Sheep´s Milk, Production and Welfare in Rearing of Sheep

Mária Angelovičová, Daniela Liptaiová, Kamil Močár, Dávid Štofan

Slovak University of Agriculture v Nitre, Faculty of Biotechnology and Food Sciences, Department of Hygiene and Food Safety, Tr. Andreja Hlinku 2 , 949 76 Nitra. Tel.: 00421/37/641 5808

Abstract

The milk of Reformed Wallachian sheep obtained by manual and machine milking of ewes contained in the 70.th day of lactation 16.87 g per 100 g^{-1} of dry matter, 6.36 g per 100 $g^{-1}$of fat and 5.25 g per 100 g^{-1} of proteins. On the 130th day of lactation was statistically significant ($P<0.05$) the increase of the contents of dry matter to 17.85 g per 100 g^{-1},the fat to 6.83 g per 100 g^{-1} and the proteins to 11 g per 100 g^{-1}. On the 190th day of lactation was statistically significant ($P<0.05$) the increase of dry matter content to 19.69 g per 100 g^{-1}, the fat to 7.90 g per 100 g^{-1} and the proteins to 6.76 g per 100 g^{-1}. Milk production in the year 2008 was 64.83 l and in the year 2009 62.7 l. On the farm was kept in the year 2008 the average of 712 ewes with the number of 724 lambs, 23 rams and 202 sheep over the age of 1 year. In the year 2009 there were about 721 ewes with 730 lambs, 25 rams and 210 sheep over the age of 1 year. The sheep were kept during the winter in a stall (deep litter). The sheep had unrestricted access to the grain feed and water.

Keywords: dry matter, fat, lactation, proteins, sheep's milk.

1. Introduction

Health is the basis of production and reproduction in populations of livestock. Disease in livestock production systems can cause economic losses in relation to morbidity, mortality, cost of medicines, extra work, reduced production of cured animals, health and safety of animal products [1].

Animal "welfare" is one of the most modern approaches to the evaluation of the complex needs of animals. It is characterized by physiological, psychological harmony of body and optimal relationship to the environment in which they live. The basic criteria include good health, welfare and natural behaviors of animals [2].

Hygiene in milk production holdings, according to some criteria for raw sheep's milk are given in Regulation of the European Parliament and Council Regulation (EC). 853/2004 [3].

Raising sheep and the sheep milk production and meat also creates the possibility of long-term development and economic stabilization of sheep breeding. This creates pressure to the development of human and material resources, including investments, compared with state guarantee [4].

It is generally known that sheep's milk in its composition is significantly different from the milk of other species of livestock. It is characterized by a higher content of protein, lactose, fat and solids. Sheep's milk is used to manufacture various kinds of cheeses, the quantity and quality is dependent on the representation of their constituents. The issue of the composition of sheep's milk has become a frequent subject of research monitoring [5, 6, 7].

Chemical composition of milk is a key indicator for the use of expression adopted animal feed for milk production and also determines its suitability as a raw material for the manufacture of dairy products, especially cheeses. Organoleptic characteristics of raw ewe's milk quality are: a homogeneous liquid without sediment, flakes and coarse dirt, white with pale yellow hue, sweet

* Corresponding author: Mária Angelovičová, *Tel.: 00421/37/641 5805, E-mail: maria.angelovicova@gmail.com*

taste and smell clean without foreign flavors and odors. Raw sheep milk should contain in 100 g at least 5.5 g of fat, less than 4.8 g of protein; solids at least 9.5 weight percent. Its density should be at least 1.033 $g.cm^{-3}$, titratable acidity (as determined by the Soxhlet-Henkel) more than 12.0 and may not contain inhibitory substances [8].

Table 1. Dynamics of changes basic components of sheep´s milk during lactation.[9].

	Average day of lactation							
	46	74	102	132	162	190	Mean	
Dry mater, %	Mean	16.66	16.92	17.66	17.79	19.91	19.98	18.50
Fat, %	Mean	5.45	6.02	6.41	6.49	7.54	7.70	6.44
Protein, %	Mean	5.24	5.30	5.64	6.22	6.54	6.64	5.93
Casein, %	Mean	3.95	4.04	4.34	4.79	5.03	5.08	4.53
Lactose, %	Mean	4.97	5.09	4.90	5.13	5.05	4.78	4.99

The overall assessment of the dynamics of changes of components of sheep milk during lactation in sheep breed Východofrízsky sheep and Reformed Wallachian shows that the average content of dry matter, fat, protein and casein had an upward trend. In contrast, the lactose content varied from the beginning until the 132 day of lactation. From the 132nd day (5.13%) until the end of lactation (4.78%) has been a steady decrease of this component. The average dry matter content, fat, protein, casein and lactose varied depending on the date of lactation in the range: 16.66 to 19.98% from 5.45 to 7.70%, from 5.24 to 6.64%, from 3.95 to 5.08% and 4.78 to 5.13%, while for the entire lactation, the content of basic milk components were: 18.5%, 6.44%, 5.93%, 4.53% and 4.99 % [9].

