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EFFECT OF THE FEED ADDITIVE EFFECTIVE MICROORGANISMS™ (EM™) ON MILK AND REPRODUCTIVE PERFORMANCE OF POLISH HOLSTEIN- -FRESIAN BLACK-AND-WHITE COWS

WPLYW DODATKU PASZOWEGO EFEKTYWNE MIKROORGANIZMY™ (EM™) NA PRODUKCYJNOŚĆ I PARAMETRY ROZRODCZE KRÓW RASY POLSKIEJ HOLSZTYŃSKO-FRYZYJSKIEJ ODMIANY CZARNO-BIAŁEJ

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Streszczenie. Oceniono wpływ stosowania preparatu EM™ w żywieniu krów mlecznych na produktywność i wybrane parametry rozrodcze. Eksperyment przeprowadzono w gospodarstwie wielkotowarowym w województwie zachodniopomorskim w 2010 roku. Materiał badawczy stanowiło 211 osobników podzielonych na dwie grupy – kontrolną (A) i badawczą (B). W grupie B wraz z paszą podawano dodatkowo probiotyk EM™ przez pierwszy miesiąc, w ilości 150 ml na dzień na krowę, a w kolejnych miesiącach – 75 ml na dzień na krowę. Przeanalizowano wybrane parametry rozrodcze (wiek pierwszego wycielenia i okres międzyciążowy) oraz użytkowość mleczną, biorąc pod uwagę 305-dniowe laktacje. Stwierdzono, że krowy w grupie B w laktacji I charakteryzowały się wyższą wydajnością mleka, FCM, tłuszczu i białka [kg] oraz większą zawartością tłuszczu ($P \leq 0,01$) niż krowy w grupie A. Dodatkowo analizując obie grupy, stwierdzono że, w laktacji III krowy z grupy B uzyskały najwyższą wydajność mleka, FCM, tłuszczu i białka [kg]; w przypadku wydajności białka wynik był istotny ($P \leq 0,05$). Nie stwierdzono natomiast istotnego wpływu podanego probiotyku na parametry rozrodcze i masę urodzeniową cieląt [kg].

Key words: dairy cows, probiotics, milk yield, reproductive parameters.

Słowa kluczowe: bydło mleczne, probiotyki, produktywność, parametry rozrodcze.

INTRODUCTION

Feeding seems to play a pivotal role on milk yield and composition among environmental factors. High performance cows are received large amounts of concentrated feedingstuffs, which are enriched with various additives buffering content of the rumen. These additives, which are called probiotics, improve digestion of nutrients to prevent digestive system diseases and make the best use of feedingstuffs by cows.

Therefore, in the present work it was decided to investigate the influence of EM™ probiotic on production and reproductive performance of cows. The preparation, thanks to the activities of beneficial microorganisms, should in efficient way affect the tested features,

feed intake and better health. Grela and Semeniuk (1999) defined probiotics in animals feeding as live and/or no longer living microorganisms as well as substances supplied by them, which may beneficially affect the host upon ingestion by improving the balance of the intestinal micro flora and its enzymatic activity.

Research on the effect of probiotics on milk yield and composition has been limited. Nevertheless the advantages of using it in ruminants has been found not only in young animals for fattening but also in adults and dairy cattle. Addition of probiotic bacteria to diet of young cattle causes a faster development of their stomachs, reduces enteritis, increases body weight gain and stress resistance associated with transport. Moreover, in adult cattle probiotics may beneficially effect on milk yield, improving the balance of the rumen micro flora and make better use of feedingstuffs (Grela and Semeniuk 1999; Grela 2006).

The aim of the experiment was to evaluate the influence of using EMTM probiotics in dairy cattle feeding on production and reproductive performance of cows.

MATERIAL AND METHODS

The experiment was conducted at large commercial farm in West Pomerania province for one year in 2010 in a herd of 211 Polish Holstein-Friesian breed of Black and White variety (PHF-HO). The cows were divided into two groups: Control Group (A) and Treatment Group (B) kept in the same environmental conditions in tie stall barn and fed with TMR system. Group A (103 cows) were fed a basic diet only and Group B (108 cows) were fed the basic diet supplemented with the EMTM probiotic 150 ml/day/animal in first month of the experiment and 75 ml/day/animal in the successive months. The basic diet (the TMR mixture) throughout the experimental period consisted of corn silage, haylage, sugar beet pulp and concentrated feedingstuffs composed of cereal middlings-wheat and protein components: post-extraction soya meal and rapeseed meal.

