

DEVELOPMENT OF A TECHNOLOGY AND A RECIPE FOR FERMENTED MILK PRODUCTS WITH A CITRUS FILLER FOR FUNCTIONAL FOOD

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ABSTRACT

This paper discusses the technology and formulation of a new fermented milk product. According to the proposed method, citrus fruits are used in the recipe and technology of a fermented combined milk product with enhanced functional properties. Grinded citrus fruits are boiled and added to the mixture together with citrus fibers after the fermentation process.

Citrus fillers in number of 6-8% and improved natural orange fibers "Citri-Fi" in number of 0.2-0.4% of the product weight are added simultaneously. The use of citrus fillers allows additional enriching the product with vitamins, carbohydrates, minerals, dietary fibers and other valuable components contained in the citrus fillers, that is, increasing the nutritional and biological value of the product.

Taking into account modern principles of foodstuffs development and the data obtained in the course of the research, a recipe of a fermented milk product containing the citrus fillers with solids content of not less than 60% and a mass fraction of total sugar of at least 53% was developed.

It was established that organoleptic and physicochemical indicators of the product developed correspond to consumer preferences and technical documentation for this product type.

Key words: functional nutrition, fermented milk product, citrus fillers, citrus fruits and fibers, titratable acidity, souring.

INTRODUCTION

The life of a modern person takes place in the conditions of the existence of such unfavorable factors as environmental pollution, man-made disasters, stressful situations, and lack of adequate nutrition. All this leads to a decrease in immunity, impaired digestive functions, an increase in the number of people suffering from allergies, diabetes and other diseases [1,2].

Therefore, a rational and balanced diet is an important condition for optimal physical and mental development of a person, maintaining his high performance, increasing the body's ability to withstand the effects of adverse environmental factors. At the same time, the provision of adequate nutrition to the entire population is a major factor in the social stability of society and today is one of the priorities of state policy, designed to significantly improving the demographic situation in the country. It is the quality and balance of nutrition that determines the health of every person and nation as a whole [3].

In recent years, the development of a new trend in the food industry — the so-called functional nutrition — which means the use of such products of natural origin, which, when

used systematically, have a regulating effect on the organism as a whole or on certain systems and organs [4].

The production of functional products is an important task for modern food industry, in particular dairy one. On a global scale, there is a constant work on the creation of new functional food products that have both a wide range of applications and a point focus on a specific organ, system, disease [5].

Varying the basics of products in the process of their production, enriching them with nutrients and biologically active additives, it is possible to achieve a certain focus of protective complexes, to offer these products for mass consumption and, therefore, mass recovery of the population [6].

To expand the range of dairy products various fillers, which have a complex of taste, medical, dietary and nutritional properties are used.

Various berries and fruits are widely used as fillers. Increasing the functionality of products can be achieved due to their poly - component contents, by directed correction of their fatty acid, amino acid and mineral composition, enrichment with micronutrients, use of specially selected lactobacillus cultures as part of the starter culture [7].

MATERIALS AND METHODS

Laboratory studies were carried out in educational and scientific laboratories of the department "Food Engineering", at the scientific laboratory base of testing regional laboratory of engineering profile at M. Auezov SKSU using all standard and generally accepted methods [8,9].

The main raw materials for the production of fermented milk products, vegetable filler (citrus fruits and fibers), and fermented milk product were chosen as objects of research.

For the fermentation of the milk mixture, the starter culture prepared on pure cultures of *Lactobacterium bulgaricus* and *Streptococcus thermophilus* was used.

RESULTS AND DISCUSSION

This work is devoted to studying the effect of the dose of selected plant materials, in particular citrus fillers on the quality of fermented milk product, as well as the development of technology and formulation of the new product.

Citrus fruits contain organic acids, sugars, vitamins A, B₆, B₂, P (bioflavonoids) and C, carotene, 32 glycosides that have the properties of P-active substances (fatigue antitoxin), minerals - salts of calcium, phosphorus, iron and others, show high AO activity [10].

The introduction of citrus fillers in the amount of 6-8% by weight of the product after fermentation allows the product to be given different shades of taste and most fully satisfy the various demands of consumers. In addition, the use of citrus fillers can further enrich the product with vitamins, carbohydrates, minerals, dietary fiber and other valuable components contained in citrus fillers, that is, increase the nutritional and biological value of the product [11].