The aim of this contribution was the presentation of results from experiments with ewes, in which we aimed to assess the conditions of breeding, milk production in dairy ewes and chemical analysis of ewe's milk.

2. Materials and methods

Experiments and the subject of monitoring

The experiments were conducted on a sheep farm in the foothills of central Slovakia. Object of experiments were ewes, their milk production and selected indicators of the chemical composition of milk during the years 2008 and 2009. On this monitored farm are kept Reformed Wallachian sheep. From late November until the end of March were the sheep reared in a stall and from late March to late November in a sheep-fold way. Top of lactation in ewes included in the experiment was the end of March in 2008 and 2009 and for sampling of milk were included 10 ewes for selected indicators for monitoring of the chemical composition of sheep milk in the year 2009. With all ewes were conducted a traditional rearing of lambs, milk and fattening. The farm kept in the year 2008 a number of 712 ewes with lambs born to the number 724, 23 lambs and 202 sheep (ewe lambs) over 1 year of age. In 2009 the number of ewes rose to 721 with lambs born to the number 730, the number of rams was 25 and the number of sheep was 210. Sheep were kept in the barn on deep litter, which consisted of hay. They were fed with fodder - meadow hay, which was in the manger. Sheep had an unlimited access to fodder and water. At the time of labor they were fed with an additional nuclear mixture. In the summer grazing period were the sheep placed in the fold and fed grazing forage stand, which was divided into morning and afternoon period. The characteristics o Reformed Wallachian breed. Ewes Weight: 50-55 kg breed standard and breeding goal 55 kg and more. Milk production per lactation: breed standard 140-160 breeding objective 180 l and more. Protein content of milk: breed standard fom 5.1 to 6.4% and breeding goal: from 5.1 to 6.4%, or improved. The fat content of milk: breed standard is from 6.5 to 9.0% and breed goal from 6.5 to 9.0%.

Viewed indicators

Samples were collected from the morning milking in three intervals of the average lactation 70, 130 and 190 days in the year 2009 for the determination of dry matter, protein and fat. We watched daily the total quantity of milk obtained by milking period from all 712 lactating ewes in 2008 and 721 in the year 2009, which we converted to a standard lactation of 150 days for average milk production per ewe and average daily milk production per ewe.

The method of monitoring indicators in selected experiments

To assess the production of lactating ewes was obtained the milk of ewes in milking machine

with 24 milking stall and manual milking. For chemical analysis of milk was the sample taken via hand milking - taking a sample to a templet. Milk samples were stored during transport to the chemical laboratory manual in the refrigerator. Milk samples were analyzed for dry matter, fat and protein according to Official Journal of the European Communities L 407/29 [10]. Raw data from experiments were evaluated according to basic mathematical and statistical characteristics (mean - average, SD = standard deviation, cv = coefficient of variation) and indicators of differences between groups were evaluated by ANOVA in the SAS program system, version 8.2

3. Results and discussion

Terms of sheep breeding in Slovakia is closest to the requirements of the welfare of all breeds of livestock. This also applies to conditions of sheep on the assessed farm. Sheep were kept in the free housing in the barn during the winter period from late March to late November. The barn had a deep litter. Litter material was hay meadow. Sheep had unlimited access to roughage - hay, which was in the manger. Similarly, sheep had unlimited access to water. Nuclear mixture was added only to the ewes in the time of labor. Weaning of the lambs was made the classic way. Such a method of sheep breeding on the farm qualifies for welfare application.

