STUDY ON CERTAIN FRESHNESS AND HYGIENE PARAMETERS OF EDIBLE MILK MARKETED BY SMALL SIZE FARMERS IN IASI CITY

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Abstract

Buying animal originated food from the small farmers within the metropolitan surroundings is a frequent behavioural pattern occurring in urban area of Romania. The situation is tributary either to certain prejudices related to the quality of the food issued from large farms or processors, usually strengthened by bad intentioned or not well informed mass-media opinions, either by the increased interests of consumers for the food sensorial features (savour, flavour, colour etc.). On the contrary, less consumers are interested in real nutritional facts or in the safety of the food bought from non trustable producers. Such a situation occurs for the whole fresh milk. This study aimed to assess the freshness and hygienic status of the milk sold in Iaşi city (apart from the markets having veterinary inspections). Laboratory analyses were performed to measure milk free acidity (Thörner method) and ionic concentration (bromothymol and alysarin methods) while reductase assay (methyl blue and resazurine methods) indicated data on its microbial payload. Out of 60 samples from 12 different producers, 31% were found above the normal acidity (15-19°T, 6.4-6.6 pH). Hygienically, 78% of the samples were found within quality class I (good, < 500000 germs/ml), 19% within class II (satisfactory, 500000-4000000 germs/ml) and 3% within class III (bad, 4000000-20000000 germs/ml), suggesting thus misconducts in following good hygiene practice in milking, packaging, transportation and storage or even udder health problems. The results revealed, once again, the lack of responsibility of certain people producing and reselling animal originated, perishable food. Finally, we should ask: hence the consumer decides to buy food from small producers, why they endanger their and theirs families' health, for the sake of a minimal advantage on the paid amount, when they could orientate toward the veterinary surveyed markets? The situation imposes the organizing of certain activities and public debates, in order to educate the consumers to be able to choose well informed and fully responsible on the food quality and safety.

Key words: cow milk raw, small farmers, freshness, hygiene, food safety

INTRODUCTION

Cultural habits throughout multiple generations and the mass-media pressure on the qualities of bio or organic products determine people to buy food from small, local producers, considering the products are less processed, therefore healthier. This could be an advantage, indeed, both sanogenically and financially, if those products are well controlled and inspected to meet hygienic and non polluted status.

However, many producers sell their products (including animal originated food – eggs, dairy products, even meat) from door to door or outside the controlled markets, hence the risk for the public health. The national legislation on food safety and hygiene, transposing the European one, imposes severe rules for producing, transporting and selling alterable food products, including cow milk [14] but, unfortunately, its articles except the small producers which sell small quantities. It is known that milk is an very appropriate environment for developing microorganism, either of endogenous or exogenous-contaminating origin, no matter it is fresh, combined, sterilized al pasteurization or ultrahigh temperature [2].

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Milk freshness could be probed using empiric measurements, either quantitative or qualitative, used massively and evolved throughout the last 100 years [boiling, acid coagulation, titratable acidity, ionic concentration, enzyme assays basing on certain reagents tintorial properties) [3; 7; 8; 10; 11].

More recent methods in milk quality and safety inspection comprise spectroscopy and comparison of the results with online databases [1; 5]. However, such methods are less affordable logistically. This paper aimed to find out, using less complicated methods, if milk bought from small producers are safe for consumption and if they are responsible for the product they sold.

MATERIAL AND METHODS

The biological material consisted in 60 samples of fresh whole cow milk, from 12 producers around Iasi city, which usually sell their production from door to door or outside a food safety controlled market. Each sample comprised 250 ml and was preserved in sterilized, clean bottles, preserved at 4°C. Prior to freshness and hygiene analysis, they were well homogenized, each sample apart.

The freshness status was assessed through acidity and ionic concentration measurements, basing on literature methodology [6, 13]. The direct acidity was measured through the titrimetic method Thörner, which specify a normality interval for the fresh milk between 16 and 19°T (fig. 1).

