Session 5

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MESOPHILIC AND PSYCHROTROPHIC AEROBE SPORULATING MICROORGANISMS IN RAW COW´S MILK

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INTRODUCTION

Milk intended for processing to human nutrition must not contain any pathogenic microorganisms. The only obligatory microbiological criterion is a total count of mesophilic microorganisms that can reach a maximum of 100 thousand per 1 ml milk expressed in CFU. Spore-forming microorganisms have a special position among total microflora of milk, with regard to their greater ability to survive pasteurization of milk and subsequently to propagate in final products. The suppliers of raw material for such processing were introduced to a new parameter of raw milk quality, a count of mesophilic and psychrotrophic aerobic sporulates (MPAS). The method for MPAS assessment is to inactivate the milk sample by heating it to 80 – 82 °C for 30 minutes. Mesophilic aerobic sporulates (MAS) are incubated in cultivation dishes at 30 °C for 3 days -, and psychrotrophic aerobic sporulates (PAS) at 7 °C for 10 days. This study deals with characteristics of microbiological contamination in milk within the year round inquiry aiming at supplementary traits of mesophilic and psychrotrophic sporeforming aerobic microflora. It evaluates relations to technologically important groups of microorganisms, proposes limit criterion and a method of cultivation as a means to decrease riskiness and prolong the durability of milk foodstuffs.

EXPERIMENTAL PROCEDURES

- 294 samples off raw cow's milk from 14 farms during one year were used for analysis.
- MMC (total count of mesophilic microorganisms) was assessed under the standard STN ISO 48 33 (1997), CBC (count of coliform bacteria) under STN ISO 48 32 (1977), PMC (total count of psychrotrophic microorganisms) under STN ISO 67 30 (2000).
- SPAN (spore-forming anaerobic bacteria) was collected by the inoculation of 1 ml milk inactivated at 85 °C for 10 min. in a test tube with the cultivating medium MPAG then embedded with paraffin and cultivated 7 days at 37 °C, and MPAS under the rule TEI 118.
- The results of all microbiological traits in the studied set of samples were converted to CFU in 1 ml of original non-diluted milk (CFU/ml) and statistically evaluated by the software Microsoft Excel XP.
- Basic statistical characteristics – geometric mean analysis
- To test the influence of season on levels of individual groups of microorganisms – analysis of variance.
- The method of pair T- test – the evaluation the results of comparing experimental procedure in determination of total mesophilic and psychrotrophic aerobic sporulates count.

RESULTS

Microbiological characteristics of studied milk

- MMC –average value for the whole year: 38-170 CFU/ml.
- CBC – average value: 698 CFU/ml.
- PMC - arithmetic mean: 12.5 ths CFU/ml.
- SPAN - average: 6.3 CFU/ml.
- No statistically significant influence on medium values of individual microbiological parameters for each season the whole year.

Evaluation of MPAS

- The mesophilic aerobic sporeforming microorganisms count (MAS) – within the span from 2 to 330 CFU/ml.
- The counts of psychrotrophic aerobic sporulates (PAS) were from 0 to 28 CFU/ml.
- The total count of mesophilic and psychrotrophic aerobic sporulates (MPAS) – within the span 2.5-340 CFU/ml.

Mutual correlations of studied microbiological parameters

- Results of MPAS do not show any correlation with the other studied microbiological parameters.
- The observation between MMC and MPAS has no dependence.
- For the mutual relation between PAS and MAS – the correlation coefficient r=0.18 was calculated.

Influence of season

- There was not any significant seasonal influence with any of the MAS, PAS and MPAS parameters by mean of analysis of variance.

Variability of individual suppliers

- Variability in values of microbiological parameters from individual suppliers of raw cow's milk expresses the operational certainty of breeders.
- We noticed close correlation dependence between average values of the studied farms and their standard deviation.

Table 1 Basic statistical data on microbiological characteristics of studied milk [count of CFU/ml]

	Average	Min.	Max.	Standard deviation	Inconvenient samples (%)
MMC	38 170	500	500 000	$7.66*10^4$	9.2
PMC	12 536	25	150 000	$6.42*10^8$	6.8
CBC	698	5	13 000	$2.60*10^6$	16.0
SPAN	6.3	0	23	22	47.6
MPAS	59.4	2.5	340.5	3052	3.1

Table 2 Results of subsequent incubation of cultivation dishes with sporeforming aerobic microorganisms [CFU/ml]

	Average	Min.	Max.	Standard deviation
MAS	54.0	2	330	2909
PAS	5.4	0	28	32
SMAS	52.3	0.5	412	3176
SPAS	2.9	0	28	18
MAS + PAS	59.4	2.5	341	3052
MAS + SPAS	56.9	2.5	346	3090
PAS + SMAS	57.7	1	421	3249

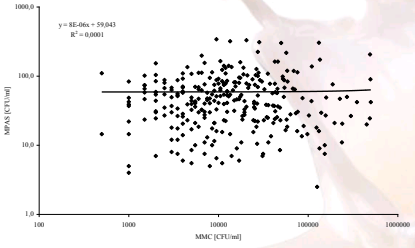

Fig. 1 Relation of MPAS count to mesophilic microorganisms count of individual samples [CFU/ml]

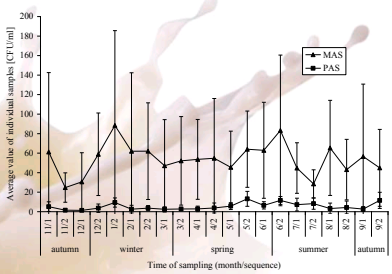

Fig.2 Average counts of mesophilic and psychrotrophic sporeforming microorganisms in course of seasons