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MARIA TIETZE, TADEUSZ MAJEWSKI, MONIKA BUDZYŃSKA

Chemical Composition of Milk of Different Genotypes Sheep

Skład chemiczny mleka owiec o różnych genotypach

Sheep milk is very valuable for a human due to its high nutritional value and high fat and protein content. Chemical composition of milk is differentiatied by many factors of genetical and environmental nature such as: nutrition, lactation sequence, number of born and fed lambs, udder healthiness state as well as stress. Interest in dairy performance direction of breeds not only dairy ones still increases because milkability is a condition of a proper lamb rearing, it affects their survival and ensures the food. It also determines the growth and development rate of lambs, which in turn determines the usefulness for production means. The purpose of the present study was to estimate the chemical composition of milk from sheep performed in a non-dairy way.

MATERIAL AND METHODS

Studies were carried out in 1994-1995 in experimental sheep-houses belonging to University of Agriculture, Lublin: Bezek and Uhrusk. Milk samples were taken three times during lactation (15^{th}, 45^{th} and 75^{th} days) from sheep of the following breeds: Polish lowland sheep, Suffolk and hybrids with Suffolk, Berrichonne and its hybrids as well as hybrids of Olkuska breed. Totally, 213 investigation series were done. Sheep from which milk was taken were between the 1^{st} and the 7^{th}

lactations and they were under continuous medical-veterinary control. Feeding was based on doses recommended by normatives.

Fat, protein and lactose levels were estimated in milk using Milko-Scan apparatus. Moreover, dairy yield was also estimated.

The obtained results were statistically elaborated for every sheep-house, calculating mean values as well as standard deviations for general milk components. Significance of differences was estimated using Duncan multiple test. Two significance levels were accepted: $P \leq 0.01$ and $P \leq 0.05$.

RESULTS AND DISCUSSION

Fat content in milk from Bezek was 4.31% on the average and it was significantly differentiated ($P \leq 0.01$) between breeds in the second week of lactation increasing up to 5.46% in the 11th week. Protein level ranged from 6.00% to 7.61%. Significant differences ($P \leq 0.01$) occurred within breeds in the 5th week of lactation. The lowest protein content – 5.43% – was found in milk from Polish lowland sheep, the highest – 7.43% – in milk from hybrids with Olkuska share breed (Table 1). Along the lactation course, lactose content decreased from 5.61% to 4.72%, but significant differences were not noted.

Level of general milk components was significantly differentiated depending both on lactation period and on breed in milk from Uhrusk. Along with the lactation course, protein content increased from 5.51% to 8.36%. Lactose level decreased from 5.59% to 4.46%. There were noted significant differences ($P \leq 0.01$) between particular breeds as regarding protein, fat and lactose contents. Milk from Berichonne ewes contained the highest levels of these components, from Olkuska hybrids – the lowest (Table 2).

Dairy yield during lactation over the whole study period for Bezek sheep-house amounted to about 106kg for Polish lowland sheep, 111 kg for Suffolk and about 107 kg for hybrids with Olkuska breed, on the average.

In Uhrusk, the highest efficiency was recorded for Berrichonne – about 115 kg, the lowest for Polish lowland sheep – about 100 kg.

Change of direction of Polish sheep breeding from woolen into meaty requires many lambs rearing. Mothers are demanded by high prolificacy as well as good quality of milk. Milk is one of the basic products obtained from sheep. Studies made by Mroczkowski (4), Kalinowska (3), Skolasiński (5), Gruszecki (2) and others point that yield and composition of sheep milk significantly affect the lamb gains. First life weeks determine which gains of youth, which depend on quantity and quality of food. The richer food, the less is needed for 1 kg of lamb's body weight gain. Results obtained from our studies confirmed investigations of other authors (1-5) as regarding the increase of fat and protein content along with lactation course. Skolasiński (5), Mroczkowski (4), Boncza r (1) proved the presen-

Table 1. Content of general milk components from Bezek sheep-house during three lactation periods

