

## THE QUALITY OF LOW PROCESSED DAIRY PRODUCTS<sup>1</sup>

*T. Grega, M. Sady, Dorota Najgebauer, J. Domagała, B. Faber<sup>2</sup>*

**Abstract:** The aim of the study was to examine the quality of milk products with regard to requirements of the new Polish norms. The level of coliforms in the cream fluctuated from  $3,49 \pm 1,58 \times 10^3$  (winter) to  $6,60 \pm 1,38 \times 10^5$  (summer). The level of yeasts and moulds also revealed great variations:  $1,51 - 9,28 \times 10^5$  depending on the season of the year. Similar disadvantageous trends in the microbiological quality were also observed for other products i.e.: butter ( $7,32 \pm 1,58 \times 10^3$  (winter);  $1,75 \pm 0,24 \times 10^4$  (summer) - coliforms); ( $1,08 \pm 0,14 \times 10^3$  (winter);  $7,72 \pm 1,69 \times 10^4$  (summer) - yeasts and moulds); quark ( $1,09 \pm 0,24 \times 10^4$  (winter);  $5,10 \pm 0,89 \times 10^5$  (summer) - coliforms); ( $6,10 \pm 1,02 \times 10^3$  (winter);  $6,09 \pm 1,20 \times 10^5$  (summer) - yeasts and moulds).

**Keywords:** low processed food, microbiological quality, dairy products

### *Introduction and literature review*

In Poland there is an increasing concern about functional dairy products made by traditional methods. These products are: quark, cream and butter.

*Bohdziewicz et al. (2004)* estimated the water content in quark at 74,0-74,5%. Acidity according to these authors fluctuated in the range of 4,53-4,55 pH and was affected by the fat content. The fat level improved also the sensory quality of the products. According to *Szpendowski et al. (2004)* the basic percentage composition of quark is: water - 71,03-76,42; protein - 12,89-14,31; fat - 6,12-7,05; lactose - 3,74-4,38; ash - 0,84-1,12 and is dependent on the method of production.

*Smietana et al. (2003)* assessed microbiological quality of either fresh quarks and of the same products after storage. The total bacteria count in the fresh quarks ranged between  $2,7-9,0 \times 10^3$ , whereas after 14 days of storage it increased to  $1,9-4,1 \times 10^4$ . Coliforms, yeasts and moulds in the examined products were not present.

The quality of fat based products i.e. cream and butter is mostly influenced by the kind of fed forage. The milk fat of summer products is richer in unsaturated fatty acids in comparison to products made in the winter period. This relationship has an effect on the dry matter level, acidity, sensoric value and texture of either butter or cream (*Żegarska, 1998*).

Majority of examined in Poland cream and butter samples were characterized with sufficient microbiological quality. The total bacteria count did not exceed 10 and no coliforms or *Listeria* and *Salmonella* (cream) bacteria were present. In butter the moulds and yeasts number can fluctuate in the ranges: 100-500 jtk/g, 300-500 jtk/g, respectively, coliforms should be absent in 0,01 g, and *Salmonella* - not present (PN-A-86155).

### *Materials and methods*

#### **Cream:**

- sensoric evaluation (5-points hedonic scale),
- titration acidity and pH (according to PN-78/A-86028),
- fat content by Kochler method (P N-78/A-86028),
- diacetyl content (Pien, 1974),
- microbiological quality: coliforms number, yeasts and moulds number.

#### **Butter:**

- sensoric evaluation (5-points hedonic scale),
- water, fat and dry matter content according to Kohman (P N-80/A-86207),
- pH of butter plasma (P N-80/A-86207),
- fat acidity (P N-80/A-86207),
- iodine number (P N-80/A-86207),
- microbiological quality: coliforms number, yeasts and moulds number (PN-93/A- 86034).

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<sup>2</sup> Prof. dr hab. Tadeusz Grega, Dr inż. Marek Sady, Dr inż. Dorota Najgebauer, Dr inż. Jacek Domagała, Mgr inż. Bartłomiej Faber: Department of Animal Products Technology, Agricultural University of Kraków, Al. 29 Listopada 52, 31-425 Kraków, Poland

## Quark:

- sensoric evaluation (5-points hedonic scale),
- titration acidity (according to PN-73/A-86232),
- water content (PN-73/A-86232),
- fat content and fat content in dry matter (PN-73/A-86232),
- protein content by kjeldahl method in Buchi instrument,
- microbiological quality: coliforms number, yeasts and moulds number (PN-93/A-86034).

*Results and discussion*

The obtained results are shown in tables 1-3. The results of sensoric evaluation as well as other obtained parameters concerning the composition and selected physicochemical characteristics of cream, butter and quark indicate that they are in good agreement with Polish Requirements for respective products.

