

Розроблено технологію сиркових мас з різною масовою часткою жиру з використанням криопорошку «Гарбуз». Встановлено, що вміст криопорошку «Гарбуз» у солених сиркових масах є нижчим, ніж у солодких. Кількість вказаної криодобавки збільшується у результаті збільшення вмісту жиру молочної основи. Також вивчено органолептичні та фізико-хімічні характеристики солодких та солених сиркових мас. Встановлено, що вони повністю відповідали нормативним вимогам. Дослідні зразки мали приємний товарний вигляд

Ключові слова: сиркові маси, енергетична цінність, криопорошок, лікувально-профілактичні продукти, біологічна цінність, енергетична цінність

Разработана технология творожных масс с различной массовой долей жира с использованием криопорошка «Тыква». Установлено, что содержание криопорошка «Тыква» в соленых творожных массах ниже, чем в сладких. Количество указанной криодобавки увеличивается в результате увеличения содержания жира молочной основе. Также изучены органолептические и физико-химические характеристики сладких и соленых творожных масс. Установлено, что они полностью соответствовали нормативным требованиям. Опытные образцы имели приятный товарный вид

Ключевые слова: творожные массы, энергетическая ценность, криопорошок, лечебно-профилактические продукты, биологическая ценность, энергетическая ценность

UDC 637.146:636.292

DOI: 10.15587/1729-4061.2017.98194

THE INFLUENCE OF CRYOPOWDER “GARBUZ” ON THE TECHNOLOGY OF CURDS OF DIFFERENT FAT CONTENT

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1. Introduction

In a complex environmental situation, among a wide range of effective population protection ways is the manufacture of therapeutic food products, including dairy. Given today's difficult environmental conditions, there is an urgent need to enhance the structure of nutrition by improving the quality, biological value and taste of food products [1]. An important focus in this regard is enrichment with vitamins, minerals and immunity substances, especially on a natural basis. Dairy products are no exception. The use of natural dietary supplements in this context has an inexhaustible source and resources. Efficient combination of cryopowders as dietary supplements to a “milk” base carries great promise, both in bio-technology, and social terms. Cryopowders are useful for both adults and children [2].

Therefore, the research of the possibility of using the cryopowder “Garbuz” as a phytonutrient in technologies of therapeutic salty and sweet curds is proposed.

2. Literature review and problem statement

Since the days of Hippocrates, it has been known that vegetable products have preventive and treatment proper-

ties [3]. Our objective is to help people understand how to improve health using functional foods. For over 15 years, researchers have been solving the problem of creating these unique products. For this, the only possible to date technology had been used to get products that would meet the above properties. These products are cryopowders [4, 5]. They significantly increase the biological value of foods and improve their chemical composition [6]. Introduction of cryopowders as fillers in sour-milk drinks allows preparing new kinds of therapeutic drinks enriched with vitamins and minerals [5]. They considerably improve the chemical composition of food products and increase their biological value. Adding cryopowders in butter and margarine allows increasing the shelf life almost 4 times [1]. These data allow us to recommend cryopowders for use in dairy production technologies.

New targeted foods, unlike traditional, can prevent and correct the effects of human diseases through the use of dietary supplements [7]. Dairy production changes, along with the consumers' needs and preferences. In this regard, the role of fillers, both animal and vegetable, increases in dairy production. Their main objective is to increase the biological, nutritional and technological quality [8, 9].

Natural vegetable dietary supplements are particularly noteworthy because they provide therapeutic properties to dairy products due to natural origin. The use of such sup-

plements allows compensating for a deficiency in essential nutrients, increasing non-specific resistance to adverse environmental factors [1].

So, the production of curds involves the development of formulations that include multifunctional additives, in particular, cryopowders from natural vegetable materials. A variety of properties of such powders causes their ambiguous effects on the product quality. In this regard, the need arose to study the properties of cryopowders to further recommend them for use in the production of curds and assess their impact on the feedstock quality.

Some authors offer basic process parameters of production of soft acid-rennet curds with vegetable components, the use of vegetable components in optimum doses for adding in milk powder products, which in turn provides products with certain structure and quality [8]. The technology of functional concentrates from dry whey, enriched with carotenoids of pumpkin, medicinal and aromatic raw materials is developed [2]. The use of licorice root in the formulation of semi-finished products based on skimmed milk is proposed, the technology of semi-finished products based on skimmed milk using Snowdon rose is developed [1, 4]. The paper investigates the use of extracts of calendula blossoms and bearberry leaves to improve the taste of spreads and prolong their shelf life. Thus, researchers suggest using various fruit and berry raw materials in the production of rennet cheese [10].

