The freezing point of milk from individual cows in Latvia

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Introduction

- Added water can occur in milk due to both unintentional and intentional addition.
- Added water can be detected in milk by measuring its freezing point. The freezing point is slightly less than that of pure water and relatively constant.
- In Latvia, the freezing point of milk is presently used as a quality indicator of cows' raw milk and its limit value is ≤ –0.520℃.
- In Latvia until year 2008 there has not been done research about cows' milk freezing point variations taking into account individual animals' genetically and physiological factors as well as the environmental conditions.
- **The objective of the study** was to investigate the average freezing point value and the factors that influenced it.

Material and Methods

- Time: in the 6-month period from August 2008 to January 2009, were 1,646 milk samples analyzed from Latvian Brown and Holstein Black and White cows. Milk samples were taken under supervision of an adviser on 4 farms.
- Research traits:
  - freezing point, ℃;
  - milk fat, protein and lactose content,%;
  - non-fat solids (NFS), %;
  - milk urea content, mg $dl^{-1;}$
  - ph;
  - somatic cell count, log,*SCC = log² (SŠS/100.000) + 3;*
- The freezing point was determinates using a thermostat cryoscopy.

Results

- During research the average milk yield was 21.4kg per day (s.d.=6.54).
- Individual monthly collected milk samples were with the average fat content 4.43%, protein content 3.51%, lactose content 4.77%, NFS 8,98%, urea 21.4 mg $dl^{-1;}$ ph 6.58 and SCC 2.37.
- The average freezing point of milk was -0.531 ºC (s.d.= 0.0106), with a range from -0.402 ºC to -0.659 ºC.
- 16% of the milk samples were found above the freezing point limit value < –0.520℃.

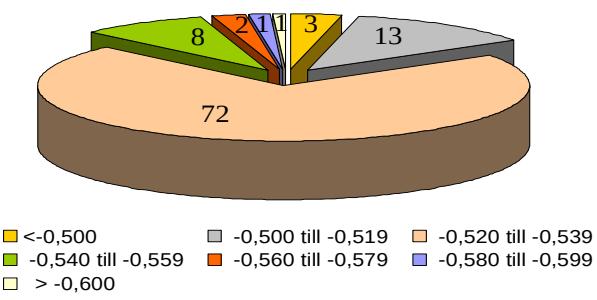

Fig.1. Distribution (%) of milk samples by freezing point

- Statistically significant freezing point changes were between months of research (lowest – August –0.543 ºC, highest – January -0.523 ºC) (P<0.05).

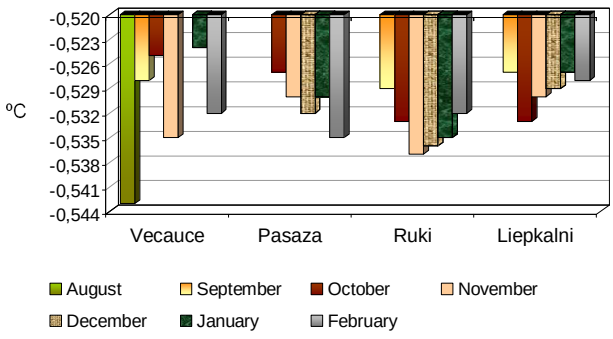

Fig.2. Milk samples freezing point in different research month

- Statistically significant freezing point changes were between lactation phase.
- The lowest in the third phase (-0.533 ºC) and highest in the second phase (-0.529 ºC) (P<0.05).

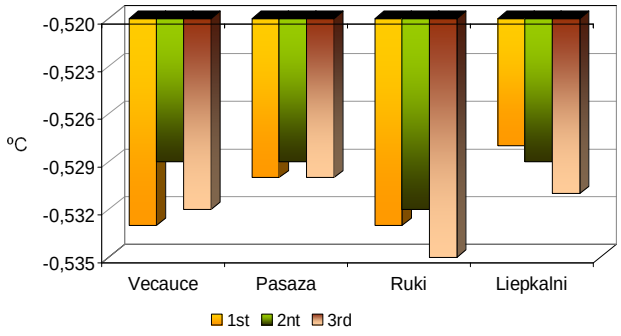

Fig.3. Milk samples freezing point in different lactation phases

Conclusions:

- The freezing point were affected by factors: month of research, lactations phase;
- The influences of breed, parity and milk yield of freezing point variation were not significant;
- Significant covariate factors were fat content, pH, NFS, urea and SCC;
- Correlation between freezing point and milk yield per day were negative (r=– 0.345);
- Correlation between freezing point and fat, protein, lactose content and NFS were negative (from r =-0.242 to r=-0.317);
- Correlation between freezing point and pH (r = 0.662); freezing point and urea (r= 0.075); freezing point and SCC (r= 0.012) were positive.