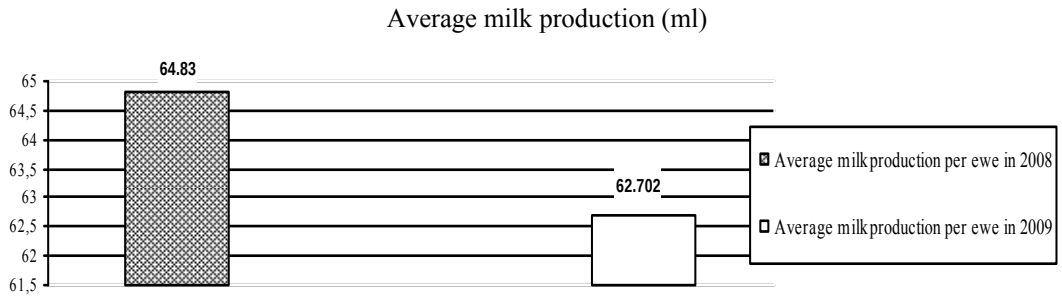

Figure 1. Average daily milk production per ewe

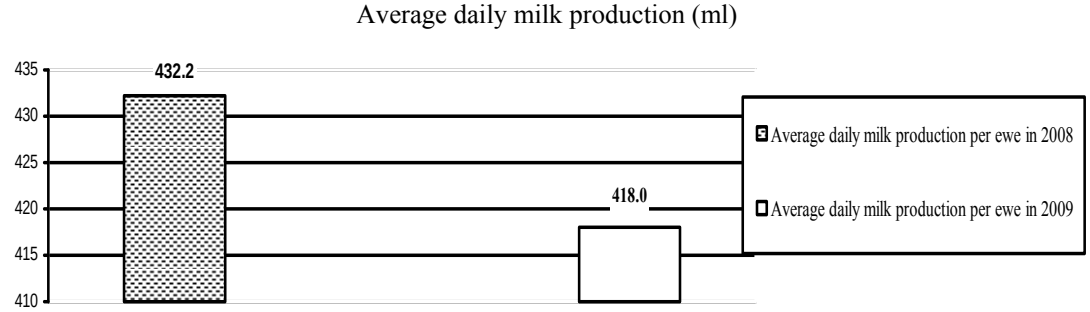

Figure 2. Average daily milk production per ewe

It is generally known that sheep's milk in its composition is significantly different from the milk of other species of livestock. Its characterized by higher content of protein, lactose, fat and solids. Like at home and abroad, the issue of the composition of sheep's milk has become a frequent subject of research monitoring, among other experts [12,13,14]. Sheep's milk and goat cheese can be legitimately classified as organic, since it is literally received in environmentally friendly manner - milking sheep reared on pasture in the middle and higher altitudes, without prejudice to automotive and other air pollutants or fertilizers[15].Similarly, the farm, where the experiments were conducted is in the environmental area in the foothills of central Slovakia, where are no communication or in the vicinity there are no factories that could pollute the environment. We can agree with the statement above and the author that milk obtained from ewes on this farm is a bio. Various stressful situations such as abuse, insensitive handling of the animal

can disturb the course of neuroendocrine reflex. Oxytocin is secreted in insufficient concentration and thus stressed sheep "do not trigger the" milk unless calmed down. To maintain or increase the milk production is also very important to follow the frequency of milking. This is also extremely important aspect of Slovak sheep in relation to the often debated question whether the milking of Wallachian sheep two-or three-times in a day is adequate [8]. Based on our monitoring, milking ewes was carried out in a regular routine twice a day in the morning and evening. According to the Green Report 2008 from the 1.1.2007 was the production of sheep milk in Slovakia, 43.8 liters. Our results of the monitoring of the production of milk at the farm in the foothills of central Slovakia in the years 2008 and 2009 are higher. In the assessment of the year 2008 produces he ewes in average 64.83 liters per ewe, and in 2009 62.7 liters per ewe converted to a standard lactation (table 2).

Dry mater in milk

Table 2. Dry mater content in sheep´s milk (100 g) depending on the duration of lactation, and statistical significant of the difference in dry matter content at the significance level of P<0.05 by Scheffe´s test

Days of lactation		70			130			190	
Index	Mean	SD	cv, %	Mean	SD	cv, %	Mean	SD	cv, %
Dry matter	16.87	0.34	1.99	17.85	0.18	1.02	19.69	0.17	0.87
F - test					0.28+				
Days of latation		70			130			190	
70					+			+	
130								+	

Mean = average, SD = standard deviation, cv = coefficient of variation

Fat content in milk

Table 3. Fat content in content in sheep´s milk (100 g) depending on the duration of lactation, and statistical significant of the difference in dry matter content at the significance level of P<0.05 by Scheffe´s test

Days of lactation		70			130			190	
Index	Mean	SD	cv, %	Mean	SD	cv, %	Mean	SD	cv, %
Dry matter	6.36	0,23	3,68	6,83	0,14	2,09	7,90	0,14	1,75
F - test					0,21+				
Days of latation		70			130			190	
70					+			+	
130								+	