Literature review showed that the use cryopowders based on vegetable materials in the food industry is very limited, and data on the use of the cryopowder "Garbuz" in the technology of curds are unavailable. Therefore, it seems relevant and timely to develop a technology of curds with the cryopowder "Garbuz", which would have great social importance.

3. The aim and objectives

The aim was to develop a new technology of sweet and salty curds with the cryopowder "Garbuz".

To achieve the aim, it was necessary to accomplish several objectives:

- to prove the usefulness of the cryopowder "Garbuz" in the technology of sweet and salty curds;
- to investigate the organoleptic properties of sweet and salty curds with the cryopowder "Garbuz";
- to study the basic physicochemical properties of curds with the cryopowder "Garbuz";
- to conduct a microbiological examination of curds with the cryopowder during storage.

4. Materials and methods

The experiments were conducted in the research laboratory of the Department of Milk and Dairy Products Technology, Lviv National University of Veterinary Medicine and Biotechnologies named after S. Z. Gzhytsky and also at the Prometey Ltd (Lviv Dairy Plant, Ukraine) (Fig. 1). The standardized dietary supplement – the cryopowder "Garbuz" (Fig. 2), the content of which was set and calculated based on preventive and therapeutic doses per 100–150 g of curds was used. The formulation of curds was recalculated for industrial production, namely per 1000 kg of finished product.

More details on the research methodology can be found in [11].



Fig. 1. Curd vat VK-2.5



Fig. 2. Cryopowder "Garbuz" and curds

5. The results of the research on the use of the cryopowder "Garbuz" in the technology of curds

An important criterion in developing the formulation of sweet and salty curds was to find optimum ratios of ingredients in order to obtain the appropriate standard taste.

Table 1, 2 show the optimum formulation of salty and sweet curds of different fat content using the cryopowder "Garbuz". It is found that the quantity of the cryopowder "Garbuz" in the formula is increased with increasing the fat content in raw milk. Thus, the cryopowder quantity is increased from 9.75 to 13.59 kg per 1.000 kg of finished product for salty curds, while the cryopowder quantity for sweet curds was somewhat higher and ranged from 17.23 to 33.61 kg. This change in the quantity of the cryopowder "Garbuz" in curds is associated with the introduction of more sugar to fatter curds and fat content of the milk base, which greatly intensifies the taste perception of the proposed dietary supplement. Major factors of the cryopowder introduction were standard organoleptic properties and daily need of the product. This development is targeted at individual categories of consumers with certain problems, which are eliminated or prevented by the cryopowder "Garbuz".

Merchandising and organoleptic properties of foods play an extremely important role in the overall assessment of dairy products since appearance, consistency and aroma of curds sharpen vision, sense of smell and evoke a certain response that causes the willingness or unwillingness to eat them.

Table 1

Recommended formulations of sweet curds with the added cryopowder “Garbuz”

Composition of curds	Sweet curds	
	low-fat with the cryopowder	semi-fat (4.8 %) with the cryopowder
Skim cheese	862.07	–
Acid curd cheese with 5 % fat content	–	840.34
Sugar	120.69	126.05
Cryopowder	17.23	33.61
Total	1000	1000

Table 2

Recommended formulations of salty curds with the added cryopowder “Garbuz”

Composition of curds	Salty curds	
	low-fat with the cryopowder	semi-fat (4.6 %) with the cryopowder
Skim cheese	974.66	–
Acid curd cheese with 5 % fat content	–	970.87
Salt	15.59	15.54
Cryopowder	9.75	13.59
Total	1000	1000

Organoleptic indicators of curds with the added cryopowder are given in Table 3.

The analysis of the organoleptic characteristics of curds with the cryopowder “Garbuz” shows that they have not undergone essential changes and mostly fully comply with standard requirements.

Thus, the color of sweet curds was:

- cream-white;
- cream with some yellowish inclusions of the cryoadditive powder.

The color of salty samples with the cryoadditive was:

- light yellow;
- yellow;
- less intense.

