



FRUIT AND BERRY COMPOSITION IN DAIRY PRODUCTS FOR MILITARY PERSONNEL

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Abstract

The impact of complicated conditions of environment on the organism of soldiers is not studied well by now. Practical absence of up-to-date researches of functional possibilities of a soldier's organism in the conditions adequate to those experienced in ATO zone requires the proper attention; otherwise the bad environment may essentially worsen the soldiers' health. The most efficient way to deal with this situation is creating foodstuffs with biocomponents supposed to be able to protect the soldier's organism, to optimize his functional state, and to mobilize the natural powers of the organism. The specimen of such a product is the new sort of yoghurt with fruit-and-berry filling, designed by authors of the article.

Introduction

Nowadays, the problem of influence of numerous malignant factors of either natural or social origin on human organism grows more and more relevant because of the increase of anthropogenous ecological stresses, exhaustion of adaptive and compensatory mechanisms.

The activity of military personnel is accomplished within the framework of extreme factors and therefore gets complicated by great nervous, emotional, and physical tension. The usage of special foodstuffs in diets for soldiers may significantly decrease their impact, and also avoid diseases and depressive states.

The analysis of actual nutrition of military personnel evidences that firstly it lacks of proteins of animal origin (Deputat, 2010). Considering the priority of proteins in functioning of human organism, especially in extreme conditions, we find it necessary to design the new functional products, particularly those of milk (Simakhina, Stetsenko, Naumenko, 2016).

During many years, dairy industry in our country remains one of the prominent branches to work out and produce functional and novelty foodstuffs. The domestic market of functional dairy products is one of the most developed and attractive for a consumer. Dairy products have the great demand and popularity. This would be a powerful stimulus to imply them into production. Mostly this group of foodstuffs is enriched with a complex of biologically active ingredients (probiotics, prebiotics, vitamins, microelements, etc.).

Since Illya Mechnykov detected the lactobacillus in Bulgarian yoghurt and called them 'Bulgarian bacillus,' yoghurt as a ready-to-eat product got spread around the world. Now it is a component of a diet for almost every inhabitant of the Earth. Yoghurt is recognized as one of effective dairy product to heal various diseases and to prevent fast aging.

Therefore, the objective of this article is to prove scientifically and to produce the new kind of yoghurt enriched with natural complexes of biologically active substances extracted from apples and cranberries.

Method

As the new trend of using apples and cranberries (first of all, with curative goals), the scientists of the Department of Healthy Food Technologies (National University of Food Technologies, Kyiv, Ukraine) worked out the method to produce yoghurt with puree additives of the mentioned above raw materials. Pectin introduced together with apple puree acts as the natural thickener and structure-making factor. Cranberry puree adds the significant amount of vitamins C and P. Thanks to their antioxidant properties, they may completely replace the artificial antioxidants. Bioflavonoids (vitamin P) give yoghurt a beautiful natural color, and make it more stable in shelf-life.

The amounts of vitamins, pectin substances, organic acids and polyphenols were defined by traditionally accepted methods.

Proposed recipes and improved technology of yoghurt production allow removing the disadvantages of today's technologies of dairy production, and using wholly the advantages of enrichment of these foodstuffs with plant polyfunctional compositions as the natural complexes of biologically active substances.

Results and Discussions

Modern technologies of yoghurt production make possible obtaining the product of high nutritional and biological value. Their main negative is the usage of artificial additives (thickeners, structural factors, aromas and so on). The majority of them in excessive doses may cause different alimentary diseases.

Along with that, plant raw grown in Ukraine can completely replace the artificial additives, thanks to the wide array of valuable biologically active substances that show the similar technological effects as synthetic components do, and otherwise allow the novelty foodstuffs that would wholly correspond the main principles of the 21st century nutrition.

The main biologically active components of chosen raw materials were defined in order to prove their functional properties (Table 1).

Table 1. The amount of pectin substances in apples and cranberries

Index	Sort of a puree			
	Symyrenko apples	Antonivka apples	Cranberries, I	Cranberries, II
Dry substances, %	9.2	9.0	8.4	8.1
Pectin substances, %	2.74	3.26	4.68	4.92
Pectin, %	1.55	1.58	3.37	3.15
Protopectin, %	1.19	1.68	1.31	1.77

Note. Cranberries, I – cropped in Transcarpathian region; Cranberries, II – cropped in Kyiv region

The analysis of presented data allows us to make the following conclusions. It is well-known that pectin is a cardinaly valuable substance and therefore is used in food industry mostly as jellifying component. Pectin substances show the radioprotective properties, lower the levels of glucose and cholesterol in blood, improve the periphery blood circulation, and speed up the feeling of satiety thanks to the effect of constraining water in stomach.

Considering 4 g a day the prophylactic norm of pectin intake, we got the mathematically proved result that the researched samples of puree (100 g) may satisfy the daily need in pectin:

- 1) Symyrenko apple puree – by 38.75 %;
- 2) Antonivka apple puree – by 39.5 %;
- 3) cranberries, I puree – by 84, 25 %;
- 4) cranberries, II puree – by 78,75 %.

In other words, both of the cranberry purees exceed the samples of apple puree by the amount of pectin substances. However, the more interesting is not only the fact that pectin substances are present in raw and half products, but also the correlation between soluble (pectins properly) and insoluble forms of pectin substances (protopectins). Just the soluble form of pectin reveals the highest biological value in human organism, thus its presence in various kinds of raw may serve one of the indices of biological value.

