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RESEARCH ON THE QUANTITATIVE AND QUALITATIVE EVOLUTION OF SHEEP'S MILK DURING THE LACTATION PERIOD

Carmen Daniela PETCU[1], Marian GHIȚĂ[1], Diana Nicoleta RABA[2], Iuliana CODREANU[1], Rosalie BALACEANU[1], Crina ANDREI[1], Oana Diana MIHAI (OPREA)[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Independenţei Spl., District 5, 050097, Bucharest, Romania
[2]Banat`s University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timișoara, Faculty of Management and Rural Turism, Calea Aradului 119, Timișoara, 300645, Romania

Corresponding author email: oprea_diana2008@yahoo.com

Abstract

Sheep's milk is a very important food for human nutrition and is also an important raw material for a whole series of dairy products. The purpose of the current paper is to investigate the milk's quantitative and qualitative variations, during the lactation period in sheep. Milk samples were collected and some parameters, such as: quantity, density, percentage of fat, protein substances and lactose were monitored every month of lactation. The obtained results (compared to the 2nd month) showed significant increase (P<0,05) in the case of milk production for the 3rd month (with 10.9%) and for the 4th month (with 9.95%). Significant increase was also obtained in the case of milk density for the 4th month (with 0.29%), for the 5th month (with 0.48%) and for the 6th month (with 0.77%). Concerning the percentage of fat, it also showed increase for the 5th month (with 9.45%) and for the 6th month (with 24.32%). Simultaneous, significant decreases (P<0.05) were found in the case of milk production in the 5th month (with 10.6%) and in the 6th month (with 30.13), as well as in the percentage of lactose in the 5th month (with 4.79%) and in the 6th month (13.73%).

Key words*: fat, lactose, milk, sheep.*

INTRODUCTION

Sheep farming in our country is a traditional economic activity that has been a source of food and raw materials for the needs of the rural population, but also for trade (Teodorescu et al., 2013; Popica et al., 2014).

The diversity of dairy products and their distinguished biological value (Savu et al., 2002) made the sheep to be appreciated and, for these reasons, the breeders pay special attention.

Milk is a very balanced food, which is why a rational diet must necessarily include it beside other dairy products, that should be consumed daily (Vidu et al., 2014; Tăpăloagă et al., 2016; Oprea et al., 2019; Petcu et al., 2020; Oprea et al., 2020).

Due to its rich and varied chemical composition, milk provides most of the substances needed for living tissues and also for the maintenance of metabolic processes that take place in the body (Savu et al., 2002; Cotor et al., 2012; Oprea et al., 2019).

Sheep's milk is a major food for human nutrition and is also an important raw material for a whole series of dairy products, extremely appreciated in our country (Savu et al., 2002).

In order to obtain a quality milk, special attention must be paid to the mammary gland. Its development must be carefully monitored by the breeders, as the optimal production in terms of quantity and quality is known to be obtained only in healthy conditions (Tăpăloagă et al., 2018; Ghiță et al., 2019). Moreover, particular attention must also be paid to food safety, the manufacture, packaging and storage of final dairy products (Petcu, 2006; Petcu et al., 2014; Visoescu et al., 2015).

Studying the literature, we found many data on the chemical composition of sheep's milk (with important repercussions on the quality of dairy

products), but we did not find data on its quantitative and qualitative evolution, so this is the main reason for initiating the current research (Antunac et al., 2001; Lujerdean et al., 2008; Ghiță, 2010).
The aim of this research is to study how quantity and quality of sheep's milk change, during a lactation period.

MATERIALS AND METHODS

The biological material was represented by a group of 6 Ţurcană breed sheep, animals that were individualized and benefited from usual maintenance conditions (they were kept in the shelter at night and ate concentrates, and during the day they were taken to pasture, where they consumed plants from spontaneous flora).
The milk was collected every first day of the lactation from some certain months, in order to carry out this study. So, the data regarding the quantity and the quality of sheep's milk was obtained at the beginning of the following months of lactation: the 2nd (II), 3rd (III), 4th (IV), 5th (V) and 6th (VI) months of lactation.
The parameters followed were: the amount of milk, the density, the percentage of fat, the percentage of protein and the percentage of lactose.
The milk samples obtained were rapidly refrigerated (at a temperature of 4°C) and were immediately transported to the laboratory for processing.
The determination of the amount of milk was assessed individually for each animal, noting that the milking was done manually and the resulting amount of milk was measured with a graduated cylinder.
The milk density was determined with the lactodensimeter.
The determination of the percentage of protein substances was achieved by the titration method.
In the current study **the percentage of lactose** was determined using the potassium ferricyanide method (Savu et al., 2002).

RESULTS AND DISCUSSIONS

The obtained results are presented in a centralized manner in Table 1. The variation of the monitored parameters is presented in the form of graphs.
The comparisons on the statistical relevance of the differences between the ranges of values obtained were processed using the t-Student test.
Analyzing the data presented in Table 1, it is observed that the highest milk production was recorded in the 3rd (III) month of lactation (average production 1318.5 ml of milk) and in the 4th (IV) month of lactation (average production 1306.6 ml of milk).
It is also noted that in the 5th (V) month of lactation (average production 1062.1 ml of milk) and in the 6th (VI) month of lactation (average production 830.2 ml of milk), milk production decreases (in the 6th month a sheep was already weaned). So, the lactation graph has a bell shape (Figure 1), a fact also reported in the literature consulted (Antunac et al., 2001; Lujerdean et al., 2008; Cotor et al., 2012).