It is known that citrus fruits are leading in terms of vitamin C content and the supply of this vitamin in citrus fruits is particularly resistant. Most fruits and vegetables lose vitamin C after one or two months of storage, that is, by the very beginning of winter. In the spring, vitamin C in its natural form is found only in citrus fruits. Also, the fruits almost do not lose their properties during processing and long-term storage. Citrus fruits also protect against cardiovascular diseases, prevent the formation of kidney stones, as well as stomach ulcers.

They ensure the normal functioning of the organs of the respiratory system, help with rheumatism and arthritis, slow down the aging process in the body; reduce the level of cholesterol in the blood.

The introduction of the orange fibers "Citri-Fi", along with the technological task of forming the necessary fiber consistency, allows us to expand the range of sour-milk functional products. Fibers "Citri-Fi" has a positive effect on the physiological processes of the human body: it removes toxins, reduces cholesterol, removes heavy metals, and improves the functioning of the gastrointestinal tract [12].

"Citri-Fi" is a natural fiber extracted from the cellular tissues of dried orange pulp without the use of chemical reagents by mechanical processing. Dietary fiber "Citri-Fi" allows getting fermented milk products with the necessary structure that is resistant to mechanical stress and temperature changes, without separation of whey throughout the shelf life. In fermented milk products with fruit fillers, orange fibers provide an even distribution of fruit. Possessing high fat-binding ability, as well as emulsifying and structure-forming properties, "Citri-Fi" orange fibers make it possible to produce fermented milk products with traditional taste and low fat content. Milk products from "Citri-Fi" are produced according to the standard technological scheme; the fibers do not require preliminary hydration and are introduced together with other dry ingredients into the composite mixture [13].

In the preparation of citrus puree, the influence of follow technological factors on the preservation of ascorbic acid was studied: temperature, duration of the heat treatment process, and the ratio of raw materials to the mass of the finished product.

It was found that citrus filler in the amount of 7% by weight of the finished product was optimal in terms of sensory and biological indicators. An increasing the amount of raw materials above 7% relative to the mass of fermented milk product does not significantly increase the biologically active substances in the extract, therefore, an increase in the consumption of raw materials is not optimal.

In order to study the effect of the duration of the process, the following experimental conditions were chosen for the concentration of citrus mass: a temperature of 95 °C, a solids content of at least 60% and a boiling time of 30-90 minutes. The data presented in table 1.

It has been established that with an increase in the time of boiling there is a slight decrease in the content of vitamin C and fiber, which is possible as a result of its oxidation in the presence of oxygen, therefore, the optimal concentration time is 60 minutes.

Table 1 - Development of the process of concentration of citrus mass

The duration of the process, min	Amount of vitamin C, mg/%	The amount of fiber, mg /%
30	94.5	3.2
60	90.6	5.8
90	89.2	7.4

Next, the effect of the dose of citrus filler on the titratable acidity of the final product was investigated.

An increase in the dose of citrus filler obviously leads to an increase in the acidity of the final product, but the optimal amount of administration of the filler is 7%. The dynamics of acid accumulation for samples with different mass fractions of additives is presented in Fig. 1.

Further, the experimental method established the effect of the amount of the filler introduced on the content of polyphenol substances in the finished product. It is also obvious

that the amount of polyphenol substances increases with increasing dose of the filler. It was shown that the studied plants contain a significant amount of these compounds.

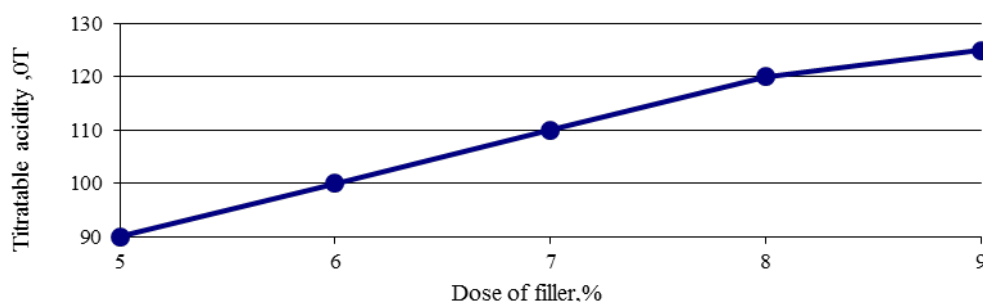


Fig. 1. Effect of citrus filler dose on titratable acidity of dairy product

The dependence of the content of polyphenol substances in the finished product from the dose of citrus filler is shown in Figure 2.

