

SEASONAL RELATED CHANGES IN THE MAJOR NUTRIENTS OF BOVINE MILK (TOTAL PROTEIN, LACTOSE, CASEIN, TOTAL FAT AND DRY MATTER)

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Abstract

The objective of this study was to analyse the chemical composition of cow milk for an entire year to provide fundamental information for dairy products making and milk cheese yielding. So an investigation of seasonal changes of major nutrients of dairy milk was performed over 12 months beginning in January 2007. Samples were collected weekly from bulk milk shipment in a commercial dairy products company and analyzed for content (%) of total protein, fat, casein, lactose and dry matter. The parameters determined were of interest both from a nutritive and technological point of view. The mean protein content was $3,21\pm 0,10\%$, lactose $4,87\pm 0,08\%$, the fat content $3,58\pm 0,07\%$, casein $2,58\pm 0,10\%$ and dry matter $12,20\pm 0,11\%$. The relationship of these parameters to season was assessed. The highest and lowest values were observed during winter and summer months respectively.

Keywords: cow milk, nutrients, total protein, casein, lactose, fat, dry matter

INTRODUCTION

Many factors influence the composition of major nutrients (fat, protein, water and minerals) in milk within species.

Nutrition or diet modifies fat and protein concentration of milk. Fat content is the most sensitive to diet changes and in a lesser degree milk protein. The concentration of lactose and minerals, the other solid constituents of milk doesn't respond predictably to the diet quality changes. Milk composition also can be affected by genetics, level of milk production, stage of lactation, udder health (clinical and subclinical mastitis), season, the age of cow, environmental temperature or light/dark ratio.

There are other components of milk affected by these factors too: the amount of short chain fatty acids, the quantity of volatile components, the abundance of tocopherol, the fraction of all nitrogen compounds.

The main objective of this study was to find out the effect of seasonal changes on chemical composition of milk, in this way collecting informations for dairy products making and milk cheese yielding.

MATERIALS AND METHODS

The provenience of cow milk samples is a dairy products factory from Miceștii de Câmpie, Bistrița county, that is supplied by the local farmers from the villages of the county (Sânmihaiu de Câmpie, Lechința, Visaia, Fântinița, Sângiorgiu Nou, Vermes etc).

Dairy company produces fermented milk products, yogurt, butter, cheese, collecting between 12,000 l (in winter) and 20,000 l (in summer) milk.

The research was carried out an entire year (2007), monthly were collected and analyzed 30 samples. All samples were collected directly from homogenized bulk milk of a tank in the factory and put in the 200 ml sterile plastic containers, stored at 8°C and immediately transported to the laboratory to be analysed.

Total fat, protein, casein, lactose were determined as described by Romanian standards using a milk analyser (Milko Scan 705) and the dry matter was determined gravimetrically.

RESULTS AND DISCUSSION

The parameters analysed, number of samples used for them are summarized in Table 1. These parameters were the main components of milk such as total protein, total fat and lactose as well as other components of significance from nutritional and technological point of view as casein and dry matter.

The average protein content of the cow milk was $3,27 \pm 0,07\%$ for late autumn winter period (Jan, Febr, March, Nov, Dec) and $3,17 \pm 0,10\%$ in the summer (May-Sept). The total protein percentage between winter months and summer months has been shown differences. The mean fat content of milk samples was $3,62 \pm 0,07\%$ (Jan, Febr, March, Nov, Dec) and $3,52 \pm 0,09\%$ during the warm months (May, June, July, Aug, Sept).

Generally, milk protein is correlated with milk fat percentage, if one is high, the other is usually high too, but the total protein does not fluctuate as much as fat. The seasonal variation was due to outdoor grazing in summer and diet based on hay during the

winter months when the herbage is not available. Increasing the fiber content in diet increases milk fat level.

Lactose fluctuation during the year was observed too: $5,00 \pm 0,09\%$ (Jan, Febr, March, Nov, Dec) and $4,56 \pm 0,08\%$ (May → Sept).

The statement made by some authors that lactose content of milk is relatively constant is not valuable in our study. The decrease of lactose during summer is largely due to increased intake of grass, a reduce de energy forage. Winter hay intake restores lactose to normal.

Casein was found $2,65 \pm 0,13\%$ in winter season and $2,50 \pm 0,07\%$ during warm months.

The casein content of milk is related to cheese making. So there is on opportunity for a cheesemaker to predict the potential cheese yield as a function of season.

The average content of dry matter in summer months was 95,74% of that observed in winter months indicatind that cows tended to show similar patterns of dry matter the entire year.

Table 1
 Effect of seasonal changes on the composition of main components of milk (average value ± sx)

Component (%)	No of samples	Month					
		Jan	Febr	March	April	May	June
Total protein	48	3,28±0,04	3,30±0,10	3,23±0,15	3,14±0,05	3,10±0,12	3,16±0,15
Total fat	48	3,74±0,02	3,68±0,05	3,53±0,10	3,40±0,02	3,52±0,12	3,50±0,06
Lactose	48	4,90±0,05	5,12±0,10	4,96±0,10	5,85±0,07	4,60±0,05	4,55±0,10
Casein	36	2,64±0,20	2,61±0,15	2,62±0,10	2,51±0,10	2,48±0,08	2,53±0,05
Dry watter	50	12,53±0,10	12,50±0,08	12,40±0,15	12,29±0,20	12,31±0,05	11,80±0,08

Component (%)	No of samples	Month					
		July	August	Sept	Oct	Nov	Dec
Total protein	48	3,18±0,07	3,20±0,10	3,23±0,08	3,20±0,20	3,30±0,10	3,27±0,10
Total fat	48	3,56±0,05	3,52±0,12	3,54±0,10	3,52±0,10	3,70±0,08	3,80±0,10
Lactose	48	4,50±0,05	4,50±0,12	4,65±0,10	4,80±0,09	4,90±0,12	5,15±0,10
Casein	36	2,60±0,04	2,30±0,10	2,60±0,12	2,71±0,06	2,68±0,12	2,74±0,08
Dry watter	50	11,70±0,10	12,0±0,12	11,90±0,14	12,2±0,25	12,37±0,05	12,45±0,07

CONCLUSIONS

1. The major components of cow milk (total protein, fat, lactose and casein) are affected by seasonal changes

2. The mean protein content was $3,2 \pm 0,07\%$ for winter period and $3,17 \pm 0,01\%$ during summer months

3. The mean fat percentage of milk samples was $3,62 \pm 0,07\%$ (January, February, March, November, December) and $3,52 \pm 0,09\%$ during the warm months (May → Sept).

4. Lactose fluctuation during the seasons of the year was observed too: $5,00 \pm 0,09\%$

(Jan, Febr, March, Nov, Dec) and $4,56 \pm 0,08\%$ (May → Sept).

5. The statement made by some authors that lactose content of milk is relatively stable is not valuable in our study

6. Casein was found $2,65 \pm 0,13\%$ in winter season and $2,50 \pm 0,07\%$ in summer.

7. The results sustain the idea that a cheesemaker can predict the potential cheese yield as function of season.

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