colloquium-journal

ISSN 2520-6990

Międzynarodowe czasopismo naukowe

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№28(80) 2020
Część 1

colloquium-journal

ISSN 2520-6990

ISSN 2520-2480

Colloquium-journal №28 (80), 2020

Część 1

(Warszawa, Polska)



«Colloquium-journal»
Wydrukowano w «Chocimska 24, 00-001 Warszawa, Poland»
E-mail: info@colloquium-journal.org
http://www.colloquium-journal.org/

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энергии, например ветро-солнечных. Для обеспечения необходимого количества отдаваемоемой в сеть мощности требуется увеличение генерируемой мощности ветро-солнечных станций, т.к. зачастую мощность первичного энергоностителя (скорости ветра или колличества солнечного излучения) зачастую ниже среднестатистических. Но данное техническое решение, может привести к переизбытку вырабатываемой энергии;

- отказ от автономной работы станции и переход на параллельную работу с централизованной электросетью — наиболее оптимальный вариант, т. к. полученный избыток электроэнергии возможно продавать в сеть.

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УДК 637.146:67:613.2

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DOI: 10.24411/2520-6990-2020-12207

## FERMENTED MILK PRODUCTS USING VEGETABLE FILLINGS

*Fermented milk products are known for their useful qualities. Products obtained in as a result of exposure of milk to beneficial bacteria, have a strengthening effect on the immune system, they also able to regulate bowel function, can be used as a prophylactic against colds and allergies. fermented milk products have an important advantage, which is the fact that it is transferred and absorbed is better than milk for most people, thanks to the fact that the constituents of milk are already partially starters fermented by microflora.*

*In this work the composition of pro- and prebiotics, the influence of bifido-stimulating component and a stabilizing system on quality indicators of fermented dairy dessert products are scientifically justified. In addition, the technologies of fermented milk desserts are developed, based on consortium of bifidobacteria and lactobacilli using bifidobacteria growth stimulants, fruit and cereal fillers increasing nutrition and biological value of dessert products that form their organoleptic properties.*

*The need to expand the range of the MDFP range is dictated today by the demographic situation in Ukraine (part of the elderly people in the general structure of the population is 20.5%, according to the forecasts of the Institute of Gerontology of the Academy of Medical Sciences of Ukraine until 2050 it will grow to 38.1%), an increase in the number of people with cardiovascular diseases, (up to 24.5 and 3.8%, respectively), the spread of*

*secondary immunodeficient conditions complicated by gastrointestinal disturbances to half of the country's population. Therefore, the development of a new assortment of scientifically based MDFP technologies enriched with the complexes of lactoid cultures of bifidobacteria, biologically active substances (BAA), prebiotics is relevant for Ukraine and needs to be addressed.*

***Keywords:*** *pro- and prebiotics, Sinbacterium, Bifidobacterium, Lactobacterium, vegetable fillers, biological value.*

The priority in the development of civilized society is human health. The number of people who prefer healthy food products has been steadily on the rise [ 1].

The normal functioning of human's basic life systems is affected by the entire range of adverse factors. On the one hand, it is the widespread use of pesticides, different food additives, preservatives, colorants, irrational nutrition by most people in the world, on the other hand, a massive uncontrolled application of chemotherapy preparations, including antibiotics. These factors are considered to cause an increase in the frequency of dysbacteriosis and a growth of gastroenterological diseases in people of different age groups.

Fermented dairy products are the main suppliers of probiotic microorganisms to the human body. Lactic acid and bifidobacteria are classical probiotics that are widely used as biologically active components in the production of food and pharmaceuticals. Currently, special attention is paid to bifidobacteria, the use of which prevents the development of opportunistic and pathogenic microorganisms, increasing the body's resistance to infectious diseases.

At assortment of products with the use of lacto- and bifidobacteria capable of normalizing the functioning of the human gastrointestinal tract is being distributed. Special attention is paid to the development of new technologies for the production of functional food products. The use of probiotics and prebiotics is a promising new direction in the dairy industry, which allows solving the problem of maintaining health and increasing human life expectancy.

The joint use of pro- and prebiotics opens up wide possibilities for improving the nutritional and biological value of fermented milk products, enriching them with vitamins, mineral and polyphenolic substances, dietary fiber.

