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IMPACT OF SELECTED PARAMETERS ON MILK PRODUCTION IN TSIGAI BREED

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ABSTRACT

The objective of our research was to study selected parameters which affect milk production. The study was performed in the selected herd of purebred Tsigai ewes (231 animals). Regular milk yield recording was performed during the morning milking in around the middle of April, May and June. Milk samples were analyzed for basic milk composition (fat, protein and lactose) and somatic cells count. According to animals, the dairy ewes were divided into the four groups on the basis of individual SCC (G_1= SCC <100×10^{3}cells.ml^{-1}, G_2= SCC between 100-400×10^{3}cells.ml^{-1}, G_3= SCC between 400-700×10^{3}cells.ml^{-1}, G_4= SCC >10^6 cells.ml^{-1} to study the frequency of distribution of animals in selected group of ewes throughout experimental period. We have not created group with SCC between 700-1000×10^3 cells.ml^{-1} because there would not be sufficient number of animals. The average daily milk production in selected herd of Tsigai was 614.51 ml, equivalent to 95.65 liters for a normalized lactation. We reached the highest daily milk production in April 779 ml and the highest content of fat and protein in May, while milk production was lower by only 30 ml. We conclude that the protein content of milk was over 6% within each division, whether by order of lactation, season or somatic cells count, except of June (5.98%). We found a tendency to lower milk production by a higher SCC. With the increasing SCC decreased lactose content from 4.66% (G1) to 4.27% (G4) and there is a need for performing bacteriological examination in milk.

Keywords: Sheep, milk yield, milk composition, SCC

INTRODUCTION

Rearing small ruminants in Slovakia has a rich history. Nevertheless, the sector has always been marginal to the livestock sector. Sheep and goat production function in addition to the much greater importance of non-productive, as a factor positively affecting the environment and cultural character of rural, which is currently within the purview of sustainable agriculture and rural development particularly important (**Margetín *et al.*, 2013a**). Ewe's milk is mainly used for making the cheese in Slovakia. Although the SCC is not considered as factor influencing the price of milk, it is also an important factor determining its yield and quality of the final product **(Oravcová *et al.*, 2007; Margetín *et al.*, 2013b).** Selection for milk yield, milk components and health of ewe's udder may have an impact on the further improvement of Slovakian breeds of local origin traditionally, i.e. Tsigai and Improved Valachian. In dairy cattle is standard practice detection of subclinical mastitis by milk somatic cell counts (SCC). In dairy ewe's instantaneous physiological and pathological thresholds of SCC ranging from (0.25 to 1.0) ×10^6 cells/ml, have been available since the early 1990s **(Ariznabarreta *et al.*, 2002).** In sheep and goats, mastitis episodes are the main reason for culling because of sanitary problems, which occur mainly during the first 2–3 months of lactation **(Bergonier *et al.*, 2003; Leitner *et al.*, 2008).** Before the milking of sheep rarely used suitable method for the detection of subclinical mastitis (NK test, California Mastitis Test - CMT, Whiteside Test - WST), although their use is generally recommended **(Bergonier *et al.*, 2003; Špánik *et al.*, 1996).**
Berthelot *et al.* (2006) recommends that a decision rule proposes to consider an udder as healthy if every SCC are lower than 0.500×10^6 cells/ml and infected if at least two individual SCC are higher than 1 or 1.2 million cells/ml. **Arias *et al.* (2012)** found by manchega sheep that milk yield was always higher for ewe with SCC ≤ 300 × 10^3 cells/ml than for those with SCC > 300 × 10^3 cells/ml. Subclinical mastitis should be always suspected as one of the primary causes in cases of decreased milk production in dairy herds **(Fragkou *et al.*, 2014).** In fact, coagulase-negative *staphylococci*, which are the most common aetiological agents of subclinical mastitis **(Contreras *et al.*, 2007)**, are also frequent inhabitants of the skin of the udder. Most sheep mastitis occurs before the end of lactation (at the beginning of dry period) and also during the rearing lambs **(Albenzio *et al.*, 2003; Bergonier *et al.*, 2003; Contreras *et al.*, 2007).**
The objective of our research was to study selected parameters which affect milk production in Tsigai breed in the year 2013.

MATERIAL AND METHODS

The study was performed in the selected herd of purebred Tsigai ewes (231 animals). The ewes were machine milked twice daily after weaning of their lambs at the beginning of April. Regular milk yield recording was performed during the morning milking in around the middle of April, May and June. Individual milk samples were obtained from whole milk collection as an average sample. Milk samples from each udder were transported to the certificated Central laboratory of the Breeding Services of the Slovak Republic (Plemenárske služby š.p. Bratislava) for milk analysis. Milk samples were analyzed for basic milk composition (fat, protein and lactose) and somatic cells count (SCC). Basic milk composition was done by MilkoScan FT120 (Foss, Hillerød, Denmark) and somatic cells count were determined using a Fossomatic 90 instrument (Foss Electric, Hillerod, Denmark) after heat treatment at 40 °C for 15 min.
According to animals, the dairy ewes were divided into the four groups on the basis of individual SCC (G_1= SCC <100×10^{3}cells.ml^{-1}, G_2= SCC between 100-400×10^{3}cells.ml^{-1}, G_3= SCC between 400-700×10^{3}cells.ml^{-1}, G_4= SCC >10^6 cells.ml^{-1} to study the frequency of distribution of animals in selected group of ewes throughout experimental period. We have not created group with SCC between 700-1000×10^3 cells.ml^{-1} because there would not be sufficient number of animals. The frequency of distribution of ewes in different SCC sorting groups was also study depending on the parity (first and second), season (sampling

periods – April, May, Jun) and milk yield and composition (fat, protein and lactose). Statistical analysis was done by SAS/STAT 9.2 (PROC Mixed, 2009).