Mean = average, SD = standard deviation, cv = coefficient of variation

Protein content in milk

Table. 4. Protein content in sheep´s milk (100 g) depending on the duration of lactation, and statistical significant of the difference in dry matter content at the significance level of P<0.05 by Scheffe´s test

Days of lactation		70			130			190	
Index	Mean	SD	cv, %	Mean	SD	cv, %	Mean	SD	cv, %
Dry matter	5,25	0,13	2,42	6,11	0,18	2,88	6,76	0,18	2,67
F - test					0,19+				
Days of latation		70			130			190	
70					+			+	
130								+	

Mean = average, SD = standard deviation, cv = coefficient of variation

Sheep's milk according to Pipova [16] contains the most valuable animal protein, essential amino acids, easily digestible fat and a number of important minerals, especially calcium and phosphorus. It also contains a milk sugar (lactose), a lot of vitamins and many trace elements necessary for nutrition, for normal metabolic function and protection of human health. Chemical composition of milk is a key indicator for the use of expression adopted animal feed in relation to milk production. Chemical composition of the milk determines its suitability as a raw material for the manufacture of dairy products, especially cheeses. At the same time, these authors state that to meet the physical and chemical quality of raw sheep's milk should contain at least 5.5 g fat, less than 4.8 grams of protein per 100 g of milk and may not contain inhibitory substances [8]. Based on our results of chemical analysis we can conclude that milk from ewes collected and chemically analyzed, qualifies according to physico-chemical quality. The lowest average value of fat, which we obtained by chemical analysis was 6.36 g per 100 g-1 and the lowest average protein content was 5.25 g per 100 g-1. Inhibitory substances, were not surveyed as it was not the goal of our work. We picked up again to the conclusions of[9]. On the farm, where we carried out experiments, we collected samples of milk in the morning milking. Ewes from which we obtained milk breeds were Zošľachtená valaška. We chose dynamic sampling of milk during the milking period at 70, 130 and 190 day of lactation. Results that we achieved in pursuit of the dry matter content from 16.87 to 19.69 g per 100 g^{-1}, the fat content from 6.36 to 7.90 g per 100 g^{-1} and protein content from 5.25 to 6, 76 g per 100 g^{-1}, confirmed the results of increasing the dry matter, fat and protein in sheep's milk depending on the duration of lactation. Based on the findings [17] confirmed in our investigations of higher fat content of sheep's milk cheese from 6.36 to 7.90 g per 100 g^{-1} protein compared with 5.25 to 6.76 g per 100 g^{-1}.

4. Conclusions

On the basis of the original researches we came to this conclusion. The farm at the foot of the Central Slovakia held in the year 2008 712 ewes with lambs born to the number 724, 23 lambs and 202 sheep (ewe lambs) over 1 year of age. In the year 2009 the number of ewes rose to 721 ewes with lambs born to the number 730, the number of rams was 25 and ewe lambs 210. Sheep were kept in the barn on deep litter, which consisted of hay. They were fed with fodder - meadow hay, which was in the manger. Sheep had unlimited access to roughage and water. At the time of labor were ewes fed with additional nuclear mixture. In the summer grazing period were sheep placed in the fold and fed grazing forage crop. Pasture was divided into morning and afternoon. Milk production of ewes Zošľachtená valaška on a farm in the foothills of central Slovakia was 64.83 liters in year 2008, average daily production of 432.2 ml and 62.702 liters in 2009, average daily production of 418.0 ml. Milk was obtained in the milking machine with 24 milking stall and manual milking. In pursuit of selected indicators of the chemical composition of sheep's milk of ewes Zošľachtená valaška in the 70 days of lactation was dry matter 16.87 g per100 g^{-1}, fat content 6.36 g per100 g^{-1} protein and 5.25 g per100 g^{-1}. On the 130th day of lactation increased statistically significantly ($P < 0.05$) the content of dry matter to 17.85 g.100 g^{-1}, fat content to 6.83 g.100 g^{-1}, a protein of 6.11 g.100 g^{-1}. On the 190th day of lactation increased statistically significantly ($P < 0.05$) the content of dry matter to 19.69 g.100 g^{-1}, the fat content of 7.90 g.100 g^{-1}, a protein of 6.76 g.100 g^{-1} the basis of the original researches, pointing the main conclusion of the work.

Acknowledgements

This work was supported by Scientific Grant Agency under the contract No. VEGA 1/0007/11.

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