

SYNTHESIS STUDY OF THE QUALITY OF THE COLOSTRUM IN ȚURCANĂ BREED

ARMAȘ ANA GINA¹, VĂLUȘESCU DANIELA¹, FIAT FLORIN²,
PETROMAN IOAN^{*1}, ȚIBRU IOAN^{*1}

¹*Development Research Station for Raising Sheep and Goats,
S.C.D.C.O.C. Caransebeș, Romania*

²*University of Life Sciences “King Mihai I” from Timisoara,
Faculty of Veterinary Medicine, Timisoara, Romania*

*Corresponding author's e-mail: tibru_ioan@yahoo.com, i_petroman@yahoo.com

Abstract: During the calving period of the 2025 season, seven farmers in the mountain area of Banat agreed to participate in the active management of the colostrum after a period of training and discussions. Five of these farmers gathered data on 125 sheep, including age, race, body condition score, number of lambs born live and dead, state of the udder, and colour of the colostrum. The results were analysed using a Brix Refractometer, which showed between 26.5% and 76% of the samples exceeded this minimum level value of the colostrum, i.e., it was of good quality. An average of 20 sheep colostrum samples showed a great variation at the level of the herd due to the feed. The forage front, especially concentrates (raw protein) and the supplementation of concentrates to the sheep with twin gestation were all factors that impacted the level of colostrum quality. Individual factors did not play a role in determining the quality of the colostrum; the quality of the colostrum was inadequate more likely if the sheep had an inadequate body condition score.

Key words: sheep, colostrum, body condition.

INTRODUCTION

As the sheep breeders in Mountainous Banat understood the role and significance of the colostrum following discussions within SCDCOC Caransebeș, they prepared for the 2025 calving season by optimizing and managing the colostrum to reduce the treatments applied to the newly-born lambs and after that. This case study shows how the sheep breeders can be motivated to measure the quality of the colostrum to determine optimal colostrum antibodies for each individual lamb. [1,5,7,10,21,26,27]

The perinatal mortality of the lambs is a significant problem regarding the animals and economic welfare of sheep farms around the world. It has been reported that it has remained stable at 15-20% in the last four decades [14,17,25]. In a study carried out in the United Kingdom, a global risk of mortality of 7% in 108 sheep farms (with an interval of 3.3-8.3%), with most mortality in the first week of life was reported. Mortality was associated with an increased risk as a result of a neonatal septicaemia, as a result of inadequate colostrum, starvation, and the death caused by the exposure hypothermia. The transfer of the antibodies from the colostrum to the lamb is vital because of the inability of the placenta of the epithelia-chorial type to transfer maternal antibodies during the uterine period. The level of IgG in the lamb's blood is directly linked to the contribution and quality of the ingested colostrum. [9,12,15,16,19]

Colostrum production occurs before calving and contains both important immunoglobulins for lambs with no immunity, as well as a high level of fat to prevent starvation. Colostrum production depends on adequate sources of both energy and protein in the last three weeks of gestation. There were limited information available on IGG egg-content, which was assumed to be equivalent to cows. However, a recent comparative study showed that, despite the higher total content of proteins and fats, sheep colostrum had a 30.1 ± 13.9 mg/ml (n = 100 samples) significantly lower IgG concentration than in the bovin colostrum at 94.0 ± 38.3 mg/ml (N = 108 samples). It has been suggested that over 20 mg/ml IgG is the target level for sheep samples. To ensure passive success of the

immune transfer, it was suggested that the lambs should consume at least 30 g IgG in the first 24 h of life. [8,11,13,23,24]

Determining the quality of the colostrum with the help of a Brix refractometer is a common practice in dairy cow farms, but it was not a common practice in sheep farms proved that for sheep, goats, and cattle, the Brix values were very well correlated with the values of IgG and protein ($r = 0.75$ and 0.87 for sheep samples) and reported the optimal limit of the highest precision of 26.5% for sheep (75% sensitivity and 91.3% specificity). This was not valid for the samples collected from Lacaune dairy sheep sheltered intensively where lower values were registered; however, this study did not aim to determine the Brix limit and showed that subsequent research was necessary [20,22,25]. This study aimed to encourage sheep breeders to focus on the quality and quantity of the colostrum to improve the survival of the lambs, while determining whether the quality of the colostrum was a problem and which factors had the highest impact on it. [2,3,4,6,18]

MATERIALS AND METHODS

Seven sheep breeders from Mountainous Banat participated in this study, after obtaining information on how to manage the colostrum. They agreed to provide data and accept visits on the farm and/or arrival at a fixed work point where the colostrum analysis was performed using a Brix refractometer.

The participants were asked to collect a colostrum sample from the sheep who delivered in the morning, within six hours of calving from the sheep with both single and twin calving. A Brix refractometer was used for testing. The colour of the colostrum (a range of colours from white to yellow) and the ease of interpreting the colostrum (good, medium, or weak) were recorded alongside the identification of the sheep – number, age, bodily condition score and a description of the udder. The lambs' living environment was inside (shelter). The breeders also completed a questionnaire, referring to sheep nutrition in the last six weeks of gestation. The data was entered and analysed in Microsoft Excel.

For the statistical analysis, a multi-level logistics regression model was used to evaluate the association between the quality of the colostrum (below, above, and equal to 26.5%) and a number of explanatory variables. The explanatory variables tested were the calving month, the age of the sheep, the bodily condition score, the number of the calving, the number of the lambs born live, and the size of the udder.