Table 1. The values of the parameters analyzed during the lactation period

Lactation month	Milk amount (ml)	Density	Fat (%)	Protein (%)	Lactose (%)
II	1188.3	1.034	7.4	5.10	4.44
III	1318.5*	1.035	7.13	5.18	4.52*
IV	1306.6*	1.037*	7.28	5.38*	4.47
V	1062.1*	1.039*	8.10*	5.56*	4.23*
VI	830.2*	1.042*	9.20*	6.05*	4.12*

*P<0.05

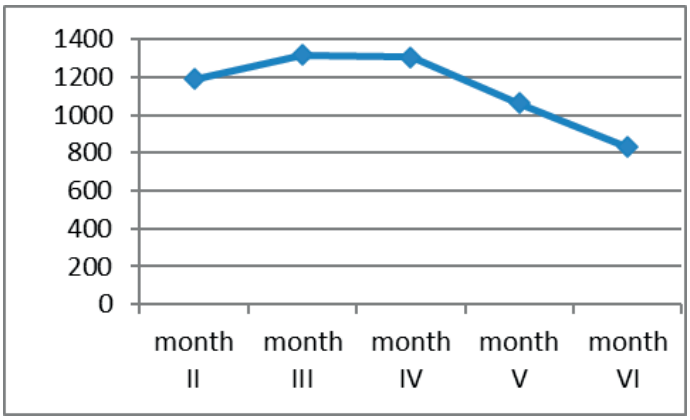

Figure 1. The variation of the average milk production, during the lactation period

As a consequence of the statistical analysis, the obtained results indicate a significant increase ($P<0.05$) of milk production in month III (by 10.9%) and IV (by 9.95%), compared to month II.

There is also a significant decrease ($P<0.05$) in milk production in months V (by 10.6%) and VI (by 30.13%), compared to the 2nd (II) month, when there was maximum amount of milk.

Results and discussions regarding the milk density

The highest value of milk density was recorded in the 6th (VI) month (end of lactation) and the lowest value was recorded in the 2nd (II) month (beginning of lactation), while in months III, IV and V the value of density was between the two limits, giving a graph with the appearance of an ascending slope (Figure 2).

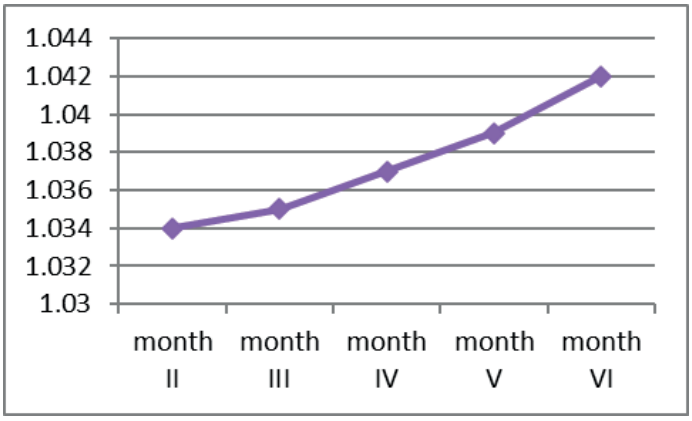

Figure 2. The variation of the average milk density, during the lactation period

The results indicate significant increases ($P<0.05$) of milk density in the 6th (VI) month (0.77%), in the 5th (V) month (0.48%) and in the 4th (IV) month (0.29%) compared to the 2nd (II) month.

In the 3rd (III) month there was an insignificant increase ($P>0.05$) by 0.09%, compared to the 2nd (II) month. These results can be explained by the increase in the percentage of dry matter in the feed, because in the middle and at the end of lactation (summer-autumn season) the proportion of coarse feed increased in the diet of the surveyed sheep.

Results and discussions regarding the percentage of milk fat

The percentage of fat had the highest value towards the end of lactation (9.20%). At the beginning of lactation (7.40%) and in the middle of lactation (7.28-8.10%) the percentage of fat was lower (Figure 3).

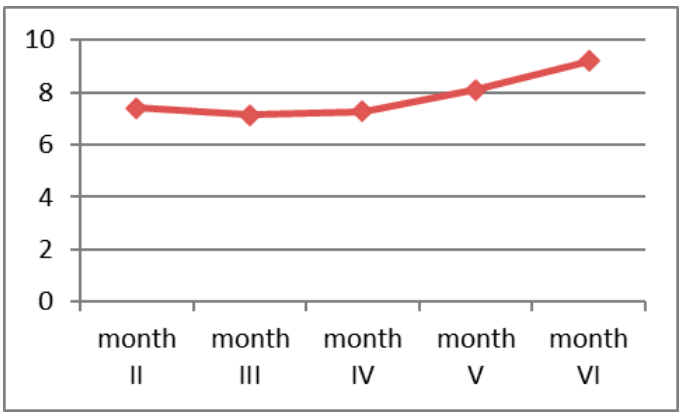

Figure 3. The variation of the percentage of fat in milk, during the lactation period

The obtained results indicate significant increases ($P<0.05$) of milk fat in the 6th (VI) month (24.32%) and in the 5th (V) month (9.45%) compared to the 2nd (II) month.