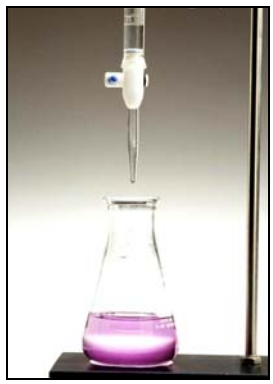

Fig. 1 Assessment of titratable acidity of milk through Thörner method

The ionic concentration (pH value) was indicated by two colorimetric methods:

- *bromothymol blue assay* (fig. 2), which has three levels of assessments, related to the color developed into the sample: light yellow-acid milk (≤6.2 pH), green-yellow – normal (6.6 pH), green-blue – alcaline (≥7.0 pH);

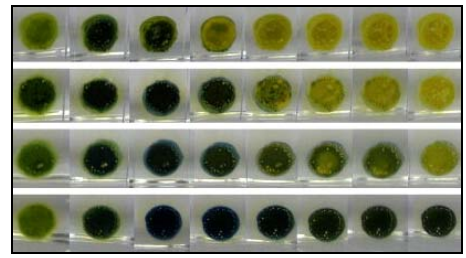

Fig. 2 Assessment of ionic concentration of milk through bromothymol blue assay

- *alizarin assay*, which has two levels of detection, related to the final achieved color in the milk container: dark brown-fresh milk (6.5 pH) and light yellow-acid milk (5.7 pH).

Fig. 3 Assessment of ionic concentration of milk through alizarin assay

Knowing the microbial proliferation in milk will increase the enzymatic load in aliment enzymatic methods are frequently used to directly or indirectly assess hygienic status of milk [4; 13]. Firstly, the microbiological reductase enzyme assay was applied, using two analytical methods: methylene blue assay and resazurine assay.

The *methylene blue assay* (fig. 4) indicates the redox action of microorganisms, especially of their excreted enzymes, onto the

blue methylen added in sample milk, incubated at 37°C [9; 12; 13].

Fig. 4 Assessment of hygienic status of milk through reductase assay (methylene blue method)

The higher the concentration of microrganisms in milk, the quicker occurrence of depigmentation in the sample. Basing con this reasoning, the bacterial population in milk, thus the milk hygienic quality could be estimated as related to demethylation interval (table 1).

Table 1 Methylene blue method – reductase assay – milk classifying

Time to loose pigment	Quality	Class	Germs/cm^3
> 5h30'	Good	I	< 500.000
5h30'-2h	Satisfying	II	500.000-4mil.
2h – 20'	Bad	III	4-20 mil.
< 20'	Very bad	IV	> 20 mil.

The *resazurine assay* is also based on the capacity of milk microbiota to depigmentate resazurine [13] (fig. 5), depending on excreted enzyme quantity (related to microbial concentration), under incubation for an hour at 37°C.

The initial color of resazurine is intense blue and could change to purple, pink and even white if the microbial contamination is high (tab. 2).

Fig. 5 Assessment of hygienic status of milk through reductase assay (resazurine method)

Table 2 Resazurine method – reductase assay – milk classifying

Milk tint after 1 h incubation at 37°C	Quality	Class
Steel blue	Good	I
Blue-violet to red-violet	Satisfying	II
Pink light	Bad	III
White	Very bad	IV

All samples were individually examined, then the results were algebraically and statistically (mean ± std. error) calculated.

RESULTS AND DISCUSSIONS

Milk freshness was found within normal and abnormal intervals, using all three methods (titratable acidity and ionic concentration) (fig. 6, table 3).e average values of heavy metals contents in combined feed, yolks, albumens and whole eggs are presented in table 1, for both studied systems.

Thus, 69% of analysed samples were considered within normality range (15-19°T); they were divided in: very fresh (29% - usually the milk produced and milked during the same morning, well preserved, in clean bottles, at proper temperature – max 4-5°C) and fresh (40% - product milked the same day or maximum 24 hours old, kept under appropriate storage and transportation conditions).

