The importance of the bacterial cultures used in production of cheeses

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Abstract
The scientific researches reflected in this study has the purpose to study the microbiological aspects of the importance of bacterial cultures used in the production of the important dairy product-the cheeses. There have been studied some determinations of interactions between lactic acid bacteria, which are highly complex and beneficial for growth promotion activity of fermentation in the cheeses, and the use of selectioned cultures of lactic acid bacteria, which are used in the form of monocultures or mixed cultures with biotechnological suitable properties for the production of quality products in everyday life.
Key words: *Cheeses, Lactic microorganisms, Maia, Lactose, Microbial Enzymes.*

Introduction

Under the action of the selectioned cultures of microorganisms used as starter cultures in milk processing, over 600 possible variants are obtained in a wide range of assortments of cheeses. To obtain cheese, is used milk, in which lactic bacteria represent more than 50% of the total microbiota, with restrictions on the presence of butyric bacteria, coliform bacteria, and Pseudomonas genes [1, 5].

Simultaneously to avoid defects and the risk of transmitting pathogenic bacteria from diseased animals, after milk collection and its qualitative and quantitative verification, pasteurization in t/T regime that does not cause the denaturing of milk proteins and ensure destruction of transmissible pathogenic micro-organisms through milk. After cooling, the milk is inoculated with specific monocultures or mixed cultures, the bacteria are propagated simultaneously with the lactic fermentation, and the technological stages aim to direct the useful activity of the starter cultures [3,6].

It is considered that cheeses are not an ideal substrate for the development of all microorganisms, but some microorganisms, including selectioned microorganisms used as starter cultures in the cheese industry, are adapted to this type of biotope. Thus, after inoculation into pasteurized milk and cooled to the optimum temperature for cultures, bacteria produce lactic acid lactose fermentation and flavoring substances. For soft cheese varieties, lactic fermentation takes 4-6 hours until the pH of lactic acid decreases below 4.5 when acidic coagulation of milk casein occurs. For assortments of hard paste cheeses, for example, when the pH reaches 5, in the fermented milk is added proteolytic enzymes from the clot, active to this pH, and enzymatic coagulation occurs [2,4].

Therefore, in milk is performed the multiplication of lactic acid bacteria favored by the presence of lactose, by assimilable nitrogen sources (amino acids and peptides), by favorable oxidation potential. The main role of lactic bacteria in cheese making is the intense and safe production of lactic acid [7,8,9].

Studying various bibliographic literature of different authors, I found it appropriate to carry out some scientific researches in this field and for this reason I proposed the main objective of this study to be the study of microbiological aspects on the importance of bacterial cultures used in the production of the important milk product - cheeses.

Material and method

For performing the research, were conducted bacterioscopic and bacteriological investigations of homemade cheeses.

Microbiological investigations were performed based on the samples of cow, sheep and goat cheeses according to the microbiological laboratory pattern.

Results and discussions

The detailed analysis of the researches made it possible to detect and analyze the microbiological aspects based on the detection of the number of lactic microorganisms through the lactic bacterial species (Streptococcus thermophillus, Lactococcus, Lactobacillus etc.) studied by their cultural activity, mode of action and other features that are particularly complex and important.

According to the researches on dairy products containing microbial lactic species, these represent a particular interest and manifest their activity through a variety of beneficial effects on the organism (Table 1).

Table 1. Cultures of lactic bacteria used as production cultures for cheese production

Cultures of microorganisms	Types of cheeses
Lactococcus lactis Lactococcus lactis diacetilactis	Fresh cow cheese
Lactococcus lactis Lactobacillus casei	Telemea, curd for consumption
Lactococcus lactis Lactococcus lactis sp. Cremoris Lactobacillus casei	White cheeses in brine Mingled cheeses
Lactococcus lactis Streptococcus thermophillus Lactobacillus casei	Scalding cheeses
Lactococcus lactis Lactococcus lactis sp. Cremoris Lactococcus lactis diacetilactis	Semi hard cheeses Netherlands

Species of lactic microorganisms are of particular importance to lactic products by some determinations of interactions between lactic bacteria that are particularly complex and beneficial to stimulate the growth of fermentative activities. Thus, S. thermophilus does not possess sufficient extracellular proteolytic activity, and the amount of free amino acids and peptides in milk is not sufficient for its optimal growth (Table 2).

Table 2. Microbial species present in researched cheeses

Cheeses	Microbial species
Cow	Lactococcus cremoris, Streptococcus lactis
Sheep	Lactobacillus bulgaricus, Streptococcus lactis
Goat	Lactobacillus plantarum, Lactococcus cremoris

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in t/T pasteurization that does not produce milk proteins and ensure destruction of transmissible pathogenic micro-organisms through milk. After cooling, the milk is inoculated with specific monocultures or mixed cultures, the bacteria are multiplied simultaneously with the lactic fermentation, and the technological stages aim to direct the useful activity of the starter cultures (Table 3).

Thus, coagulation of milk is accompanied by the conversion of soluble casein in insoluble paracasein which is performed in two ways: coagulation of acid may take place due to the accumulation of lactic acid resulting from the fermentation when the lowering of the pH reaches the isoelectric point of casein from milk; insoluble paracaseinate and calcium lactate are formed; enzymatic coagulation is performed with coagulant proteolytic enzymes when a compact, richer calcium coagulum (Figure 1) is obtained by insoluble paracaseinate formation.