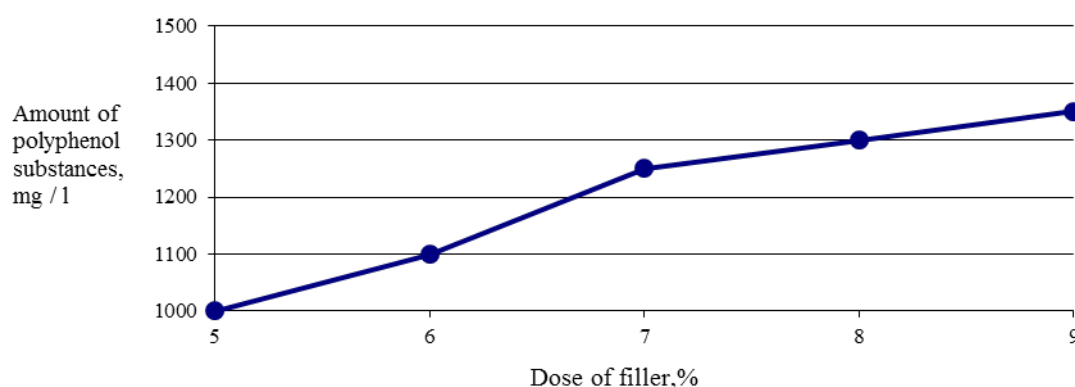


Fig. 2. The effect of the dose of citrus filler on the content of polyphenol substances

The resulting drinks have a pure fermented milk taste and smell, the consistency of the samples is homogeneous without separation of the serum, the color is milky-pink.

The offered fermented milk product with citrus fillers is produced from pasteurized normalized milk by ripening with pure cultures of lactic acid bacteria. For the production of yogurt citrus, it was used milk, sourdough (*Lactobacillus gallinarum*, *Streptococcus thermophilus*), granulated sugar, orange puree, and citrus fibers. Citrus filler is added after fermentation of milk and mixing the clot.

The objective of this work is to obtain a new fermented milk product with high nutritional and biological value, dietary properties and low cost. The technical result is achieved by introducing citrus fillers into the product in the amount of 6-8% of its mass, together with natural improved orange fibers “Citri-Fi” in the amount of 0.2–0.4%. in terms of the finished product.

An example of a fermented milk product with citrus fillers. Purified normalized mixture is homogenized at a temperature of 46.5 °C and a pressure of 15 MPa, pasteurized at a temperature of 91 °C for 3 minutes without exposure. The mixture is then cooled to a

fermentation temperature of 38 °C, fermented by pure starter cultures of thermophilic streptococcus with the addition of a Bulgarian stick, fermented for 4 hours at a temperature of 38 °C, cooled to a temperature of 6 °C and stirred until a thick uniform consistency is reached, then citrus is added the filler in the amount of 7% by weight of the product together with the natural improved orange fibers "Citri-Fi" in the amount of 0.3% in terms of the finished product and mixed again until the clot reaches the homogeneous consistency and uniform distribution of citrus fruit [14].

An example of the recipe for fermented milk product with citrus fillers is presented in table 2.

Table 2 - Recipe for fermented milk product with citrus fillers (in kg per 1000 kg of product without taking into account losses)

Name of raw materials	Mass fraction of fat in the product, %	
	2.5	4.0
Whole milk with a fat content 3,4 %	698.9	871.4
Skimmed milk with a fat content 0,05 %	216.1	-
Cream with a fat content 20 %	-	43.6
Citrus filler with a mass fraction of total sugar of at least 53%, dry matter of at least 60%	70.0	70.0
Orange fibers "Citri-Fi"	3.0	3.0
Starters <i>Lactobacillus gallinarum</i> , <i>Streptococcus thermophilus</i>	50.0	50.0
Total	1000	1000

CONCLUSION

The developed product with the use of new technologies, new technological means for improving the structure, as well as various plant components from local raw materials for the fortification of the product has qualitatively new sensory properties, expands the range of preventive products, improves consumer properties. The unique properties of plant components allow solving many technological problems.

The technical result is achieved by the fact that, after fermentation, citrus fillers in the amount of 7% of its mass are brought together with natural improved orange fibers "Citri-Fi" in the amount of 0.3% in terms of the finished product. The use of citrus fillers allows you to further enrich the product with vitamins, carbohydrates, minerals, dietary fiber and other valuable components contained in citrus fillers, that is, to increase the nutritional and biological value of the product.

It was studied the influence of the concentration of plant components introduced on the sensory, physicochemical, and functional properties of a fermented milk product, as well as the study of the effect of the amount of applied filler on the content of polyphenol substances in the finished product, depending on the concentration of plant components.

The results of the work can be used in further research in the development and improvement of technology for producing dairy combined products.

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