RESULTS AND DISCUSSION

The average daily milk production 614.51 ml in selected herd of Tsigai was observed, which is equivalent to 95.65 liters for a normalized lactation. The milk yield is by 20% lower than the breed standard specifies of Tsigai breed **(ZCHOK, 2014)**. Dairy ewe's at 1^{th} lactation achieved 654.84 ml of average daily milk production and the second one 574.18 ml. Although, the sheep of the 2^{nd} lactation had lower milk yield by 12%, sheep reached a higher fat and protein (tab. 1). The lower fat content, but higher protein content compared to **Oravcová *et al.* (2007)** was observed. From the available publications **Špánik *et al.* (1996)**, **Margetín. *et al.* (1998)** and **Oravcová *et al.* (2005),** which researched the composition of Tsigai milk rearing in Slovakia, a positive trend of increasing milk production was observed. Comparison with our results the highest daily milk production in April 779 ml was reached (tab. 2). Furthermore, the highest content of fat and protein in the month of May was observed, when the average daily milk production was lower (by 30 ml) compared to the April. It was found that the protein content of milk was over 6% within each division. Compared to **Antonič *et al.* (2013)** we reached in April increased daily milk yield and containing components, excluding lactose 0.5% less. This situation could be explain with a higher content of somatic cells. The number of somatic cells was slowly reduced, what was probably due to an adaptation of sheep to the machine milking.

Table 1 The investigated parameters depending on the order of lactation

	Lactation			
	First (n=87)		Second (n=144)	
	mean	S. E.	mean	S. E.
Milk yield (ml)	654.84	46.08	574.18	38.00
Fat (%)	7.69	0.15	7.78	0.13
Protein (%)	6.00	0.07	6.21	0.06
Lactose (%)	4.44	0.03	4.37	0.03
logSCC	5.18	0.07	5.12	0.06

SCC is used to assess the health status of the cows, sheep or goats udder. Among the group of sheep on the first and second lactation were observed minimal differences (tab. 1). Depending on the season, we found statistically significant differences between April and June, and May and June (tab. 2). In April could be somatic cell count increased become of stress of weaning lambs, the start of machine milking and changing the microbial composition of the environment sheep put out to pasture.

Table 2 The investigated parameters depending on the season

	Season (months)						
	April		May		June		
	mean	S. E.	mean	S. E.	mean	S. E.	Significant
Milk yield (ml)	779^{+++}	88.00	749^{+++}	88.00	547^{+++}	85.00	1:3, 2:3
Fat (%)	7.75^{+++}	0.42	8.64^{+++}	0.41	8.26^{+++}	0.40	1:2, 1:3
Protein (%)	6.16^{+}	0.14	6.17^{+}	0.14	5.98^{+}	0.14	1:3, 2:3
Lactose (%)	4.47^{+++}	0.08	4.32^{+++}	0.08	4.56^{+++}	0.08	1:2, 2:3
logSCC	5.51^{+++}	0.21	5.48^{+++}	0.21	4.79^{+++}	0.20	1:3, 2:3

+++ significant P<0.0001; + significant P<0.05

In Table 3, the animals were divided into groups according to SCC. It was found a tendency to lower milk production by a higher SCC. With the increasing SCC lactose content decreased from 4.66% (G1) to 4.27% (G4). This phenomenon was also statistically significant. Reduced lactose content refers to the occurrence of mastitis. For individual animals, the best approach has been provided by **Berthelot *et al.* (2006)**. The mentioned author suggested that values $<0.5 \times 10^6$ cells ml^{-1} indicate a healthy mammary gland and values $>1.0 \times 10^6$ cells ml^{-1} indicate a mammary gland with clinical or subclinical mastitis. Furthermore, here is no need to perform a simultaneous bacteriological examination of milk samples to confirm the problem. Values between 0.5×10^6 and 1.0×10^6 cells ml^{-1}, according to those authors, indicate 'suspected disease', hence there is a need for performing bacteriological examination in milk.

Table 3 The milk yield and milk composition by SCC

	SCC group							
	G_1(1), n=81		**G_2**(2), n=100		**G_3**(3), n=21		**G_4**(4), n=29	
	mean	S. E.	mean	S. E.	mean	S. E.	mean	S. E.
Milk yield (ml)	744	90	754	84	593	96	674	96
Fat (%)	7.68	0.42	8.00	0.39	8.13	0.46	7.71	0.46
Protein (%)	6.03	0.15	6.05	0.14	6.14	0.16	6.19	0.16
Lactose (%)	4.66^{+++}	0.08	4.50^{+++}	0.08	4.38^{+++}	0.09	4.27^{+++}	0.09

G_1= $Group_1$ of (SCC <100×10^3 cells.ml^{-1}), G_2= (SCC between 100-400$\times10^3$ cells.ml^{-1}), G_3= (SCC between 400-700$\times10^3$ cells.ml^{-1} and G_4= (SCC >10^6 cells.ml^{-1}), Significant P<0.0001 between 1:2, 1:3, 1:4, 2:4.

CONCLUSION

From this herd of purebred Tsigai was 78% of ewes below SCC 400×10^3 cells.ml^{-1}. This SCC indicated good health status of experimental ewes, at which 62% sheep were at the second lactation. Although the average daily milk production was 614.51 ml, equivalent to 95.65 l for a normalized lactation, reached above the average content of protein (above 6.0%). We found a tendency to lower milk production by a higher SCC. With the increasing SCC decreased lactose content from 4.66% (G1) to 4.27% (G4). Reduced lactose content refers to the occurrence of mastitis and there is a need for performing bacteriological examination in milk. However more detail study is needed to see relationship between high SCC and presence of microorganisms to better understanding the reasons the physiological and pathological SCC in the udder.

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