Study stage	Breed*	Number of series	15th day of lactation						45th day of lactation						75th day of lactation					
			protein		fat		lactose		protein		fat		lactose		protein		fat		lactose	
			x	s	x	s	x	s	x	s	x	s	X	S	x	s	x	s	x	s
I	P	39	5,26^{B}	1,86	4,35	0,41	5,61	0,41	5,43^{B}	2,37	5,19	0,87	4,79	0,41	7,59	1,94	5,27^{A}	0,99	4,72	0,40
	S	24	6,42^{A}	1,83	4,51^{A}	0,51	5,42	0,36	6,66^{A}	3,03	5,33	1,30	4,55	0,90	7,96	2,10	5,32^{A}	0,78	4,56	0,38
	FS	23	6,27^{A}	1,58	4,17^{B}	0,36	5,42	0,32	6,93^{A}	2,14	5,21	0,76	4,46	0,67	7,10	1,21	5,46^{A}	0,60	4,44	0,22
	FO	22	6,59^{A}	0,96	4,15^{B}	0,35	5,48	0,41	7,43^{A}	1,27	5,15	0,52	4,50	0,63	7,78	1,39	4,54^{B}	0,65	4,59	0,31
	sub-total	108	6,00	1,72	4,31	0,43	5,50	0,39	6,43	2,42	5,22	0,90	4,61	0,65	7,61	1,75	5,17	0,86	4,60	0,36
II	P	38	6,26	2,18	4,28^{B}	0,57	4,99	0,39	6,96	2,34	4,86^{B}	0,67	4,80	0,46	6,64^{B}	1,78	5,73	1,10	4,72^{A}	0,55
	S	24	6,43	2,37	4,82^{A}	1,05	4,88	0,45	7,86	2,07	5,34^{A}	0,65	4,60	0,41	8,55^{A}	1,48	5,93	1,09	4,58	0,32
	FS	22	6,33	1,80	4,22^{B}	0,68	5,00	0,32	7,01	2,02	4,95^{B}	0,75	4,71	0,27	8,36^{A}	1,76	6,08	1,38	4,46^{B}	0,50
	FO	21	6,01	1,30	4,04^{B}	0,35	5,08	0,27	7,95	1,82	4,87^{B}	0,49	4,69	0,21	7,59^{A}	0,91	5,36	0,89	4,72	0,26
	sub-total	105	6,25	1,98	4,34	0,74	4,99	0,37	7,36	2,14	4,99	0,67	4,71	0,37	7,61	1,75	5,78	1,11	4,63	0,45
Total		213	6,12	1,85	4,32	0,60	5,25	0,46	6,89	2,32	5,11	0,80	4,66	0,53	7,61	1,74	5,47	1,05	4,61	0,40

^{A,B} significant at P≤0.01 within breeds; *P- Polish lowland sheep, S – Suffolk, FS – Suffolk hybrids, FO – Olkuska hybrids.

Table 2. Content of general milk components from Uhrusk sheep-house during three lactation periods

Study stage	Breed*	Number of series	15th day of lactation						45th day of lactation						75th day of lactation					
			protein		fat		lactose		protein		fat		lactose		protein		fat		lactose	
			x	s	x	S	X	s	x	s	x	S	X	s	x	s	X	s	x	s
I	P	46	4,63^{B}	0,47	4,87^{B}	1,17	5,84^{B}	0,28	5,29^{A}	0,63	6,41^{B}	1,43	4,84^{A}	0.17	5,41^{B}	0,78	7,92^{B}	1,38	4,50	0,84
	B	23	5,56^{AC}	0,54	6,46^{AC}	1,73	5,01^{A}	0,46	5,65^{A}	0,54	7,40^{A}	1,54	4,37^{B}	0,41	^{A}	0,89	9,06^{A}	1,81	4,32	0,41
	FB	10	5,24^{A}	0,46	7,00^{C}	1,81	5,50^{AC}	0,31	5,12	0,52	5,47^{B}	0,55	4,65^{AC}	0,23	5,79	0,35	8,08	0,68	4,35	0,36
	O	8	4,51^{B}	0,43	4,57^{B}	0,76	5,92^{BC}	0,20	4,66^{B}	0,46	5,69^{B}	1,29	5,10^{AD}	0,20	5,20^{B}	0,29	8,31	1,72	4,55	0,26
	sub-total	87	4,93**	0,64	5,51	1,64	5,59**	0,49	5,30**	0,63	6,50	1,50	4,72	0,35	5,62	0,81	8,36**	1,54	4,44**	0,66
II	P	46	4,54^{B}	0,49	5,24	1,38	5,14	0,37	4,59^{B}	0,54	5,82^{B}	1,58	4,68^{B}	0,41	5,17^{A}	0,77	5,67^{B}	1,58	4,72	0,50
	B	23	5,01^{A}	0,43	4,95	1,24	5,01	0,41	5,27^{A}	0,89	7,19^{A}	1,88	4,53^{B}	0,34	6,37^{A}	1,14	6,91^{A}	1,55	4,57	0,32
	FB	10	4,47^{B}	0,54	5,33	0,96	5,29	0,16	4,52^{B}	0,48	7,10^{A}	2,03	4,76	0,23	5,75^{A}	0,91	6,99^{A}	1,44	4,57	0,48
	O	8	4,51^{B}	0,46	5,69	0,81	5,02	0,45	4,26^{B}	0,47	6,05	0,82	4,99^{A}	0,10	4,45^{B}	0,32	5,83	0,77	4,83	0,26
	sub-total	87	4,65**	0,52	5,21	1,26	5,11**	0,38	4,73**	0,72	6,41	1,80	4,68	0,37	5,49	1,05	6,17**	1,60	4,67**	0,44
Total		174	4,79	0,59	5,36	1,46	5,35	0,50	5,02	0,73	6,45	1,65	4,70	0,36	5,56	0,94	7,26	1,91	4,56	0,57