Certain samples were measured as acid (20-21°T) (17% - milk older than 2 days or fresher but kept under inappropriate conditions – temperature and containers hygiene), while 14% were found as highly acid, results underlined by the sensorial exam as well. These bad quality results could be explained either through inappropriate storage or through bad hygiene during milking or preserving milk.

The microbial load of the milk was indirectly assessed using bacterial secreted enzymes ability to deconstruct certain pigments, such as methylene blue and resazurine (table 4 and fig.7).

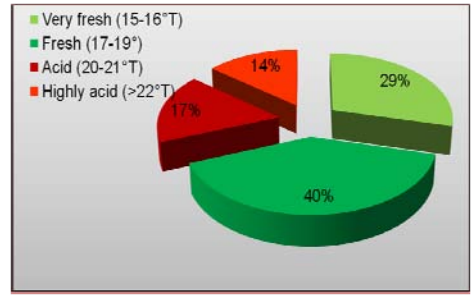

Fig. 6 Milk freshness status, accordingly to titritable acidity and ionic concentration in samples

Table 3 Status of the milk samples freshness, according to Thorner method, bromthymol blue and alizarin assays

Freshness class	Thorner Method			Bromthymol blue method			Alizarin assays		
	Measured acidity (°T)	Samples amount	%	Final colour	Samples amount	%	Final colour	Samples amount	%
Very fresh	15.6±0.38	17	29	green yellow	41	69	dark brown	41	69
Fresh	17.8±0.63	24	40						
Acid	20.4±0.35	10	17	light yellow	19	31	light yellow	19	31
Highly acid	22.8±0.57	9	14						
TOTAL	-	60	100	-	60	100	-	60	100

Table 4 Status of the milk samples hygienic status, according to microbian reductaze assays

Hygienic class	Quality class	Methylene blue method				Resazurine method		
		Depigmentation interval (h±min)	Germs load/cm^3	Samples ammount	%	Final colour	Samples amount	%
Good	I	6h±25min	< 500,000	47	78	Dark blue	47	78
Satisfactory	II	4h±55min	500,000-4,000,000	11	19	Blue-violet	11	19
Bad	III	1h±20min	4,000,000-20,000,000	2	3	Pink	2	3
TOTAL	-	-		60	100	-	60	100

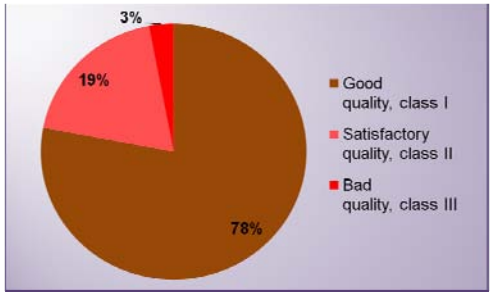

Fig. 7 Milk hygienic status, accordingly to microbian reductase assays

Accordingly to these analytical investigations, 78% of samples felt within the Class I – good quality, while 19% represented satisfactory quality (class II) and 3% bad quality (class III), thus unsafe, dangerous to be consumed.

This could suggest that milk freshness, given by acidity was mostly affected by storage and transportation conditions, hence 78% of samples presented good microbiological quality and only 69% of them had proper acidity.

CONCLUSIONS

The results suggested misconducts in following good hygiene practice in milking, packaging, transportation and storage or even udder health problems.

They revealed, once again, the lack of responsibility of certain people producing and reselling animal originated, perishable food.

Finally, we should ask: hence the consumer decides to buy food from small producers, why they endanger their and theirs families' health, for the sake of a minimal advantage on the paid amount, when they could orientate toward the controlled markets?

The situation imposes the organizing of certain activities and public debates, in order to educate the consumers to be able to choose well informed and fully responsible on the food quality and safety.

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