THE EVOLUTION OF SOME BIOCHEMICAL INDEXES DURING THE PROCESSING OF SOME ACID DAIRY PRODUCTS, UNDER THE INFLUENCE OF SOME EXTERNAL STIMULI

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The acid dairy products are obtained by milk fermentation using lactic cultures and, in some cases, dairy bacteria associated with some yeast varieties for a mixed fermentation.
The acid dairy products possess a high nutritive value. The fulfilled tests indicated that not all pursued parameters were modified during the processes for obtaining acid dairy products. The most significant changes were observed at the acidity samples parameters (pH, titrable acidity), changes produced due to the activity of lactic bacteria from the starter cultures which have consumed lactose from the milk and changed it in lactic acid; also the pH decreases and the acidity increases between some limits.

It was also observed a difference between the values of the percentage of free amino acids at the raw material and at the finite product, namely it is greater for the finite product, especially for the butter milk than for the yoghurt. This difference indicates the progress of a proteolysis process, smaller at the yoghurt and more intense at the butter milk.

The various added supplements influenced the fermentation but also the proteolysis, lipolysis, and protein coagulation and have also changed the physical, chemical and organoleptic properties of the finite product.

Key words: *acid dairy products, lactose, folic acid, free amino acids*

The nutritional characteristics of lactic dairy products are determined by the nutrients from milk, those from other possible ingredients and nutrients resulted as metabolits generated through fermentation produced by the diary bacterium.

Acid dairy products like yoghurt, kefir and acid milk contain some compounds from the milk used as staple, but are different from the viewpoint of quality and quantity because of the biochemical transformations which occur during the lactic fermentation. The lactic fermentation produces changes of composition which consists of production of lactic acid from lactose, formation of pepdides and amino acids from proteins and fatty acids from lipids.

Furthermore, the changes of milk constituents during the lactic fermentation influence the nutritive and physiological value of these products. The final nutritional composition of the product is influenced also by the species and suse of bacteria used in the fermentation, by the source and type of milk, by the temperature and duration of the fermentative process.

The raw milk does not have an optimum content of nutritive nitrate substances, vitamins and other growth elements, indispensable to the lactic bacteria. The lactic aromatization bacteria need the presence of citrate and ions of Mg^{2+}/Mn^{2+} in the culture medium (specially the leuconostocs). Regarding the development of the starter cultures of the propionic bacteria, the culture medium must be improved with yeast extract, glucose and vitamins (biotina, pantotenic acid and tiamina).

The lactic diet products are obtained from a directed lactic fermentation which determines an increased digestions and superior tasting characteristics. These products are diet because the lactic bacteria used in production restrain the development of the putrefaction bacteria from the intestinal mediums. They have an increased content of vitamins from the B complex, therefore they are associated with the treatment with antibiotics because they can recover the intestinal flora destroyed by the these.

MATERIAL AND METHOD

This paper studies the influence of several exogenous factors on the fermentative processes leading to obtain yoghurt and curd.

The samples were processed at S.C. "Tudia" Siret, following the standard recipes, the starter cultures used were delivered by S.C. "Enzymes Derivees".

The manufacturing recipe for yoghurt and curd follows the classic technology, the starter culture used is lyophilized type XPL-1 (CHR HANSEN).

The exogenous factors used in experiments are:

- Mineral addition (Mg, Zn), has an important role in the lactic fermentation
- Lactose addition
- Vitamin addition, plays the role of growth factor for microorganisms (folic acid)

These factors were chosen for the study of their influence over the development of the fermentative processes leading to obtain acid milk considering the following:

- Mg, Zn have confactor role of some enzymes and non enzymes molecules, for example some vitamins, proteins, macroergic compounds, nucleic acids;
- The lactose contains the main substrate of the development of the lactic fermentation; its addition brings a surplus of food for the development and the activity of the lactic bacteria from the starter cultures
- The folic acid has many functions, one the most important is its participation at the synthesis of the purinic basis from the nucleic acids and at the formation of timina (from ADN). The folic acid also participates at the group transfer with a carbon atom, contributing to important metabolic reactions. Both folic acids and its derivates are growth factors for organisms.

