

## Research Article

# Beverages and Desserts With Therapeutic and Prophylactic Properties Based on Alginate-Containing Biogel From Laminaria -- "Vitalgar Cardio"

Liliya Kh.Kotelnikova<sup>1</sup>, Antonina V. Podkorytova<sup>1</sup>, Anna N. Roshchina<sup>1</sup>, and I.A. Shashkina<sup>2</sup>

<sup>1</sup>FSBSI "Russian Federal Research Institute of Fisheries and Oceanography", Moscow, Russia, <sup>2</sup>SPC "Vita-Li" LLC, Dmitrov, Russia.

**ORCID**

Liliya Kotelnikova; 0000-0001-6475-730X

**Abstract.** In this research, recipes were developed for beverages and desserts based on "Vitalgar Cardio", a biogel that contains alginate, has therapeutic and prophylactic properties, and was produced from laminaria at the SPC "Vita-Li" LLC. "Vitalgar Cardio", in its liquid form, as well as desserts based on it, is a source of soluble dietary fiber (alginates) and chemical elements such as potassium, magnesium and iodine, and is an adsorbent of various toxins, including radionuclides and heavy metals. The developed products have traditional appeal, with a focus on healthy nutrition, which is currently being promoted among the population.

**Keywords:** Lamibararia, Alginate, Fucoidan

Corresponding Author: Liliya Kotelnikova; email: vafinavniro@yandex.ru

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## 1. Introduction

The environmental burden on nature and humanity increases with every passing year, while food quality is decreasing, due to a deterioration in the quality of raw materials. Thereby it becomes necessary to consume natural foods, which are balanced in micronutrients and contain biologically active substances of action different spectrum, positively affecting the functions of human organs and tissues[1]. Consumption of such products contributes not only to the normal performance of vital functions, but also to an effective recovery from increasing burdens, stresses and the aftermath of illnesses and diseases. In this regard, specialized food products (SFP), such as laminaria biogels, appear to be particularly promising. Their natural formula is completely devoid of flavorings, dyes and preservatives; all components that make up the biogels are in a bioavailable organic form, which is extremely important for the full digestion of a combination of useful substances by the body, since this is a determining factor in

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the effectiveness any product[4]. As a highly effective agent with sorption, enveloping, antacid properties, therapeutic and prophylactic laminaria-based biogels with contain organically bound iodine, alginates, etc.[3,4].

Currently, the SP Corporation "Vita-Li" LLC produces produces bio-gels from laminaria of eight names, chief among them being "Vitalgar Cardio" with magnesium and potassium, as this is an SFP with multifunctional properties suitable for preventive dietary nutrition[2, 3]. This biogel is made from air-dry alga (*Saccharina japonica*). In addition to biologically active properties of algal biogel, this product is a source of such trace elements as potassium and magnesium, which are important for salt balance, normal functioning of the musculoskeletal system, heart muscle. These elements are necessary for maintaining the stability of cell structure during cell growth and regeneration, the functioning of the lungs, the proper performance of the body's enzymatic reactions, and many others.

Biogels "Vitalgar Cardio" with magnesium and potassium participated in clinical trials conducted by the Federal State Budgetary Institution "State Research Center of the Russian Federation, Burnasyan Federal Medical Biophysical Center of Federal Medical Biological Agency". According to the results of clinical trials, it has been established that the twice-daily intake of Vitalgar Cardio in the form of water cocktails (biogel- 50 g, water - 150 ml), consumed two hours after breakfast and dinner for 30 calendar days as part of the complex therapeutic treatment of cardiac patients with heart rhythm disorders of various origins, leads to an improvement in the cardiac function, a better recovery of patients after illnesses and improves the condition of the body in general. The duration of intake can last as long as 3 months.

In this regard, it is advisable to manufacture and mass-produce an assortment of beverages or desserts based on "Vitalgar Cardio", prepared for the ease of consumption and incorporated into the traditional diet of the population. This will provide the population with low-calorie, preventive dietary products enriched with biologically active substances, the organoleptic properties of which are improved by natural flavorings and do not differ from the conventional foods, with a proper balance of biologically active substances [5].

Obviously, new types and forms of products, which can be recommended for consumption by a wide range of determined population groups, will play a certain positive role in improving health, quality of life and increasing life expectancy.

## 2. Organization of research

1. At recipe development stage for the production of algal beverages and desserts, the following all-natural taste- and aroma-forming components were used:
2. biogel "Vitalgar Cardio" with potassium and magnesium (SFP for preventive dietary nutrition), manufactured according to quality specifications TC 9284-004-42233132-16 at the SPC "Vita-Li" LLC;
3. food confectionery flavorings "Baker Flavors": "Pear", "Peach", "Raspberry", "Mango", "Banana", "Wild Strawberry", "Strawberry", "Green Apple";
4. natural food confectionery flavoring "Dolce Inside": "Orange";
5. natural "fruit" sugar (Fructose), made according to quality specifications TU 9197-010-72315488-2011;
6. edible citric acid (5% solution);
7. water for drinking;
8. fresh berries and fruits (mango, blueberry, strawberry);
9. sugar;
10. cream (20% fat).