The EMTM probiotic was a specially compound mixture of microbes that support processes in animals, thus improving their health, welfare and consequently productivity. The preparation consisted of organisms are not subject to any modification, which was isolated from nature, like lactic acid bacteria, yeast and phototrophic bacteria (emgreen.pl). The preparation was prepared according to a formula given on the packaging by the manufacturer.

In the present paper the chosen reproductive parameters such as: age at first calving and intercalving period and milk performance traits (milk yield, FCM, fat and protein yield [kg] and fat and protein content [%]) were analyzed. In addition, birth weight of calves [kg] was evaluated. The study data were derived from breeding documentation of the farm which is under the evaluation of Polish Federation of Cattle Breeders and Dairy Farmers. In order to compare obtained results fat corrected milk (FCM, kg) – milk yield adjusted for 4% fat content was calculated according to the following formula (Januś and Borkowska 2006):

$$\text{FCM} = (\% \text{ fat} \times 0.15 + 0.4) \times \text{milk yield [kg]}$$

The data were analyzed statistically in Statistica[®]10 PL (StatSoft, Inc. 2011) and the significant differences between mean values of milk traits were determined by Duncan's test.

RESULTS AND DISCUSSION

Table 1 presents the data of milk performance of cows in three consecutive standard lactations considering the division on two groups (A and B). Taking into consideration the average value for all lactations higher milk yield, FCM, fat and protein yield had cows in Group B (respectively 9396.67 kg, 9853.67 kg, 406.67 kg and 321.33 kg) compared to Group A (respectively 8580.67 kg, 9095 kg, 377 kg and 281.33 kg). Moreover, if each lactation was analyzed individually it could be found significant differences between groups. In 1st lactation better results in milk performance was found in Group B and they were significant ($P \leq 0.01$). Also the highest milk yield, FCM, fat and protein yield were obtained by cows in Group B in 3rd lactation (respectively 10 287 kg, 11 074 kg, 464 kg, 390 kg) compared to Group A (respectively 9123 kg, 9743 kg, 406 kg and 300 kg). Significant differences were found in protein yield ($P \leq 0.05$).

Beneficial effect on milk yield and composition of yeast probiotics has been found by few authors. Hossain et al. (2014) studied the effect of probiotics consisted *Saccharomyces cerevisiae*. Their results indicated 8.8% increase in milk production ($P < 0.05$). Kinal et al. (2007) investigated the effect of supplementation yeast metabolites in cows with the average milk yield exceeding 9500 kg in an amount 60 g/days/cows. They found a beneficial effect of preparation on dry matter, protein and solids-not-fat and level of biochemical indices (Ca, P, Zn and Cu in colostrum). Piva (1993) examined Italian Holstein-Fresian cows and observed that milk production significantly improved (26.2 vs 25.4 kg/day), FCM (23.6 vs 21.6 kg/day) and fat yield (0.9 vs 0.78 kg/day). Improvements in dry matter intake by 1.2 kg/day and in milk yield by 1.4 l/day (FCM) have been noted by Williams et al. (1991). Similar results were obtained by Sretenović et al. (2008), Iwańska et al. (2000) and Kudrna et al. (2007).

Other scientists have studied the effect of probiotics on a transition period (period from the end of lactation to 90–100 days of the successive lactation). Mostafa et al. (2014) observed favorable effect of bacteria probiotics supplementation on milka and fat yield. Nocek and Kautz (2006) noted that diet supplemented with probiotics containing yeast culture and bacteria had beneficial effect on milk production, which increased by 2.3 kg/cow/day and animals ingested more dry matter in the ration. After supplementation with similar preparation upward tendency in milk, fat and protein yield was found by Vibhute et al. (2011). But Swartz et al. (1994), Oetzel et al. (2007) and Raeth-Knight (2007) failed to observe any effect on milk yield or composition or dry matter intake when feeding dairy cows a different probiotics preparation.