Work methods used:

Both for yoghurt and crud the work methods are:

I. Control sample: staple in normal work conditions (keeping with the recipe);
II. Sample with addition of mineral compounds(Mg, Zn);
III. Sample with addition of growth factors (folic acid);
IV. Sample with addition of minerals and lactose;
V. Sample with addition of minerals and growth factors;
VI. Sample with addition of growth factors and lactose;
VII. Sample with addition of minerals, growth factors and lactose.

Work methods

Both for yoghurt and curd samples, the addition of growth factors, mineral compounds and lactose will be done directly in the pasteurized and cold milk before the introduction of the starter cultures and before the start of the lactic fermentation processes.

For the yoghurt samples, after the inoculation of milk with selected cultures of lactic bacteria *Sptreptococcus termophillus and Lactobacillus bulgaricus,* follows the introduction of the additions, whose quantity is illustrated in table 1, by their dissolution in a small quantity of pasteurized and cold milk. The process continues with their addition in the rest of the milk which will be used in obtaining the samples with the corresponding addition.

The milk sowed this way and the margins corresponding to each research variant are distributed in packaging sales (hygienizated in advance). During pouring, the milk from the penstock were the inoculation was made must be shaked. The product packaged in 250 g containers was thermostatted at a temperature between 42-45°C for 3-4 hours, precooled (20°C), cooled (2-8°C) and stored at 2-4°C.

The analyzed samples were drawn at default time frames (4 of 4 o'clock in the beginning of the thermostattion) for the verification of the evolution of some parameters.

Table 1

The vitamins, mineral compounds and lactose addition established for the analyzed samples

Analysed Product		Yoghurt					
Addition	Sample	II	III	VI	V	VI	VII
Magnesium -mg/l		47,8		47,8	47,8		47,8
Zinc -mg/l		10		10	10		10
Folic Acid -mg/l			30		30	30	30
Lactose -g/l				1		1	1

The doses of the additives made were calculated based on DZR, so that it does not adversely affect the human body after consumption.

RESULTS AND DISCUSSIONS

Compared with milk used as staple in the preparation of milk acid taken for research, the obtained values of the parameters considered for yoghurt suffered significant modifications (*tab. 2*).

Table 2

Staple Characteristics – finite product YOGHURT

	pH	Titrabilă acidity	Raw protein	casein	C/PB	Free Aa.	Fats	IA fats
MILK	6,57	17°T	3,31%	2,61 g/100g	0,78	0,95%	3,72%	2,56 mgKOH/g
Yoghurt (control sample)	4,89	75°	3,12%	2,39 g/100g	0,76	1,39%	3,64%	5,02 mgKOH/g

The most significant changes were obtained at the values of the parameters which indicate the acidity of the samples (pH, titrabil acidity). The changes are due to the activity of the lactic bacteria from the starter cultures that consumed lactose from milk transforming it in lactic acid; therefore the pH decreases between some limits.

Also, it is noticed a difference between the values of the free amino acids percentage at the staple compared with those from the finite product.The same difference it is noticed at the values of the acidity index of fats, both between the staple and finite product and the two finite products.

These differences between the percentages of the free aminoacids and the acidity indexes of fats between the staple and the finite products are due to the proteilic and lipolitic enzymes that release amino acids through split of the peptidic chain of the existing proteins from milk, respectively the fat acids from the trigliceridelor from milk.

For yoghurt were taken samples at different time periods form the beginning of the thermostattation, namely at 1-2-3-4 hours of termostattation. The results of the analysis are shown in *table 3*.

Table 3

The results of the yoghurt analysis

Sample no.	Analysed parameter	Thermostatic period			
		1 hour	2 hour	3 hour	4 hour
I blank	Free amino acids %	1.503	1.352	1.42	1.390
	Acidity°T	50	58	73	75
	pH	5.83	5.10	4.92	4.89
II (Mg; Zn)	Free amino acids %	1.2024	1.127	1.503	1.352
	Acidity°T	43	45	68	72
	pH	6.02	5.22	5.04	4.94
III (Folic Ac.)	Free amino acids %	1.35	1.277	1.578	1.427
	Acidity°T	39	65	72	75
	pH	5.71	5.13	4.9	4.89
IV (Mg, Zn, lactose)	Free amino acids %	1.052	1.150	1.560	1.2024
	Acidity °T	43	68	73	77
	pH	5.59	5.01	4.92	4.85
V (Mg, Zn, Folic Ac.)	Free amino acids %	2.329	2.280	2.350	2.630
	Acidity°T	40	65	74	74
	pH	5.73	5.08	4.93	4.83
VI (Folic Ac., lactose)	Free amino acids %	2.855	2.770	2.910	2.930
	Acidity°T	41	64	77	85
	pH	5.68	5.07	4.82	4.77
VII (Mg, Zn, Folic Ac., lactose)	Free amino acids %	2.630	2.580	2.705	2.7054
	Acidity°T	39	60	78	76
	pH	5.71	5.19	4.98	4.93

From *table 3* it can be seen that the free amino acids vary between some limits, for each work sample the differences are quite small.