However, examined products showed a high level of microbiological contamination. The level of coliforms in the cream fluctuated from  $3,49 \pm 1,58 \times 10^3$  (winter) to  $6,60 \pm 1,38 \times 10^5$  (summer), in butter it varied from  $7,32 \pm 1,58 \times 10^3$  (winter) to  $1,75 \pm 0,24 \times 10^4$  (summer) and in quark – from  $1,09 \pm 0,24 \times 10^4$  (winter) to  $5,10 \pm 0,89 \times 10^5$  (summer). According to Polish Requirements for cream it should contain not more than 100 coliforms per 1g, and in butter and quark coliforms should be absent in 0,01 and 0,001 g, respectively. So it can be easily seen that the number of coliforms was significantly exceeded in all examined products especially during the summer period. The same relationship was found for number of yeast and moulds. In every samples of butter it always exceeded maximum acceptable value of 1000 (from  $1,08 \pm 0,14 \times 10^3$  (winter) to  $7,72 \pm 1,69 \times 10^4$  (summer)) and among all quark samples only products sold in the winter did not contain more than 10500 yeasts and moulds per g (from  $6,10 \pm 1,02 \times 10^3$  (winter) to  $6,09 \pm 1,20 \times 10^5$  (summer)). Bad microbiological quality probably resulted from bad raw milk quality.

Table 1. Selected qualitative characteristics of cream in relation to the season of the year

Parameter	Spring (III, IV, V)	Summer (VI, VII, VIII)	Autumn (IX, X, XI)	Winter (XII, I, II)
Sensoric evaluation (points)	4,38 ± 0,24	4,65 ± 0,42	4,50 ± 0,31	4,29 ± 0,48
pH	4,67 ± 0,41	4,42 ± 0,32	4,50 ± 0,53	4,89 ± 0,46
Acidity (°SH)	33,73 ± 5,24	37,57 ± 4,45 a	35,46 ± 5,34	27,15 ± 4,08 a
Fat content (%)	25,89 ± 3,86	26,24 ± 4,17	26,31 ± 3,37	25,72 ± 4,16
Diacetyl content (mg/cm <sup>3</sup> )	1,01 ± 0,22 A, a	1,62 ± 0,26 A, B	1,43 ± 0,19 a, C	0,82 ± 0,10 B, C
Coliforms (cfu/cm <sup>3</sup> )	4,19 ± 1,47 × 10 <sup>4</sup> A, D	6,60 ± 1,38 × 10 <sup>5</sup> A, B, C	3,73 ± 1,01 × 10 <sup>4</sup> B, E	3,49 ± 1,58 × 10 <sup>3</sup> C, D, E
Yeasts and moulds (cfu/cm <sup>3</sup> )	8,27 ± 2,12 × 10 <sup>4</sup> A	9,28 ± 2,46 × 10 <sup>5</sup> A	1,51 ± 0,44 × 10 <sup>5</sup> A	6,95 ± 0,44 × 10 <sup>3</sup> A

A, B, C, D, E – significant,  $p \leq 0.01$

a – significant,  $p \leq 0.05$

Table 2. Selected qualitative characteristics of butter in relation to the season of the year

Parameter	Spring (III, IV, V)	Summer (VI, VII, VIII)	Autumn (IX, X, XI)	Winter (XII, I, II)
Sensoric evaluation (points)	4,56 ± 0,23	4,76 ± 0,21	4,66 ± 0,19	4,48 ± 0,25
Water content (%)	16,77 ± 2,84	17,44 ± 2,12	17,06 ± 3,04	16,53 ± 2,63
Non fat dry matter content (%)	81,49 ± 4,47	80,73 ± 5,83	81,25 ± 4,19	80,84 ± 5,09
pH of plasma	4,57 ± 0,38	4,52 ± 0,28	4,63 ± 0,42	4,69 ± 0,31
Acidity of fat (°K)	2,01 ± 0,32	2,49 ± 0,49	2,33 ± 0,37	2,09 ± 0,30
Iodine fat number	30,4 ± 3,2 a	37,1 ± 3,6 A, a	35,2 ± 4,1 b	27,6 ± 3,5 A, b
Coliforms (cfu/cm <sup>3</sup> )	7,32 ± 1,58 × 10 <sup>3</sup> A, B	2,39 ± 0,42 × 10 <sup>4</sup> A	1,75 ± 0,24 × 10 <sup>4</sup> B	1,58 ± 0,28 × 10 <sup>3</sup> A, B
Yeasts and moulds (cfu/cm <sup>3</sup> )	6,81 ± 1,73 × 10 <sup>3</sup> A, B	7,72 ± 1,69 × 10 <sup>4</sup> A	5,49 ± 1,04 × 10 <sup>4</sup> B	1,08 ± 0,14 × 10 <sup>3</sup> A, B

