

FREEZING POINT OF HALF-UDDER EWE MILK

Gilberto Giangolini, Carlo Boselli, Francesco Filippetti, Simonetta Amatiste, Remo Rosati
 Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana – Via Appia Nuova, 1411 Roma –Centro
 Nazionale di Referenza per la Qualità del Latte e dei Prodotti Derivati degli Ovini e dei Caprini
 (C.Re.L.D.O.C.) Fax: +0390679099406-e-mail: creldoc@izslt.it

Key words: ewe milk, freezing point

Introduction. Freezing point of ewe milk is used to determine the percentage of added water. In order to have a correct interpretation of this criteria we continue the study about ewe milk freezing point in relation to chemical composition. For this reason we collected half udder ewe milk, surely safe of water adulteration, from different breeds.

Methodology. A total of 350 half-udder milk samples were collected in the evening milking from 175 ewes belonging to 4 flocks of Sopravissana (50 ewes), Sarda (25 ewes), Comisana (78 ewes) and Massese (22 ewes) breeds, from March to June 2008. The milk samples were representative of a total half-udder milk yield. They were cooled at 4°C and analysed the day after sampling. We determine the freezing point (FP) by thermistor milk cryoscope (model 4DII, Advanced Instruments Inc.); fat, protein, lactose, non-fat solids (NFS) and urea by Fourier Transformed Infrared analysis (Milko-Scan FT6000, Foss Electric), somatic cell count (SC) by Fossomatic 5000 (Foss Electric), chloride (Cl⁻) by silver nitrate titration (Mettler DL50), pH and Tritable acidity (SH) (Soxlet-Henkel). The statistical analysis has been performed by BMDP new system software.

Results and discussion. The average value of freezing point over the considered period was $-0.574^{\circ}\text{C} \pm 0.013$ with the minimum value of -0.623°C and the maximum of -0.545°C . The average of others analysed criteria was: fat 8.05% ± 1.66 , protein 5.77% ± 0.56 , lactose 4.64% ± 0.23 , NFS 10.88% ± 0.63 , somatic cell 176000cell/ml ± 157000 , urea 37.7mg/dl ± 15.6 , pH 6.63 ± 0.11 , tritable acidity 8.19°SH ± 1.75 , chloride 0.81g/l ± 0.23 . The 61% of the samples showed a freezing point lower than -0.570°C (Tab.I).

Table I – Frequencies (%) of freezing point by classes

FP Classes	> -0.550	-0.550 -0.560	-0.560 -0.570	< -0.570
% of samples	2.6	11.4	25	61

The average of FP in the different breeds were: Comisana $-0.579^{\circ}\text{C} \pm 0.0125$ (Min. -0.612°C ; Max. -0.545°C), Massese $-0.571^{\circ}\text{C} \pm 0.0061$ (Min. -0.584°C ; Max. -0.563°C), Sarda $-0.556^{\circ}\text{C} \pm 0.0071$ (Min. -0.581°C ; Max. -0.545°C) and Sopravissana $-0.575^{\circ}\text{C} \pm 0.0086$ (Min. -0.602°C ; Max. -0.549°C). The

freezing point of Sarda breed in higher probably due to the lower content of total solid. The average value of FP is higher than that recorded in a previous study ($-0.563^{\circ}\text{C} \pm 0.008$) (1) conducted on individual Comisana ewe milk collected in the morning milking. The different average is presumably related to the different moment of sample collecting (morning and evening milking). Highest significant correlations were recorded between FP and others considered criteria like urea, NFS and protein (Tab.II). Pavic V. et al (2) has found significant correlations with the FP vs acidity (-0.97 ; $p < 0.001$), total solids (0.31 ; $p < 0.01$) and lactose (-0.25 ; $p < 0.01$).

Table II – Coefficients of correlation (r Pearson)

	Freezing Point
Fat	-0.20**
Protein	-0.29**
Lactose	-0.19**
NFS	-0.40**
Urea	-0.50**
Somatic cells	-0.09
pH	0.33**
SH	0.01
Cl ⁻	0.13*

* $P < 0.05$; ** $P < 0.001$

Among the others analysed criteria the highest correlation coefficients (r_{Pearson}) are found between fat vs lactose -0.50 ($p < 0.001$), protein vs NFS 0.85 ($p < 0.001$), urea vs pH -0.39 ($p < 0.001$), tritable acidity vs pH -0.68 ($p < 0.001$) and urea vs tritable acidity 0.33 ($p < 0.001$).

Conclusions. Highest correlation value of FP were found with urea also obtained from our earlier study on individual Comisana ewe milk (1). Study to determine the content of single minerals in milk to get more information about correlations with the FP are under way.

References.

1) Giangolini G., Filippetti F., Boselli C., Amatiste S., Rosati R. (2007). Relationship between freezing point and chemical composition of individual Comisana ewe milk. *FIL-IDF 5th International Symposium on the Challenge to sheep and goats Milk Sectors*. Alghero/Sardinia. Italy, 18-20 April 2007, poster.

2) Pavic V. Antunac N., Mioc B., Ivankovic A., Havranek J.L. (2002). Influence of stage of lactation on the chemical composition and physical properties of sheep milk. *Czech J. Anim. Sci.*47.(2):80-84