Bifidobacteria - one of the most important groups of intestinal microorganisms that dominate in the anaerobic flora of the colon [ 2 ]. International Dairy Federation considers that biobased products are compounds, which contain at least 1×106 CFU bifidobacteria in 1 cm3 [3, 4]. It should be noted that milk is an unfavorable environment for the development of the majority of microorganisms-representatives of normal bacterial flora of the human intestinal tract. This is due to the fact that milk does not contain the low-molecular weight compounds needful for the development of microorganisms such as free amino acids, monosaccharides, etc., as well as the fact that the majority of bacteria of the genus Lactobacillus, Lactococcus and Bifidobacterium refer to the obligate anaerobes, affected negatively by the dissolved oxygen in milk [5, 6, 7]. That is why bifidobacteria that belong to anaerobic bacteria develops very slowly in milk.

The experts examined the possibility of combined use of bifidobacteria and lactobacilli. It was determined that a significant number of lactic-acid streptococci and bacilli stimulate the growth of bifidobacterim flora in milk, contribute to the increasing of number of active cells of bifidobacteria and contribute to the intensive accumulation of their metabolism products [8].

Bifidobacteria regulate qualitative and quantitative composition of the normal intestinal flora, hinder growth and prevent reproduction of pathogenic, putrefactive and aerogenic bacterial flora, restore the damaged structure of the mucous membrane of the intestine. Together with other representatives of the normal intestinal flora, bifidobacteria are involved in the digestion and absorption, synthesis of B vitamins, vitamin D, folic and nicotinic acid, they promote the synthesis of essential amino acids, better absorption of vitamin D and calcium, stimulate the activity of lysozyme and synthesis of antibodies, increasing the body's function of immunity protection [9].

Fermented dairy products are the main suppliers of probiotic microorganisms that contribute to the restoration of human microbial ecology. The following types of bifidobacteria and laktobacilli as Lactobacillus acidophilus, Lactobacillus casei, Bifidobacterium spp. (B. adolescentis, B. animalis ssp. lactis, B. bifidum, B. longum, B. breve) belong to probiotic cultures that have a positive impact on the consumer and normalize the composition and functions of the bacterial flora of the gastrointestinal tract.

An effective way of normalization of intestinal bacterial flora is a creation of synbiotics (complex of pro- and prebiotics) and manufacturing of the products on their basis, which will allow stimulating the development of its own intestinal bacterial flora and increasing the protective functions of the body.

In Ukraine, the fermented dairy desserts of functional orientation are very popular. In the process of their production a wide range of flavors and stabilizers is used which regulates the processes of structure formation that prevents denaturation of proteins during thermal conditioning of the milk-based mixtures improving the nutritional and biological value of the dessert product.

The development of technologies of dairy lacto- and bifidobacteria-based desserts, using vegetable fillers enriching foods with vitamins, minerals, polyphenols substances makes it possible to increase significantly the biological value and expand the range of functional dessert products. As a filler, a variety of fruit and berry juices is used, such as juices, purees, syrups, natural fruits and berries in a candied or in a frozen form.

The aim of this work is a scientific justification of composition and development of technologies of fermented dairy dessert products of functional purpose, enriched with biologically active substances of plant origin.

Our analysis of the lactic acid bacteria by the lactose digestion level finds that lactococci and streptococci are characterized by a high degree of acid-formation, but lactobacilli L. delbrueckii ssp. bulgaricus and Lactobacillus acidophilus exceed other lactic acid bacteria by the level of acid. According to experts, strains of lactic streptococci Lactococcus lactis ssp. lactis, Lactococcus lactis ssp. cremoris, S. thermophilus, Lactobacillus acidophilus produce mainly L (+) - lactic acid, which is physiologically more beneficial for the human body. Acidophilic bacilli Lactobacillus acidophilus inhibit harmful bacterial flora - salmonella, staphylococci, etc., due to the ability to produce antibiotics lactocidin and acidophilus, which are amplified in contact with the lactic acid [8,15].

