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COMPARISON OF MARE'S MILK COMPOSITION OF DIFFERENT BREEDS

PORÓWNANIE SKŁADU MLEKA KLACZY RÓŻNYCH RAS

Summary. The aim of this work was to estimate the breed influence on composition of mare milk. Milk samples in amount about 100 ml were collected from similar aged mares of four breeds: wielkopolski (9 mares), cold-blood (10), Polish konik (10) and hucul (11) between 80 and 90 day of lactation. Milk samples obtained by manual milking were weighted for density calculation and homogenized with Ultra Turrax T-25 apparatus and then analyzed with FTIR – MilkoScan FT 120 apparatus for chemical composition. Obtained results were statistically analyzed using ANOVA one-factor variance and Tukey's test. It could be concluded that breed affects the composition of mare milk, especially protein, fat and lactose level. Cold-blood mares were characterized by producing milk with the lowest level of dry matter, fat and free fatty acids. Polish konik mares produced milk with highest level of dry matter, fat, lactose and urea. The protein richest milk was produced by hucul mares.

Key words: mare's milk, milk composition, horse breed

Introduction

Many factors (genetic, physiological, nutritional, environmental) affect milk composition of mammalian species. Mare's milk, besides its role for foals, is also used in human nutrition, mainly in eastern Asia. In the last years there has been an increasing interest in it as food in Europe, mainly Germany, France, Italy and also in Scandinavia (MALACARNE et AL. 2002). Some study results suggest that mare's milk could be used instead of cow milk in allergic children (BUSINCO et AL. 2000). Many authors studied the changes in mare's milk composition, its physical properties and hygiene quality during lactation (CSAPO et AL. 1995, SALIMEI et AL. 2002, DANKÓW et AL. 2006 b, DOREAU and MARTUZZI 2006, PIKUL and WÓJTOWSKI 2008). DOREAU and BOULOT

(1989) in their review work described the effect of many factors on mare milk composition. These authors shown the influence of breed, too. Unfortunately, last years the works concerning the effect of breed on mare milk yield and composition are rare. Therefore the aim of this work was to estimate the breed influence on composition of mare milk.

Material and methods

Milk samples in amount of about 100 ml were collected from 40 mares of similar age (between 7 and 10 years old) of four breeds: wielkopolski (9), cold-blood (10), Polish konik (10) and hucul mares (11) between 80 and 90 day of lactation. All horses were managed in a similar way and kept in group stables where mares were still tied up but foals were kept free. The studied animals were fed with pasture grass and oats, good meadow hay with free access to water and salt-mineral blocks. Daily doses were calculated according to their breed (body size). Milk samples were taken by manual milking from one nipple when foal was drinking milk from the other into plastic bottles. The samples were frozen in -18°C till the analysis. After refreezing milk samples were weighted for density calculation and homogenized with Ultra Turrax T-25 apparatus and then analysed with FTIR – MilkoScan FT 120 apparatus for chemical composition (dry matter, total fat, total protein, lactose, free fatty acids, urea and also density). The obtained results were statistically analysed using ANOVA one-factor variance. Tukey's test was used for estimating significance of differences between studied breeds.

Result and discussion

Total density for milk of all studied mares was 1037,12 g per 100 ml and the differences between breeds were only slightly marked – the highest density was observed for wielkopolski mares and the lowest for Polish koniks. Any statistical differences between breeds were noted (Table 1). DANKÓW et AL. (2006 a) studying milk of wielkopolski mares showed between 77 and 94 days of lactation slightly lower density (between 1033.1 and 1031.0 g per 100 ml) than in our study. Similar density was observed by MARIANI et AL. (1996) for Italian mares and BORNAZ et AL. (2010) for Arabian mares while WALECHLI et AL. (1990) studying mares of different breeds shown much higher density (1.28 g per 100 ml). PAGLIARINI et AL. (1993) noted lower density (1.033 g per 100 ml) for German and Italian mares.

The studied cold-blood mares were characterised by the lowest level of dry matter (9.28%) while Polish koniks produced milk with the highest level of this component (9.95%) but the differences were not significant (Table 1). Most authors showed higher level of dry matter in mare's milk (FUENTES GARCIA et AL. 1991, CSAPO-KISS et AL. 1994, POOL-ANDERSON et AL. 1994, MARIANI et AL. 1996, MALACARNE et AL. 2002, DANKÓW et AL. 2006 a, PIKUL and WÓJTOWSKI 2008) comparing to our results while PAGLIARINI et AL. (1993) showed lower level of dry matter for German mares.