The construction of the model was made in the MLWiN 3.04 version. The initial construction of the model was made by forwarding, selection and explanatory variables were retained in the model where the estimated coefficient was higher than the double standard error (so that the 95% trusted interval for estimation did not include zero, equivalent to $P < 0.05$); all rejected variables were re-offered to the final model and retained if they met these criteria.

The model used for analysis was a two-level hierarchical model to take into account the correlations between repeated samples within individual farms.

The model had the form: Colostrum quality $\geq 26.5\%$ (yes = 1, no = 0) \sim Bernoulli (π_{ij}) ($\text{logit} = \pi_{ij}$) = $\alpha + \beta_1 X_j + \beta_2 X_{ij} + u_j$ [u_j] \sim $n(0, \Omega_u)$ where the index i designated the number of sheep, j the farm, π_{ij} the probability of classifying the quality of the colostrum to be $\geq 26.5\%$ for each sheep (i) as a focus on the farm (j), α the value interception, and X_{ij} and X_j were explanatory covariables to the sampling point and, respectively, the difference between the sheep, with the β_n the corresponding coefficients, u_j random effect to explain the residual variation between the sheep (supposed to be distributed normally with an average = 0 and a variance = Ω_u).

RESEARCH RESULTS

One hundred and twenty-five samples from the five herds were analysed, which represented 71% of the farms registered in the study. The average number of samples per farm was 25. Four breeders provided details about the size of the herd, which ranged from 60 to 220 lambs. The percentage of primiparous sheep was 23%. Most of the calving took place in February and March.

In this study, it was decided to use the Brix limit of $\geq 26.5\%$, as suggested by Kessler, because this is the optimal value based on research so far and on the authors, which have determined optimal Brix limit for colostrum samples with a recommended immunoglobulin concentration of 20 mg/ml immunoglobulins colostrum concentration. In this study, quality colostrum had a Brix value of $\geq 26.5\%$ (sensitivity 76.3%, specificity 87%, positive predictive value 95.1%, negative predictive value 52.6%).

There were 125 samples analysed, of which 118 (98.8%) could be accepted, and 74.8% had, when reading with a Brix refractometer, $\geq 26.5\%$. There were only two herds in which all the samples were $\geq 26.5\%$, one had values with an average percentage of the examined samples and two had less than 50% of the classified samples.

The descriptions about the size of the udder determined by palpation were recorded in 90 sheep, of which 70 of the udders were average or normal. Only 20 sheep had non-compliant udders. As for the size of the udder, in 20 sheep they were described as small, in the rest of the sheep (70) as large. The degree of udder filling was not often used as a comparison element and only 55 sheep were described as full udder, 15 sheep as empty udder, and 20 sheep with flap udder. A variety of colours of the colostrum was described, but most was yellow (60) or cream (30).

The impact of feed before calving was available from three of the five herds and included 75 colostrum samples, of which 50 had an adequate quality. The larger feed front per sheep was associated with a better colostrum quality, with only 80 appropriate quality samples when the space was smaller than the 45 cm recommended. The supplementation of sheep with the administration of maize was not associated with a better colostrum quality, although this supplement was beneficial in the case of twin calving being associated with an improvement in the quality of the colostrum.

These results highlight the fact that the measurement of the sheep colostrum with the Brix refractometer is useful as a management in sheep farms. There is a continuous debate on an appropriate Brix limit with relatively few studies so far. The limit of 26% was used in this study, as it was considered to have the highest sensitivity and prediction compared to the negative value, which are the desired features in this situation regarding the provision of a sufficient quality colostrum received by the lamb.

The results obtained confirm those of another study, which reports that 23% of the samples had inadequate colostrum, but differ from a study in Spain, in which about 62.7% of samples were $\geq 18\%$ Brix (the limit used in this study) and about 15% were $\geq 26.5\%$ in 536 sheep in intensive sheltering. There was a great variation between farms: 14% of farms ($n = 9$) with good quality colostrum ($> 26.5\%$) in all tests tested, and 14% of farms ($n = 9$) with lower quality colostrum ($< 26.5\%$) in more than 50% of their tested samples.

The management decisions on the colostrum at herd level have shown that the highest impact on the quality of the colostrum largely included the individual potential risk factors. One of the largest management variations between farm before calving is nutrition in the last phase of gestation, which has been shown to influence the synthesis of colostrum both by ensuring the necessary nutrients and in the metabolism of progesterone.

Colostrum production has been previously proven to be significantly reduced in sheep fed on a restricted diet in the last 45 days of gestation and on the provision of

glucose precursors with high energy cereals, such as maize; it was shown that barley or wheat increase the production of good quality colostrum.

The main significant risk factor at individual sheep level was the ease of filling the udder: a harder udder is harder to change to ensure the physiological requirements of the lamb, and has low chances for an adequate colostrum, compared to other sheep. This indicates that it may have been an intra-mammal (clinical or subclinical) problem, as previously associated with a considerable reduction in the serum concentration of immunoglobulins in lamb or it could indicate that the lamb was breastfed before for sample collecting.

CONCLUSIONS

This study showed that 76 of the samples were considered good quality, using a 26.5% Brix refractometer. The main factors for determining the quality of the colostrum have proven to be at the level of the number of sheep, with feeding before the calving playing an important potential role. Additional impact of the access to concentrates and feed front has a potential role in determining the quality of the colostrum and still requires research. The study also highlighted the ease with which farmers can monitor the quality of the colostrum in their herds to improve the health and performance of the newly born lambs.

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