions result in a lower incidence of mastitis, and thus cows react to medicines more effectively and faster in case of therapy.

The aim of the study was to investigate the effect of the adopted management system on lifetime productivity and somatic cell counts in milk of Black-and-White cows.

Material and methods

Material for the study consisted of Black-and-White cows with a high share of Holstein-Friesian genes in their genotype, culled in a 3-year period. Animals were kept at a large commercial farm in the Wielkopolska region. Experimental cows were divided into two groups depending on the management system: coming from the indoor keeping (219 animals) and loose housing system (212 animals). In both groups the animals were divided into primiparous and multiparous cows. From the

documentation on the production value testing source data were recorded, making it possible to calculate the length of life, productive life and the number of milking days of cows. Moreover, data on lifetime production of milk, butterfat and protein were collected and the productivity of animals was converted into days of milking, productive life and life. Somatic cell counts in milk, tested once a month during routine milk recording of cows, were also collected. In the study the lengths of life, productive life and milking were compared, along with the somatic cell contents in milk of animals kept in the indoor keeping and loose housing systems.

The SAS[®] (2002) software package was used to assess the analyzed dependencies. In the linear model the effect of the following factors was included: age at first calving, year, season, age group, lactation and calving interval. The analysis of variance was conducted and differences between the analyzed factors were estimated using the LSD (Least Significant Difference) test. Somatic cell counts were subjected to logarithmic transformation according to Ali and Shook (1980):

where:

$$y = \ln(x + 10),$$

x – experimental somatic cell count.

Results

Table 1 presents the length of life and lifetime productivity of cows kept in the indoor keeping and loose housing systems. Cows from the loose housing system lived longer, had longer productive lives and longer milking periods (2172, 1321 and 996 days, respectively). Differences between means for the above mentioned traits were at the level of significance $p \leq 0.01$. Similarly, more advantageous production traits were found for animals kept in the loose housing system in comparison to indoor keeping. Lifetime productivity of cows from the loose housing system was 25 515 kg milk, 1024 kg butterfat and 849 kg protein. Statistical analysis showed for the above mentioned milking performance traits highly significant differences between cows kept in both management systems. Moreover, statistical differences were found at the level of significance $p \leq 0.05$ for milk production calculated per day of milking, productive life and life, and bufferfat yield per day of life.

Graphs 1 and 2 present a comparison of the actual and logarithmic somatic cell counts in milk of cows kept in the indoor keeping and loose housing systems. A highly significant lower somatic cell count was found for cows coming from the loose housing system.

Table 2 presents somatic cell counts in milk of cows in terms of age groups. Animals kept in the indoor keeping were characterized by higher somatic cell counts, expressed both in actual and logarithmic numbers (in the group of multiparous cows it

was 524.9 and 12.07, while for primiparous cows it was 235.9 thousand/ml and 11.47 ln/ml) in comparison to cows kept in the loose housing system (250.6 and 11.56, and 211.2 thousand/ml and 11.27 ln/ml, respectively). Statistical analysis showed highly significant differences in the actual number of somatic cells in milk of multiparous cows coming from the tethering system and the number of somatic elements in all compared groups of animals. In turn, primiparous cows in both analyzed systems did not differ statistically in terms of this trait. Similar dependencies were found for LNSCC, while cows after the first calving in both systems differed at $p \leq 0.05$.

Conclusion

The loose housing management system of cows in terms of the length of life, productive life, milking, as well as lifetime production and somatic cell counts in milk was more advantageous than the tethering system.

References

- Ali A.K.A., Shook G.E. (1980): An optimum transformation for somatic cell concentration in milk. J. Dairy Sci. 63:487-490.
- SAS[®] (2002) User's Guide. Statistic version 8.20 editions. SAS Inst., Cary, Nc.

Table 1. Longevity and lifetime production of cows depending on the management system.