If we follow the variation of the free amino acids percentage vertical, namely the samples with different additions, we will notice that the V, VI, VII samples have a greater amino acids percentage than the rest of the samples. The explanation for this could be the fact that those additions accelerated the activity of the protolitic enzymes or even participated at the synthesis of some of them, Mg and

Zn have cofactor role of some enzymes including the protoelitic enzymes and some non-enzyme molecules.

Regarding the pH variations, for each analysis variant, it decreases in time, along with the growth of the acidity of the metabolism of the selected cultures of lactic bacteria.

Vertically, between the different analysis variants it can be seen that the I and II samples recorded a significant growth of the acidity only after three hours of thermostattation, while the III, IV, V, VI and VII samples recorded a increase of acidity after two hours of thermostattation (figure 5). This fact can be explained by the fact that the III, V, VI and VII samples have an addition of folic acid that has a factor role in growth, participating at specific metabolic processes of the lactic bacteria. These processes, stimulated by the folic acid, can decrease the needed period in normal conditions for growth and multiplication of microorganisms before the beginning of the fermentation processes of the lactose with formation of lactic acid.

It seems that there has been an exponential reduction of the growth period for the lactic bacteria because of the additions that were used. These can start the fermentation of the lactose much quicker.

On the other hand, the lactose addition made for the IV, VI and VII samples is in fact a food input for the lactic bacteria which can ferment this surplus and form lactic acid and implicit determine the acidity increase.

The variations of the acidity are shown in the graphic below:

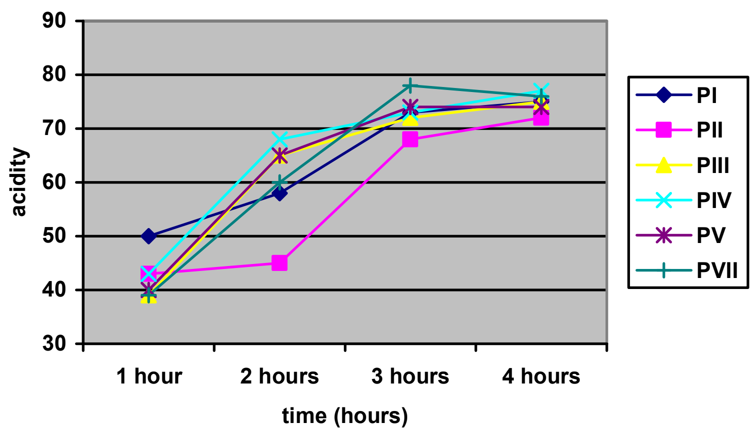

Figure 5 **Variations of acidity for yoghurt samples**

CONCLUSIONS

The determinations and observations based on the analysis presented in this work lead to the following conclusions:

The folic acid used as addition, alone or with Mg, Zn and lactose, seems that influenced the normal development of lactic bacteria, decreasing the needed period in normal conditions for growth and development of the lactic bacteria before the beginning of the fermentation of the lactose from the lactic acid. This is suggested by the fact that the yoghurt samples with folic acid addition registered a faster increase of the acidity than the samples without the addition.

The Mg and Zn addition, in combination with the folic acid determined the increase of the proteoliza rate, denoted by a small value of the C/PB report at the samples where these additions are all present (VII yoghurt, V curd). This report is an indicator of the enzymatic hydration of casein and a possible formation of flavor compounds that will provide the finite product superior gustative qualities. Also, this addition seems to have increased the intensity of lipolytic processes, fact indicated by a greater value of the acidity index of fats at the same samples, as presented above (VII yoghurt). In conclusion, it can be stated that the Mg and Zn additions influenced also the activity of lipolytic enzymes, making them to work more intense.

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