Table 1. Milk composition of mares of different breeds
Tabela 1. Skład mleka klaczy różnych ras

Item Element	Wielkopolski Wielkopolska	Cold-blood Zimnokrwista	Polish konik Konik polski	Hucul Hucuł	Total Razem
Density (g per 100 ml) Gęstość (g w 100 ml)	1 037.67	1 037.07	1 036.57	1 037.21	1 037.12
Dry matter (%) Sucha masa (%)	9.52	9.28	9.95	9.67	9.61
Protein (%) Białko (%)	1.17 AB	1.57 ACa	1.15 CD	1.85 BDa	1.45
Fat (%) Tłuszcz (%)	0.8	0.49 A	1.14 A	0.92	0.84
Free fatty acids (mmol per 10 l) Wolne kwasy tłuszczowe (mmol w 10 l)	8.54	4.86	8.36	5.24	6.67
Lactose (%) Laktoza (%)	7.62 a	7.21	7.73 A	7.04 Aa	7.38
Urea (%) Mocznik (%)	0.07 Aa	0.07 B	0.09 AC	0.05 BCa	0.07

Means in rows marked by the same capital letter differ highly significantly ($p < 0.01$).

Means in rows marked by the same small letter differ significantly ($p < 0.05$).

Średnie w wierszach oznaczone tą samą wielką literą różnią się wysoce istotnie ($p < 0,01$).

Średnie w wierszach oznaczone tą samą małą literą różnią się istotnie ($p < 0,05$).

Protein level in milk of studied mares was characterized by the highest variation – Polish konik mares produced milk with significantly ($p \leq 0.01$) lower level of this component (1.15%) comparing to cold-blood (1.57%) and hucul mares (1.85%) (Table 1). Also wielkopolski mares were characterized by significantly ($p \leq 0.01$) lower level of protein (1.17%) comparing to cold-blood and hucul mares. Significantly lower ($p \leq 0.01$) concentration of urea was also observed for huculs (0.05%) comparing to Polish koniks (0.09%) and cold-blood mares (0.07%) (Table 1). Most cited above authors showed higher level of protein comparing to our results but KUBIAK et AL. (1991) noted similar level of protein for quarter horse mares.

Significant differences in fat level in milk of studied mares was also observed – Polish koniks gave milk with higher level (1.14%) than cold-blood mares (0.49%, $p \leq 0.01$) which also produced milk with the lowest level of free fatty acids. Most authors (FUENTES GARCIA et AL. 1991, CSAPO-KISS et AL. 1994, POOL-ANDERSON et AL. 1994, MARIANI et AL. 1996, MALACARNE et AL. 2002, DANKÓW et AL. 2006 a, PIKUL and WÓJTOWSKI 2008, PIKUL et AL. 2008) showed higher level of fat and free fatty acids except POOL-ANDERSON et AL. (1994) who noted similar to our results of content of fat. However, KUBIAK et AL. (1991) shown significantly lower level of fat for quarter horse mares. The significantly ($p \leq 0.01$) lower level of lactose (7.04%) was characterized for hucul mares comparing to Polish koniks (7.73%) and to wielkopolski mares (7.62%, $p \leq 0.05$, Table 1). Lactose level shown in most works was lower than observed in our study, only PAGLIARINI et AL. (1993) observed similar content of this milk compound.

Conclusion

On the basis of the achieved results it is possible to conclude that breed as the genetic factor affects the composition of mare milk, especially protein, fat and lactose level. Cold-blood mares were characterised by producing milk with the lowest level of dry matter, fat and fatty acids which could be connected to their higher milk production. Polish konik mares, which are treated as primitive horses, produced milk with the highest level of dry matter, fat, lactose and urea. The protein richest milk was produced by hucul mares.

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PORÓWNANIE SKŁADU MLEKA KLACZY RÓŻNYCH RAS

Streszczenie. Celem pracy było oszacowanie wpływu rasy na skład mleka klaczy. Próby mleka w ilości około 100 ml pobierano w trakcie doju ręcznego od 40 klaczy czterech ras: wielkopolskiej (9 klaczy), zimnokrwistej (10), konika polskiego (10) i hucuła (11) między 80. a 90. dniem laktacji. Następnie próby mleka ważono w celu określenia ciężaru właściwego mleka, homogenizowano je w aparacie Ultra Turrax T-25 i poddano analizie chemicznej w aparacie FTIR – MilkScan FT 120. Uzyskane dane poddano analizie statystycznej z użyciem jednoczynnikowej analizy wariancji ANOVA oraz testu Tukeya. Na podstawie wykonanych analiz można stwierdzić, że skład mleka klaczy zależy od ich rasy. Klacze zimnokrwiste, produkujące największą ilość mleka, cechowały się najniższym poziomem suchej masy, tłuszczu i wolnych kwasów tłuszczowych w mleku, natomiast klacze rasy konik polski dawały mleko o największej zawartości suchej masy, tłuszczu, laktozy i mocznika. Mleko najbogatsze w białko pochodziło od klaczy rasy huculskiej.

Słowa kluczowe: mleko klaczy, skład mleka, rasa koni

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