Assessment of protein cleavage by lactic acid bacteria mentioned above was determined by the increase in the number of free amino acids in plasma after deposition of milk proteins by 5,0 % solution of trichloroacetic acid, relative to control - content of free amino acids in sterilized milk before the fermentation process.

Bifidobacterium bifidum 791, Bifidobacterium longum ssp. longum In M 379, Bifidobacterium adolescentis B-1 were selected aiming to obtain symbiotic systems and to use them in the development of fermented dairy dessert of functional purpose .

It was found that the selected strains of bifidobacteria in the development process are resistant to high concentrations of bile, phenol, they are developed in the environment of low and high pH, they do not form catalase and hydrogen sulfide, do not restore nitrates and nitrites and do not dissolve gelatin [12].

The consortium of selected bifidobacteria in the ratio of 1: 1: 1 was evaluated for resistance under conditions close to the medium of the stomach (HC1 pH 2 - 3) during 5 hours, and under conditions close to the storage of finished dairy dessert products (lactic acid pH 3 - 4) during 24 hours. It was found that in contact with the hydrochloric acid at pH 3 the number of viable cells of bifidobacterium of the consortium was reduced by 5,2% when pH is 2 – 9,8%. When storing dairy products in contact with lactic acid at pH 4 the number of viable cells of bifidobacteria was decreased by 3,4% at pH 3 – 6,2%.

Based on the experimental data we can predict that the bifidobacteria activity preservation while passing through the gastrointestinal tract gives the opportunity to predict the survival of the bifidobacteria in the composition of fermented dairy dessert during storage of finished products before the experimental deadline.

The research of technological properties change of the consortium of the adapted lactobacilli and bifidobacteria and their composition within 6 hours of storage was conducted.

Energy of acid-formation of the composition of laktobacilli and bifidobacteria consortium compared to the bifidobacteria consortium increases, but decreases in comparison with the lactobacilli consortium, which is a favorable factor for the growth of bifidobacteria. In the development of bifidobacteria nutrients play an important role which are accumulated as a result of the vital activity of the strains of lactic acid bacteria, increasing the number of bifidobacteria viable cells.

We used bifidobacteria probiotics as growth and development factors, - fructose, lactulose, concentrate of artichoke as a source of inulin, as a stabilizing systems - pectin, gelatin, starch and cereals - rice and oat flour.

During the fermentation of sterilized skim milk, the bifidobacteria consortium within 6 hours of active acidity of milk coagulum in contact with the bifitostimulator of fructose reaches pH – 4,64, lactulose - pH 4,6, inulin – 4,5 without stimulators for bifidobacteria - 4,7, while titrated acidity is, respectively, 68, 72, 74 and 52 %. In contact with bifidostymulators the product has a lower active acidity and significantly increased volumetric acidity, which can be explained by the increase in bifidobacteria activity and the formation of acetic acid, which is quite strong electrolyte.

Nonfat dry milk (NFDM) is used to determine the rational concentration of milk solids non-fat (MSNF) in milk base of dairy products. Milk base increase in MSNF contributes to an increase of the number of contacts between the caseins during coagulation per unit volume of the dispersion medium and leads to their intense interaction. As a result, the viscosity of the product increases and its consistency improves. It is also known that MSNF concentration increasing in a nutrient medium significantly stimulates the growth and development of bifidobacteria by increasing in sulfur-containing amino acids. [10]. Improving of their content in milk base increases the titer of bifidobacteria and the increase in caseinate-calcium phosphate complex in milk base - forms a buffer system that inhibits the growth of acidity while biomass increasing. As a stabilizer of dairy dessert product structure, pectin, gelatin, starch, oat and rice flour are used.

Pectin activates the development of bifidobacteria; it is a breeding ground for the growth of normal bacterial flora of the gastrointestinal tract and it has a detoxifying and radioprotective properties [15]. In contact with pectin a number of viable cells within 24 hours of bifidobacteria increases from 1 × 10 4 CFU / cm3 to 2,5 × 108 CFU / cm3, compared with the control, in which the number of bifidobacteria increases from 1 × 104 CFU / cm3 to 1 × 2 107 CFU / cm3.