The flavor of curds remained fresh, sour-milk. However, unlike in salty samples, in sweet samples there was a pronounced flavor of the added cryoadditive. Pilot samples had a sweet or salty taste with a smack of the cryopowder, more pronounced in sweet samples. The consistency of pilot samples was uniform, soft, pasty.

Another important group of indicators to characterize curds is their physicochemical characteristics.

According to regulations, all curds produced by the dairy industry in Ukraine must comply with certain constants (titrable acidity, moisture and fat content, energy value).

The physicochemical properties of pilot samples of sweet curds with the cryopowder are shown in Table 4.

The analysis of numeric data from Table 4 shows that the cryopowder addition in a certain way affects the physicochemical characteristics.

In the production and storage of curds, there may be an increase or decrease in the quantity of microorganisms. Microorganisms enter with feedstock from the surface of process equipment and communications. Violation of sanitary-hygienic conditions of production leads to the development of pathogenic organisms, which results in the formation of toxic substances that cause food poisoning. So, the research of microorganisms during storage is important in the production of curds. The dynamics of microbiological indices of curds during storage is shown in Table 5.

The change of titrable acidity of sweet and salty curds during storage is shown in Fig. 3, 4.

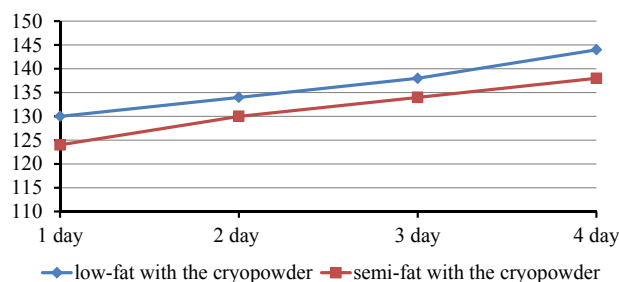


Fig. 3. The change of titrable acidity of sweet curds during storage

So, titrable acidity of pilot samples of salty curds was 124–130 °T, moisture content – 62–60 %, solids content – 40–38 %, and the energy values were 164 and 118 kcal/100 g. Titrable acidity of pilot samples of sweet curds was 126–134 °T, moisture content – 63–66 % and solids content – 34–37 %.

Table 3

Organoleptic indicators of curds with the added cryopowder “Garbuz”

Curds	Color, appearance	Flavor and taste	Consistency
Curds with fillers (TU; TI)	White with a shade or color of a filler, uniform	Pure, sour-milk, with flavor, taste and aroma of the filler	Uniform, soft, moderately dense, with or without filler particles
Salty curds: low-fat and semi-fat (4.8) with the cryopowder “Garbuz”	Light yellow, pronounced yellow	Fresh, salty, slightly sour, light, pumpkin flavor and taste	Pasty, with some cryopowder particles
Sweet curds: low-fat and semi-fat (4.6) sweet with the cryopowder “Garbuz”	Cream-white, uniform cream	Fresh, sweet, slightly sour, pronounced pumpkin taste and flavor	Pasty, with some cryopowder particles

Table 4

Basic physicochemical properties of curds with the cryopowder “Garbuz”

Curds	Acidity (°T)	Content			Energy value (kcal/100g)
		moisture	solids	fat, %	
Standard values of curds	120–140	60–70	–	s-f; 4–6	120–180
Salty curds: low-fat and semi-fat with the cryopowder “Garbuz”	130/124	60/62	40/38	s-f; 4.8	118/164
Sweet curds: low-fat and semi-fat with the cryopowder “Garbuz”	134/126	63/66	37/34	s-f; 4.6	128/174

Table 5

The results of the microbiological research of curds with the cryopowder during storage

Day	Investigated microbiological indices during product storage	Sweet curds		Salty curds	
		low-fat with the cryopowder	semi-fat with the cryopowder	low-fat with the cryopowder	semi-fat with the cryopowder
1	Presence of CGB	Dilution 10 ⁻⁵ not found			
	Microbial landscape	Lactic streptococci		Lactic streptococci	
2	Presence of CGB	Dilution 10 ⁻⁴ not found			
	Microbial landscape	Lactic streptococci		Lactic streptococci	
3	Presence of CGB	Dilution 10 ⁻³ not found			
	Microbial landscape	Lactic streptococci		Lactic streptococci 1–2 micrococci	
4	Presence of CGB	Dilution 10 ⁻³ not found			
	Microbial landscape	Lactic streptococci 3–4 micrococci; 1–2 stab	Lactic streptococci 1–2 micrococci	Lactic streptococci 3–4 micrococci	Lactic streptococci