The obtained data show that the part of protopectin in Symyrenko apple puree counts 43.6 % of total amount of pectin substances; in Antonivka apple puree 51.8 %; in cranberry I puree 28 %; in cranberry II puree 36 %. Therefore, the highest efficiency is expected from pectin in cranberry I puree, i. e. from cranberries cropped in Transcarpathia.

The main characteristic for a raw material investigated as a source of functional ingredients is the content of organic acids. Nowadays their biological impact is defined as the factor to oppress the growth and development of harmful bacteria; some certain acids (e. g. apple acid) have the radioprotective action. In a definite correlation with sugars, organic acids condition the taste qualities of raw materials and final products.

Furthermore, we defined the general amount of sugars and organic acids in apple and cranberry purees (Table 2).

Table 2. The amount of organic acids and sugars in researched raw materials

Experimental samples	Sugars sum, %	Organic acids sum, %
Symyrenko apple puree	20.4	0.44
Antonivka apple puree	18.6	0.57
Cranberries, I puree	4.9	2.24
Cranberries, II puree	3.8	2.66

The obtained data showed that apple puree in total contains 4...5fold more sugars than cranberry one. This is specific for the products of Symyrenko apples. An interesting fact is that cranberries cropped in Transcarpathia contain more sugars than those from Kyiv region. Obviously the natural conditions in Transcarpathia are more suitable for sugar synthesis in berries.

As for organic acids, we observed the contrary proportion: apple puree contains 4...5fold less of OA than cranberry one.

Regardless of biological activity of organic acids, there was confirmed that their general high acidity can lower the taste qualities of raw materials. This is one more proof to use cranberry and apple purees together, as it would allow comprehending the exceptional role of organic acids in human organism and giving the final product higher organoleptic properties.

In selection of plant raw materials to enrich the various foodstuffs, including those dairy, one of the main criteria of choosing the functional enhancers is their vitamin compound, first of all ascorbic acid and polyphenol substances.

Researchers who studied the vitamin compound of different plants came to conclusion that the utmost effect of ascorbic acid would be revealed in its common effect with bioflavonoids. Moreover, today's specialists tend to connect the mechanism of physiological impact of polyphenol compositions with the presence of ascorbic acid, and diversity of polyphenols with properties of vitamin C.

Table 3 represents the figures of the amount of above mentioned biologically active substances found in researched purees.

Table 3. The amount of ascorbic acid and polyphenol compounds in researched samples of purees

Experimental samples	Dry substances, %	Ascorbic acid, mg%	Polyphenols, mg%
Symyrenko apple puree	31.4	38.8	436.0
Antonivka apple puree	32.2	36.4	412.5
Cranberries, I puree	24.6	735.0	1345.0
Cranberries, II puree	25.2	694.5	1224.0

The represented data show that both of the samples of cranberry puree are outstanding due to high concentrations of ascorbic acid as well as polyphenols. This is special for cranberries grown in Transcarpathian region (sample No. I). Apple puree contains less amounts of noticed substances, however they are quite significant (especially polyphenols).

It is well-known that the daily need in phenol substances varies from 50 to 500 mg; so that 100 g of apple puree may cover 100 % of phenols' daily dose, and 100 g of cranberry puree – from 230 to 300 %.

Considering daily need in ascorbic acid of 200 g, we concluded that 100 g of apple puree may cover only 36...38 % of this amount, and cranberry puree 350...370 %.

The obtained data prove the expedience of using apples and cranberries to produce good wellness yoghurt enriched with fruit and berry additives.

We calculated the nutritional value of yoghurt, regarding replacement of 10 % of milk by 10 % of the additive containing equal portions of fruit (apples) and berry (cranberries) puree (Table 4). The following table shows that, thanks to this replacement of ingredients, the amounts of ascorbic acid, polyphenols, pectin, and protopectin were successively increased in our product, in comparison with classical recipe of yoghurt.

Table 4. Comparative characteristics of classical and experimental yoghurt

Index	Classical yoghurt	Experimental yoghurt
Dry substances, %	12.52	12.14
Pectin substances, %	0.00	0.40
Pectin, %	0.00	0.25
Protopectin, %	0.00	0.15
Sugars sum, %	4.84	5.54
Organic acids sum, %	0.00	0.14
Ascorbic acid, mg%	1.50	40.31
Polyphenols, %	0.00	89.22

Results of organoleptic analysis of newly produced yoghurt are shown in Table 5.

Table 5. Organoleptic indices of newly designed yoghurt

Index	Characteristics	
	Normal yoghurt	Experimental yoghurt
Taste and smell	Pure of sour milk, with no strange smacks and odors, reasonably sweet, with a hue of corresponding additive or aroma	Pure of sour milk, with no strange smacks and odors, reasonably sweet, with a hue of apple and cranberry puree
Consistence	Homogenous, tender, reasonably thick, with no gas bubbles; with particles of additives spread evenly in the whole mass of yoghurt (or in layers)	Homogenous, tender, reasonably thick, with no gas bubbles; with particles of apple and / or cranberry puree
Color	According to the color of used additive	Pale pink

As it is evident from table, experimental yoghurt wholly corresponds to all the normative documents for such products with its organoleptic indices.

Therefore, the technology described in this article may allow creating new foodstuffs on dairy base, containing the complexes of biologically active substances shaped in plant-origin poly-functional enhancers. As a result, soldiers would get the high-quality products with optimal amounts of main ingredients and attractive organoleptic characteristics, completely safe and stable in shelf-life. These products would protect human organism from stresses and their bad consequences, normalize the activity of nervous and endocrine systems, restore immunity, and avoid cardiovascular diseases.

Reference list

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