Gelatin as a protein substance in the acidic environment has a positive effect; it binds moisture and forms a solid gel at low pH. The gelatin ability to bind free moisture and to form dense coagulum and gels through the formation of three-dimensional mesh structure is important in the dairy industry because it reduces the risk of synaeresis in manufactured products; as a result, the output increases, prime cost reduces and quality of the finished product improves [14].

Starch is a neutral polysaccharide, which serves as a structure-directing agent and as a stabilizer of the obtained structures. Starch increases the water-retaining capacity of dairy base, but it affects the acid-formation ability of bifidobacteria. In the control sample without the starch the acidity of derived structures is almost 88 oT, in samples with the starch content 5,0 % - the acidity is less than 76 oT [15].

We can assume that the starch as a neutral hydrocolloid does not directly affect the fermentation process, but it binds moisture and increases the viscosity, which hinders the development of starter cultures and slows down the fermentation process.

It is found that the use of stabilizers: pectin – 0,3 % gelatin - 3% starch - 4%, gives a possibility to get a structure peculiar to the fermented-milk products, to provide the necessary moisture and viscosity, to increase the number of viable cells of bifidobacteria and to prevent milk protein aggregation using fruit and berry fillers.

As we stabilizer we used oat and rice flour intended for infant food, without the enzyme lipase. Rice flour differs from the oat flour in higher content of starch, minerals and fewer content of proteins and fats. Starch rice flour swells well, its volume increases in 5 - 7 times compared with the oat flour starch, the volume of which increased only in 4,5 times. We used a mixture of rice flour and oatmeal in the ratio 1: 1. Oat flour enriches the mixture with the proteins and fats, and rice flour starch provides high water-retaining capacity.

Specified component structure of stabilizing system gives a possibility to get a structure that has a delicate, homogeneous, gelling consistency with glossy surface, typical for dairy dessert products like pastes and puddings. After 18 hours of fermentation, the titrated acidity of control samples is 82 ºT, active acidity – 4,5 in test samples, respectively, 88 and 4,4 ºT. Coagulum begin to form after 12 hours of fermentation, when titrated acidity of control and test samples is up, respectively, 72 and 76 ºT and active acidity – 4,7. A mixture of oat and rice flour stimulates growth and proliferation of bifidobacteria, increasing the number of viable cells during fermentation from 1 · 102 to 1 · 109 CFU / cm3.

It was found that for pasteurization of symbiotic milk base, protein and fat normalized, it's appropriate to use the mode (90 ± 2) °C with an exposure of 2 min. Given that in milk and grain basis using a mixture of oat and rice flour spore forms of microorganicms can be present, pasteurization temperature set at (95 ± 2) ° C at interval of 5 minutes.

In the production of milk-based desserts in MSNF and fat normalized skim milk, they added the mixture of prepared stimulators for bifidobacteria and stabilizers in the prescribed rational number. The end of the fermentation process in contact with milk-based composition of bifidobacteria and lactobacilli was determined by volumetric parameters and active acidity. Gel formation process starts from the third hour of the fermentation. Lag-phase duration takes 1 hour, which indicates a properly selected quantitative and qualitative composition of stimulators for bifidobacteria. The sharp increase in volumetric decline and the reduction of active acidity starts from the third hour of fermentation, and in six hours titrated acidity of test samples of milky-based desserts reaches 72 ºT, of control samples - 85 ºT active acidity, respectively, 4,7 and 4,5, on milky grain basis - titrated acidity reaches, respectively, 78 and 82 ºT active acidity – 4,4 and 4,5.

The content of bifidobacteria in milk-based experimental samples during 6 hours of fermentation is 10,3 Lg CFU / cm3, lactobacillus - 8,5 Lg CFU / cm3, in con-control samples, respectively, - 8,1 Lg CFU / cm3 and 8, Lg 6 CFU / cm3, in milk-based grain content of viable cells of Bifidobacteria is 10,5 Lg CFU / cm3, lactobacillus - 10,3 Lg CFU / cm3, in control samples – 8,3 Lg CFU / cm3 and 8,7 Lg CFU / cm3, respectively.

It was found that the process of structure formation of sweet milk-based products is almost completed at the viscosity level of 1,65 • 102 Pa • s, while the process of structure-formation of milk-grain based products is slower and after 5 hours the viscosity reaches to 1,85 •102 Pa/s.