Traits	Management system			
	Indoor keeping		Loose housing	
	N = 219 cows		N = 212 cows	
	x	SD	x	SD
Days of life	1 871 A	667	2 172 A	717
Years of life	5 A	2	6 A	2
Days of productive life	1 006 A	659	1 321 A	710
Years of productive life	3 A	2	4 A	2
Days of milking	742 A	442	996 A	541
Milk (kg)	18 727 A	11 795	25 515 A	14 205
Fat (kg)	732 A	471	1 024 A	584
Protein (kg)	608 A	377	849 A	473
Milk (kg) / day of milking	24.44 a	4.66	25.45 a	2.95
Fat (kg) / day of milking	0.95	0.19	1.01	0.14
Protein (kg) / day of milking	0.79	0.15	0.85	0.11
Milk (kg)/ day of productive life	18.87 a	3.63	19.45 a	3.26
Fat (kg) / day of productive life	0.73	0.15	0.77	0.14
Protein (kg)/day of productive life	0.61	0.12	0.65	0.11
Milk (kg) / day of life	9.04 a	3.50	10.86 a	3.27
Fat (kg) / day of life	0.36 a	0.14	0.43 a	0.14
Protein / day of life	0.30	0.11	0.36	0.11

Means with the same letter differ:

A... – highly significantly ($p \leq 0.01$)

a... - significantly ($p \leq 0.05$)

Diagram 1

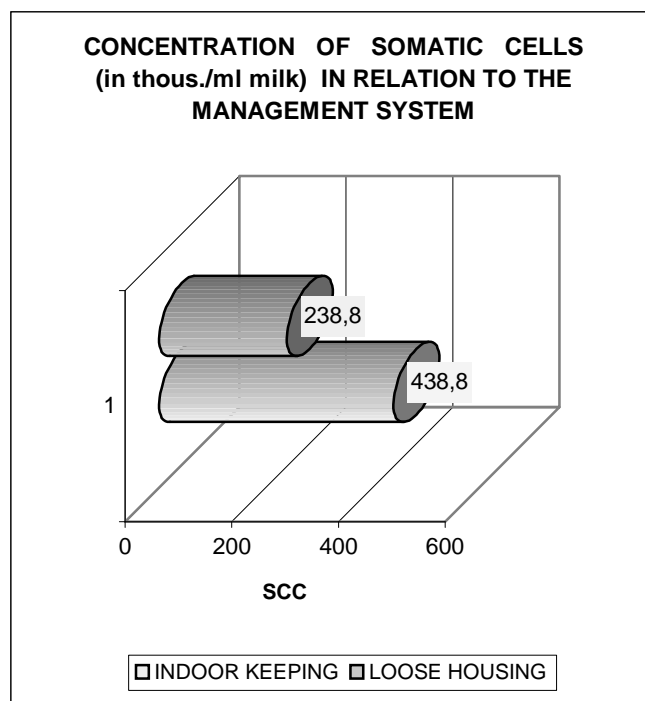


Diagram 2

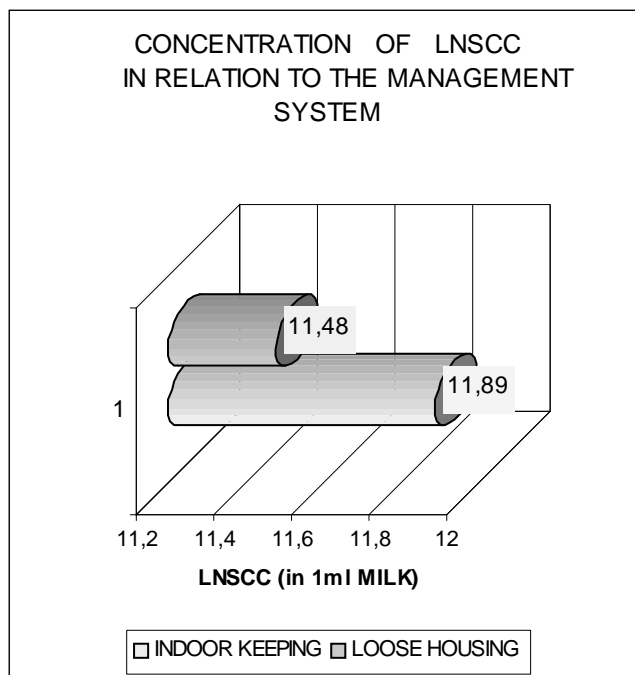


Table 2. Somatic cell count in milk of primiparous and multiparous cows depending on the management system.

Somatic cells count	Management system							
	Indoor keeping				Loose housing			
	Primiparas		Multiparas		Primiparas		Multiparas	
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD
(thous. / ml)	235.9 C	482 100	524.9 ABC	989 190	211. 2 Aa	604 054	250. 6 Ba	672 497
LN	11.47 Da	1.23	12.07 BCD	1.38	11.27 ABa	1.14	11.56 AC	1.17

Means with the same letter differ:

A, B, C... – highly significantly ($p \leq 0.01$)

a, b, c... - significantly ($p \leq 0.05$)