^{A,B} significant at P≤0.01 within breeds; **- significant by P≤0.01 between stages research; *P- Polish lowland sheep, B – Berrichonne, FB – Berrichonne hybrids, O – Olkuska.

ce of clear inter-breed differences in mean fat content. Significant differences of protein content from 4% to 6% were also noted although they were not so evident as for fat. The highest protein content was recorded in Berrichonne and Suffolk milk. The percentage of lactose was not significantly differentiated between breeds. At the final stage of lactation, significant difference of lactose amount was found for Polish lowland sheep and Olkuska hybrids.

Dairy yield over 100-day lactation in Bezek and Uhrusk calculated on the basis of daily efficiencies was high. According to Mroczkowski (4) it was higher than that for other breeds of sheep commonly performed in non-dairy direction. Apart from the genetical assumptions that first of all differentiate the variability of dairy yield, environmental conditions, lactation length, feeding, maintenance, udder healthiness and various methods of milkability estimation should be taken into account. One should suppose that such high milkability was affected by vitamin and carrot addition into the nutrition dose.

CONCLUSIONS

1. Content of general milk components from sheep of various genotypes did not show significant differences.

2. Fat and protein content increased along with the lacatation course.

3. Dairy yield of non-dairy sheep was high and amounted from 106kg for Polish lowland sheep to 115 kg for Berrichonne breed.

REFERENCES

1. Bonczar G.: Zmiany składu chemicznego i cech fizycznych mleka owczego w zależności od stanu zdrowotnego wymienia. Rozprawa habilitacyjna. Zesz. Nauk. AR Kraków,1989.
2. Gruszecki T.: Określenie przydatności maciorek polskiej owcy nizinnej w typie uhruskim do krzyżowania towarowego z trykami ras mięsnych. Rozprawa habilitacyjna. Wyd. AR Lulin,1989.
3. Kalinowska Cz.: Współzależność między mlecznością matek a wzrostem jagniąt jako czynnik selekcyjny. Ann. Univ. Mariae Curie-Skłodowska, sectio EE, vol. 21, Lublin 1976.
4. Mroczkowski S.: Mleczność merynosa polskiego w świetle badań pogłowia w Sobiejuchach. Rozprawa habilitacyjna. AT-R Bydgoszcz,1988.
5. Skolasiński W., Charon M.K.: Skład mleka owiec niektórych ras występujących w Polsce. Biul. Inf. Inst. Zoot., 4, 58-70,1986.

STRESZCZENIE

Celem badań była ocena składu chemicznego mleka owiec użytkowanych niemlecznie. Badania przeprowadzono w latach 1994-1995 w owczarniach doświadczalnych Akademii Rolniczej w Bezku

i Uhrusku. Próby mleka pobierano trzykrotnie w ciągu laktacji. W mleku owiec ras: polskiej nizinnej, suffolk, berrichonne, olkuskiej i u ich mieszańców (FS, FO) oceniano zawartość tłuszczu, białka i laktozy aparatem Milko-Scan oraz dobową wydajność mleczną metodą oksytocynową. Stwierdzono, że w mleku owiec z Bezka zawartość tłuszczu wynosiła średnio 4,31% i wzrastała do 5,46% w miarę trwania laktacji. Zawartość białka wahała się od 6,00 do 7,61%, zaś poziom laktozy ulegał obniżeniu z 5,61% w I fazie laktacji do 4,72% w 75 dniu 100-dniowej laktacji. Podobne wartości uzyskano w mleku owiec z Uhruska, przy czym wystąpiło istotne statystycznie zróżnicowanie w zawartości składników w obrębie ras i najwyższą odnotowano u matek rasy berrichonne. Wydajność mleka owiec ras niemlecznych wahała się od 106 do 115 kg mleka w ciągu laktacji.