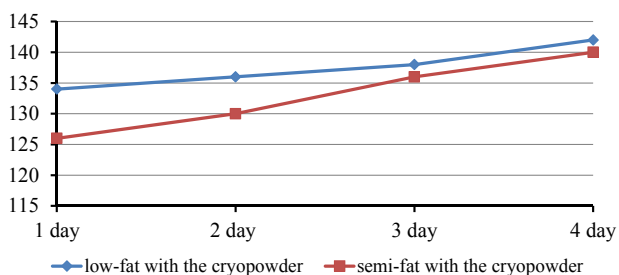


Fig. 4. The change of titrable acidity of salty curds during storage

6. Discussion of the results of using the cryopowder “Garbuz” in the technology of curds

It is found that daily diets of Ukraine’s population are deficient in the content of almost all nutrients, including dietary fiber – by 30 %, vitamins – by 30–55 % [2]. In this regard, the creation of a wide range of functional products for correction of the population diets is an urgent task of different sectors of the food industry.

Several authors point to the usefulness of cryopowders in therapeutic and preventive nutrition of all population segments [5, 12].

The curds made using vegetable materials combine traditional consumer properties with the capabilities of func-

tional and technological ingredients of plant origin [13, 14]. It is found that the cryoadditive quantity is increased with increasing the fat content in the “milk base”. Some differences in formulations of sweet and salty curds are revealed. The research of organoleptic and physicochemical characteristics found that salty curds had a yellow color with the cryoadditive, while sweet curds had a cream color with some yellowish inclusions of the cryoadditive powder. The flavor of salty curds remained fresh, sour-milk, while in sweet curds there was a clearly pronounced flavor of the cryoadditive. Pilot samples of sweet curds had a pronounced taste. The consistency of curds with the cryopowder “Garbuz” was uniform, pasty, soft.

Thus, the use of the cryopowder “Garbuz” for food dishes allows enriching them with vitamins, minerals, dietary fiber. Cryopowders of food plant materials contain a wide range of carbohydrates, pectin, as well as vitamins, amino acids, fiber, polyphenolic compounds. According to the literature, addition of pectin as fillers prevents protein precipitation during heat treatment [15]. Pectin is known as “traditional” gelling agent for the industrial production of jelly, marmalade, marshmallow, jam and other food. It contributes to consistency density, increases the milk jelly stability and prevents whey isolation. A characteristic feature of pectin is the gel-forming ability and also high stability at low pH and high sugar content. The properties of pectin in the dairy production positively affect a consistency of finished

products and have a significant radioprotective effect on a human body [16].

The complex set of chemical and biochemical compounds in the cryopowders allows attributing them to products with a wide range of therapeutic and radioprotective properties [8]. At the same time, it should be noted that, along with the therapeutic effect, the introduction of dietary supplements in curds improves the energy value and also promotes a positive influence on the content of all standard vitamins in the pilot samples.

Thus, the usefulness of the cryopowder “Garbuz” in the technology of curds of different fat content and type, which increases the biological value is proved.

7. Conclusions

1. The usefulness of the cryopowder “Garbuz” in the technology of sweet and salty curds is proved. The possibility of using the cryopowder “Garbuz” as a component of ther-

apeutic and preventive curds is investigated. Major factors of introduction of the cryopowder “Garbuz” were standard organoleptic properties and daily need of the product.

2. The research of the organoleptic characteristics of curds with the cryopowder “Garbuz” found that sweet curds had a cream color with individual yellowish inclusions of the cryoadditive powder, and salty curds, respectively, had a yellow color. In sweet curds, there was a pronounced flavor of the cryoadditive, while the flavor of salty curds remained fresh, sour-milk.

3. The research of the influence of the cryopowder “Garbuz” on physicochemical quality parameters of curds and their changes during storage revealed improvement of the quality of pilot samples compared with traditional ones. Sweet and salty curds containing the cryopowder “Garbuz” had a nice presentation.

4. The research of titrable acidity in curds found that titrable acidity of salty curds was 124–130 °T, while that of sweet curds – 126–134 °T, respectively.

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