Analysing Table 2 we failed to obtain advantageous influence of usage probiotics. There were no significant effect of probiotics supplementation on reproductive parameters of cows in contrast to the results of Mostafa et al. (2014). The authors noticed crucial improvement in the reproductive performance of cows after yeast probiotics supplementation. In ongoing study it was found that intercalving period in third lactation has been reduced, which may indicate a positive impact of probiotics on health and animal welfare.

Table 1. Milk usability of cows in three consecutive 305- day lactation considering the division of research and control groups
Tabela 1. Użytkowość mleczna krów w trzech kolejnych 305-dniowych laktacjach, z podziałem na grupy badawczą i kontrolną

Lactation Laktacja	Group A – Grupa A							Group B – Grupa B						
	n	milk mleko	FCM	fat tłuszcz		protein białko		n	milk mleko	FCM	fat tłuszcz		protein białko	
		kg	kg	kg	%	kg	%		kg	kg	kg	%	kg	%
	$\bar{X} \pm se$							$\bar{X} \pm se$						
I	64	7436 ^A (207.53)	7586 ^A (204)	307 ^A (8.66)	4,16 ^A (0.06)	243 ^A (7.03)	3,34 (0.03)	66	8301 ^B (130.29)	8624 ^B (168.59)	354 ^B (8.34)	4.25 ^B (0.07)	272 ^B (3.93)	3.3 (0.02)
II	24	9183 (312.64)	9956 (147.24)	418 (19.65)	4,56 (0.09)	301 (9.75)	3,29 (0.04)	27	9602 (188.35)	9863 (286.33)	402 (15.20)	4.17 (0.11)	302 (12.49)	3.27 (0.03)
III	15	9123 (494.13)	9743 (628.34)	406 (30.28)	4,42 (0.18)	300 ^a (15.52)	3,31 (0.05)	15	10287 (360.05)	11074 (410.16)	464 (18.85)	4.51 (0.11)	390 ^b (10.64)	3.30 (0.05)
Average for all lactation Średnia wartość dla wszystkich laktacji	\bar{X}	8580.67	9095	377	4.38	281.33	3.31	\bar{X}	9396.67	9853.67	406.67	4.31	321.33	3.29

A,B – differences significant at – różnica istotna na poziomie $P \leq 0,01$; a,b – differences significant at – różnica istotna na poziomie $P \leq 0,05$.

Table 2. The comparison of selected fertility indices in analyzed groups
Tabela 2. Porównanie wybranych wskaźników płodności w analizowanych grupach

Reproductive parameters Parametry rozrodcze	Control group A Grupa kontrolna A	Treatment group B Grupa doświadczalna B
	$\bar{X} \pm se$	$\bar{X} \pm se$
Age at first calving [days] Wiek pierwszego wycielenia [dni]	753 (12,55)	753 (5,44)
2 intercalving period [days] 2 okres międzyciążowy [dni]	452 (21,78)	506 (27,66)
3 intercalving period [days] 3 okres międzyciążowy [dni]	421 (17,17)	387 (15,78)

CONCLUSIONS

Summarizing it can be concluded that diet supplemented with EMTM probiotic may have a beneficial effect on the milk yield performance of the cows. In contrast, no significant effect of that supplementation were found in reproductive parameters.

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Abstract. The aim of study was to evaluate the influence of using EMTM probiotics in dairy cattle feeding on production and reproductive performance and birth weight of calves. The present investigation was undertaken at a large commercial farm in West Pomerania province in 2010. 211 cows were chosen to determine the effect of EMTM probiotics on studied parameters. These cows were divided into two groups: Control Group (A) and Treatment Group (B). Group B were fed during first month of the experiment 150 ml/day/animal probiotics and in next months 75 ml/day/animal. In current work we analyzed chosen reproductive parameters (age at first calving and intercalving period) and milk performance in standard lactation. It has been noticed that cows in Group B in 1st lactation characterized higher milk yield, FCM, fat and protein yield [kg] and fat content ($P \leq 0.01$) compared to Group A. In addition, during comparing both groups it was found that cows in Group B in 3rd lactation received the highest milk yield, FCM, fat and protein yield [kg]. Considering protein yield the result was significant ($P \leq 0.05$). On the other hand, no significant differences were found for using EMTM probiotics on reproductive parameters and calves' birth weight [kg].