A, B – significant,  $p \leq 0.01$  a, b – significant,  $p \leq 0.05$

Table 3. Selected qualitative characteristics of quark in relation to the season of the year

Parameter	Spring (III, IV, V)	Summer (VI, VII, VIII)	Autumn (IX, X, XI)	Winter (XII, I, II)
Sensoric evaluation (points)	4,53 ± 0,24	4,36 ± 0,36	4,48 ± 0,28	4,58 ± 0,37
Acidity (°SH)	78,83 ± 8,04	99,42 ± 8,64 A, B	88,64 ± 7,37 C	70,26 ± 7,92 B, C
Water content (%)	72,60 ± 7,01	70,59 ± 5,65	71,63 ± 5,94	73,37 ± 4,38
Fat content (%)	15,09 ± 1,95	14,34 ± 2,42	15,62 ± 2,01	16,41 ± 2,04
Fat content in dry matter (%)	55,07 ± 6,29	48,76 ± 5,14	55,06 ± 7,06	61,62 ± 7,82
Protein content (%)	12,04 ± 1,41	14,34 ± 1,28	13,40 ± 1,93	11,05 ± 1,64
Coliforms (cfu/cm <sup>3</sup> )	3,49 ± 0,72 × 10 <sup>4</sup> A	5,10 ± 0,89 × 10 <sup>5</sup> A	7,03 ± 1,03 × 10 <sup>4</sup> A	1,09 ± 0,24 × 10 <sup>3</sup> A, B
Yeasts and moulds (cfu/cm <sup>3</sup> )	4,38 ± 0,91 × 10 <sup>4</sup> A, D	6,09 ± 1,20 × 10 <sup>5</sup> A, B, C	6,92 ± 1,31 × 10 <sup>4</sup> B, E	6,10 ± 1,02 × 10 <sup>3</sup> C, D, E

A, B, C, D, E – significant,  $p \leq 0.01$

### Conclusions

1. Examined dairy products offered in direct sale, were characterized with unproper microbiological quality.
2. Unsufficient quality of these products was due to lack of cooling conditions and probably bad quality of raw milk.

## KVALITET MLEČNIH PROIZVODA

T. Grega, M. Sady, Dorota Najgebauer, J. Domagala, B. Faber,

### Rezime

Kao rezultat zabrinutosti u vezi sa preradevinama u ishrani pojavili su se proizvodi od nepasterizovanog mleka (regionalni proizvodi) na mnogim tržnicama u Poljskoj. Cilj ovog istraživanja je bio da se ispita kvalitet ovih proizvoda u vezi sa zahtevima novih poljskih standarda i normi. Uzorci različitih mlečnih proizvoda (pavlaka, buter, quark-sir) su uzeti sa manjih tržnica u Krakovu koje na ponudi imaju individualni proizvođači i proizvodi su analizirani tokom cele godine. Kvalitet proizvoda je ocenjivan na sledeći način: pavlaka (sensorna ocena, titrirani aciditet °SH, pH, sadržaj masti, sadržaj diacetila, mikrobiološka analiza, itd.), buter (sensorna ocena, sadržaj vode, masti, suve materije, pH plazme, aciditet masti, jodni broj, mikrobiološki kvalitet), quark-sir (sensorna ocena, titrirani aciditet °SH, sadržaj vode, masti, masti u suvoj materiji i proteina, mikrobiološki kvalitet).

Većina analiziranih parametara, pod uticajem sezone u godini, osim mikrobiološkog kvaliteta, su bili u skladu sa zahtevima poljskih normama. Nivo koliforma u pavlaci je varirao od  $3,49 \pm 1,58 \times 10^3$  (zima) do  $6,60 \pm 1,38 \times 10^5$  (leto). Nivo kvasca i plesni takođe pokazuje velike varijacije:  $1,51 - 9,28 \times 10^5$  zavisno od sezone. Slične negativne trendove u mikrobiološkom kvalitetu pokazuju i ostali proizvodi: buter ( $7,32 \pm 1,58 \times 10^3$  (zima);  $1,75 \pm 0,24 \times 10^4$  (leto) - koliformi); ( $1,08 \pm 0,14 \times 10^3$  (zima);  $7,72 \pm 1,69 \times 10^4$  (leto) – kvasac i plesni); quark - sir ( $1,09 \pm 0,24 \times 10^4$  (zima);  $5,10 \pm 0,89 \times 10^5$  (leto) – koliformi); ( $6,10 \pm 1,02 \times 10^3$  (zima);  $6,09 \pm 1,20 \times 10^5$  (leto) – kvasac i plesni). Zabeleženo je da su ovi proizvodi na tržištu karakterišu niskim mikrobiološkim kvalitetom što može biti rezultat nedostatka rashladnih uređaja tokom skladištenja kao i početnog lošeg kvaliteta mleka.

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