While adding fruit and berry fillers, we have to consider that they have low acidity and as a result can occur a compaction of three dimensional structural mesh of protein gel, disruption of sweet fermented products structure and the emergence of synaeresis.

We experimentally found that during the production of sweet fermented products, set way should be used and adding a fruit and berry filler should be done after adding starter, while stirring. Adding stabilizers and sodium solt three replaced which maintains pH at optimum level and increases the buffer capacity of dairy products, prevents the emergence of synaeresis process. The results of the research of fermented desserts with fruit fillers immediately after the cooling to storage temperature (3 ± 1) ° C are shown in Table 1.

Characteristic of dessert products with fruit and berry filling

Table 1

**Characteristic of dessert products with fruit and berry filling**

| Indexes | Milk-based | | Milk and grain base | |
|---|---|---|---|---|
| | Control | Test | Control | Test |
| Activ acidity, vol.un pH | 4,5±0,1 | 4,67±0,1 | 4,52±0.1 | 4.64±0.1 |
| Titrated acidity, ºT | 77,5±0.2 | 75.2±0.2 | 78±0,2 | 78,8±0,2 |
| Number of cell viability of bifidobacteria, Lg CFU / $cm^3$ | 9,2±2 | 9,8±2 | 10,1±2 | 10,5±2 |
| Time of the coagulus emerfence, hour. | 5,0±0,5 | 5,5±0,5 | 5,0±0 5 | 5,5±0,5 |
| Viscosoty, $\eta \cdot 10^3$, Pa · s | 1,89±0,2 | 1,93±0,2 | 1,91±0,2 | 1,95±0,2 |
| Syneresis, $cm^3$ | Absent | Absent | Absent | Absent |

The process of fermentation takes place 5 - 6 hours. Coagulums of symbiotic product are dense; the texture is homogeneous, delicate, gelatin-like and moderately viscous. The taste is clean, pleasant, with a taste and smell of fruit –berry filler.

The results of experimental studies were the basis for the development of new formulas and technologies of fermented dairy product dessert of functional orientation.

A study of changes on the content of viable bifidobacteria during storage of the finished product during 25 days at the temperature (4 ± 2) ° C was conducted. It was found that within 10 days the quantity of viable bifidobacteria is almost unchanged over the next 5 days begins a gradual death of bifidobacteria cells, but their content in products remains high - 102 - 103 Lg CFU / cm3.

The research of rheological properties changes of milk and milky-grain basis products during storage showed that during the first five days of storage, obtained structures thicken and viscosity of fermented dessert products increases in the result of process of complex formation of hydrocolloids with proteins and with each other [11] and through adsorption of polyphenolic substances of fruit and berry raw on the surface of proteins and polysaccharides with the forming of complex structures, thickening the structure [12].

Conclusions:

It is found that the structure of control samples of desserts is unchanged for 15 days, of test samples – for 20 days, followed by a gradual destruction of the structure and there is little separation of moisture in separate drops. After 25 days, synaeresis of sweet milk-based products is 1,2 cm3, of milk and grain basis - 0.8 cm3 was noted. Probiotic properties of both control and test samples for 20 days of storage are not lower than 1 × 108 CFU / cm3, but considering that after 10 days of storage bifidobacteria cell death starts, the storage time of fermented sweet products was limited to 15 days.

So we have developed the formula and technologies of fermented desserts milk and milky-grain-based product using bifidobacteria and lactobacilli, bifidostimulators, structure-formants and fruit-berry fillers that remain high biological value, delicate texture, taste and aroma over 15 days, inherent to used fruit and berry fillers.

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Colloquium-journal №28(80), 2020

Część 1

(Warszawa, Polska)

ISSN 2520-6990

ISSN 2520-2480

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Umowa z RSCI nr 118-03 / 2017 z dnia 14.03.2017.

Redaktor naczelny - **Paweł Nowak, Ewa Kowalczyk**

«Colloquium-journal»
Wydrukowano w «Chocimska 24, 00-001 Warszawa, Poland»
Format 60 × 90/8. Nakład 500 egzemplarzy.

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