Table 3. Conditions for reactivation the lactic bacteria cultures

Milk product	**Selectioned cultures**	**Inoculated quantity, %**	**Temperature, °C**	**Time, hours**	**Acidity, °T**
Sour milk	Str. lactis, cremoris, lactis (diacetilactis)	1-2 1-2	20-23 25-30	17-20 18-24	90-95 86-92
Fermentated sour cream	Str. Cremoris Str. acetoinicus	3-5	24	24	65
Yogurt	Lb. delbruechi (bulgaricus) Str. salivarus (thermophilus)	1-2	43-45	3	90-95
Acidophilic milk	Lb. acidophillus	2-3	37-40	7-10	120-130
Fresh cheese	Streptococcus	2-3	26-30	12-24	100

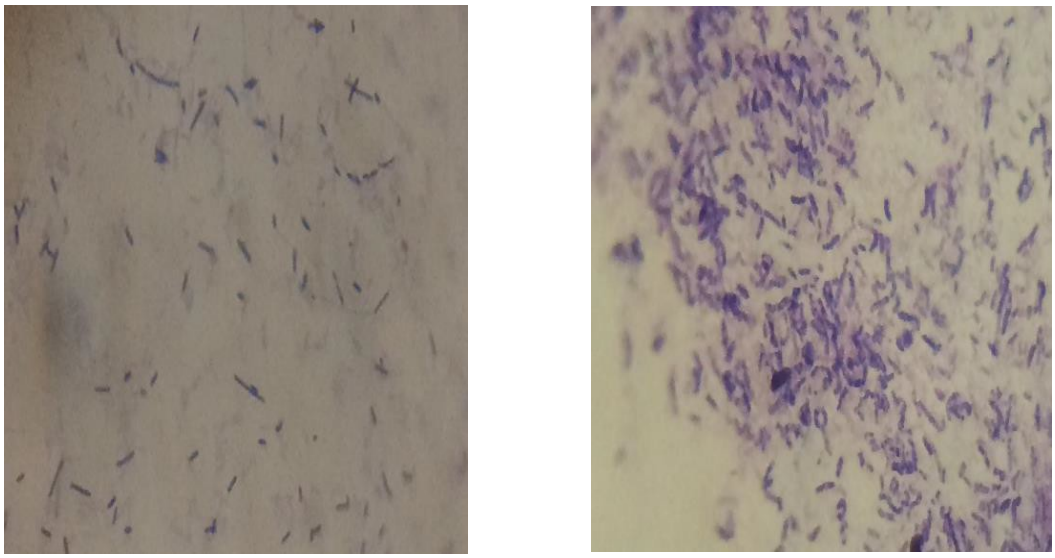

Fig.1. Lactic microorganisms

Nowadays, the coagulating enzymes are used: the curd, obtained by extraction from lamb stomach (calf), containing a complex of proteolytic enzymes which includes: chymotrypsin, trypsin, plasmin renin; enzymes of plant origin: papain, bromelain, ficin, used in warm countries; enzymes of microbial nature are obtained with the help of microorganisms selected with the following species: *Mucor pussilus, Mucor miehei, Endothia parasitica*.

The coagulation process is performed according to the assortment of cheese, the coagul is subjected to the cutting operation (grinding), which favours the separation of the whey. During the operation, bacteria are multiplied and by separating the whey it is estimated that about two-thirds of the milk microbe remains in the clot and the rest is eliminated with the whey.

The maturation of cheeses is a very important step for the finished product and is the result of complex activity of microbial live cells, of microbial exogenous enzymes or of released enzymes from the process of autolysis of nonviable cells and of native milk enzymes or added with the clot on the main components of the clot, namely: unfermented lactose, lactic acid, antide and lipids.

As a result of the formation of calcium lactate, the acidity of the paste is reduced and the activity of the bacteria which requires the development of neutral pH values is possible. At maturation, a limited hydrolysis of milk proteins, especially casein, occurs with the formation of low molecular weight compounds, readily digestible and amino acids. By maturation, the digestibility and nutritional value increase. Amino acids resulting from maturation can undergo transamination, decarboxylation, deamination, and the resulting products can be aldehydes, alcohols, etc., which explains the diversity of taste and aroma.

Lipids under the action of lipases produced by cultures or from clot or milk are converted to glycerol, a source of carbon for microorganisms, and fatty acids are partially converted into aldehydes, ketones, compounds that give a spicy, specific taste.

Taking into account the subsequent information, we note the importance of microbial digestion of acidic dairy products characterized by nutritional value and high biological value, because by the consumption of lactic bacteria (occasionally yeasts), man benefits from the presence of vitamins produced by these microorganisms. Lactic acid bacteria can produce antibiotic-like substances such as: bulgaric acid, acidophilin, which may speed up the healing of gastrointestinal diseases. Some lactic acid bacteria can adapt to the human body because they have an optimal temperature of 37ºC, such as those isolated from infants intestinal microbiota (Lactobacillus acidophillus and Lactobacillus bifidus).

Considering the cheese making technologies, we are finalizing this study as a basis for the use of selectioned lactic bacteria cultures, which are used in the form of monocultures or mixed cultures with the appropriate biotechnological properties for obtaining quality products in everyday life of the man.

Conclusions

1. The lactic bacteria in cheeses favor the presence of lactose, of assimilable sources of nitrogen (amino acids and peptides), of favorable oxidation potential
2. The principal role of lactic bacteria in cheese producing is the intense and safe production of lactic acid.
3. Nowadays, from the coagulant enzyme is used the clot obtained by extraction from the lamb stomach (calf), which contains a complex of proteolytic enzymes.
4. The maturation of cheeses is a very important step for the quality of the finished product and is the result of the complex activity of microbial live cells, of microbial enzymes.
5. The isolation of useful microbial cultures regarding the microbial biotechnology of cheeses characterizes the nutritional value and high biological value of this dairy product food.

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