It is also observed that in the 3rd (III) and in the 4th (IV) months there were insignificant decreases ($P>0.05$) by 3.64% and 1.62%, compared to the 2nd (II) month.

An explanation of these results can be represented by the consumption of coarse feed; it is known that this type of food influences the concentration of fatty acids in milk (Cotor et al., 2015), as well as the size of fat globules in milk (Cotor et al., 2009).

Results and discussions regarding the percentage of milk protein

The highest percentage of protein is recorded at the end of lactation (6.05%), while in other periods of lactation the percentage of milk protein is less than 6% (Figure 4).

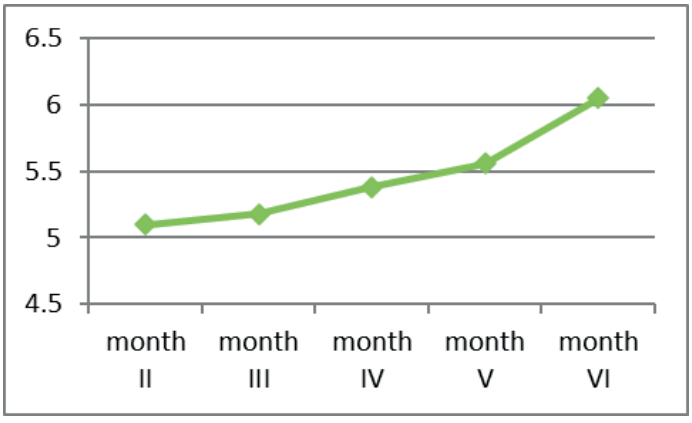

Figure 4. Milk protein percentage variation, during the lactation period

The results indicate significant increases ($P<0.05$) of milk protein in the 6th (VI) month (18.62%), in the 5th (V) month (9.01%) and in the 4th (IV) month (5.49%) compared to the 2nd

(II) month. In the 3rd (III) month there was an insignificant increase (P> 0.05) with 1.56%, compared to 2nd (II) month.
These results can be explained by the functional status of the mammary gland (Cotor et al., 2011) and by the diet in these periods.

Results and discussions regarding the milk lactose percentage.

The percentage of lactose varied only slightly and it has values between 4.52% and 4.12% (Figure 5).

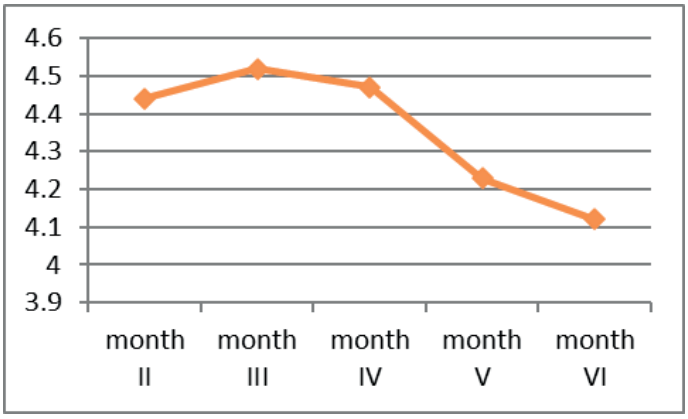

Figure 5. lactose percentage variation in milk, during the lactation period

The results indicate a significant increase (P<0.05) of lactose in the 3rd (III) month (1.8%) and in the 4th (IV) month there was an insignificant increase (P>0.05) with 0, 67%, compared to the 2nd (II) month.
Moreover, significant decreases (P <0.05) of lactose in milk were found in the 5th (V) month (4.79%) and 6th (VI) month (13.73%), compared to the 2nd (II) month. These variations are determined by the diet of the sheep correlated to the season.

CONCLUSIONS

Significant increases were found in the following parameters, compared to the 2nd (II) month of lactation: milk production, for the 3rd (III) month (by 10.9%) and the 4th (IV) month (by 9.95%), milk density for the 4th (IV) month (by 0.29%), for the 5th (V) month (by 0.48%) and for the 6th (VI) month (by 0.77%), fat percentage for the 5th (V) month (by 9.45%) and for the 6th (VI) month (by 24.32%), the percentage of protein for the 4th (IV) month (by 5.49%), for the 5th (V) month (by 9.01%) and for the 6th (VI) month (by 18.62%) and the percentage of lactose for the 3rd (III) month (by 1.8%);

Significant decreases were found (P <0.05) in the case of milk production in the 5th (V) month (by 10.6%) and in the 6th (VI) month (by 30.13%), and in the percentage of lactose in the 5th (V) month (by 4.79%) and in the 6th (VI) month (by 13.73%), compared to the 2nd (II) month of lactation.

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