## 3. Results and discussion

Algal biogel "Vitalgar Cardio" with potassium and magnesium is a gel-like product, greenish-brown in color, with a smell characteristic of freshly harvested algae. It is obtained by modifying the structure of alginates bound in the cell walls and intercellular space of laminaria tissues. Table 1 shows the chemical composition, nutritional and energy value of the algal biogel "Vitalgar Cardio".

In addition, "Vitalgar Cardio" contains fiber (up to 3%), mineral micro- and macroelements, mannitol, fucoidan, laminaran, etc., which possess a number of biologically active properties and have a beneficial effect on the human body.

A decision was made to use natural flavorings in order to obtain a fragrant and tasty product, due to the fact that fresh fruits and berries are prone to darkening, which makes it difficult to fix their color and distorts the consumer appeal of the product. The following convenience foods, ready for immediate consumption, were supposed to be

TABLE 1: Chemical composition, nutritional and energy value of the specialized food product "Vitalgar Cardio" with potassium and magnesium.

Nutritional value	g / 100 g of finished product	g / 50 g of finished product (recommended dose)	% RDI*
Protein	below 0,5	below 0,3	below 0,3 %
Fat	below 0,1	below 0,1	below 0,5 %
Carbohydrates (digestible)	1,2-1,4	0,6-0,7	-
Soluble dietary fiber (alginates)	2,4-2,6	1,2-1,3	50-65%
Iodine, no more than	1000 mcg	500 mcg **	50-100%***
Potassium	400-1600 mg	200-800 mg	from 10 to 40%
Magnesium	80-320 mg	40-160 mg	from 10 to 40%
Energy value	approximately 57,2 kJ/15,2kcal	approximately 28,6 kJ/7,6kcal	below 0,2 %

% RDI\* - percentage of the recommended daily intake in accordance with the EAEU CU TR 022/2011 and \*\* - " Unified Sanitary Epidemiological and Hygienic Requirements for Goods Subject to Sanitary and Epidemiological Control (Supervision)"; \*\*\* - taking into account the partial assimilation of iodine (15%).

produced: ones with viscous flowing consistency (like jelly) - beverages and desserts (mousses) - with the consistency of sour cream (viscous, not liquid).

### 3.1. Technology for producing beverages from "Vitalgar Cardio" biogel

The ratio of biogel to water was experimentally selected to obtain the required consistency, the GM was - 1:3 (biogel: water), and the ratios of the remaining components were selected dosed. Natural flavorings used in the production included: green apple (1), peach (2), raspberry (3), mango (4), orange (5), banana (6), wild strawberry (7), strawberry (8), pear (9). Fragrances were added in minimal amounts to ensure a consistent, pleasant aroma. The calculation data used in the preparation of recipes are presented in table 2.

The technology used to prepare the beverages is shown in Figure 1. The technological process consists of the following procedures:

1. Preparation of the required amount of biogel at room temperature.
2. Preparation of the required amount of drinking water and fructose.
3. Preparation of fructose solution.
4. Mixing of ingredients and their homogenization.
5. Heat treatment at a temperature not lower than 75°C for at least 30 minutes.

TABLE 2: Recipes of algal beverages based on the "Vitalgar Cardio" biogel.

Name of ingredient	Ingredient content, g / 200 g of product in the beverage recipe								
	1	2	3	4	5	6	7	8	9
Biogel "Vitalgar Cardio"	45,76	45,51	45,14	45,08	44,86	45,12	42,39	45,40	42,94
Fructose	7,02	7,03	7,02	7,01	7,06	7,01	7,00	7,07	7,00
Drinking water	146,8	147,1	147,4	147,4	147,5	147,3	150,1	147,1	149,6
Edible citric acid (5% solution)	0,3	0,3	0,4	0,4	0,5	0,5	0,4	0,3	0,4
Flavoring "Green Apple"	0,05	-	-	-	-	-	-	-	-
Flavoring "Peach"	-	0,05	-	-	-	-	-	-	-
Flavoring "Raspberry"	-	-	0,05	-	-	-	-	-	-
Flavoring "Mango"	-	-	-	0,075	-	-	-	-	-
Flavoring "Orange"	-	-	-	-	0,05	-	-	-	-
Flavoring "Banana"	-	-	-	-	-	0,075	-	-	-
Flavoring "Wild Strawberry"	-	-	-	-	-	-	0,09	-	-
Flavoring "Strawberry"	-	-	-	-	-	-	-	0,10	-
Flavoring "Pear"	-	-	-	-	-	-	-	-	0,04
TOTAL	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0	200,0

## 6. Packaging of the finished product.

The finished product was packaged into 200 ml polymer bottles; the pH of the finished product is 4.5-5.0.

By the time the organoleptic characteristics were evaluated at a tasting council meeting of the laboratory at the FSBSI "Russian Federal Research Institute of Fisheries and Oceanography", the beverages had been stored for 3 weeks at a temperature of + 5°C. The safety of products in terms of microbiological indicators had been established in advance. The organoleptic properties of the beverages were assessed according to the following indicators: appearance, color, taste, smell, consistency. The "Vitalgar Cardio" beverages are greenish-brown in color, which is characteristic of algal biogel; they have a homogeneous, slightly viscous, jelly-like consistency, pleasant aroma (with minimal

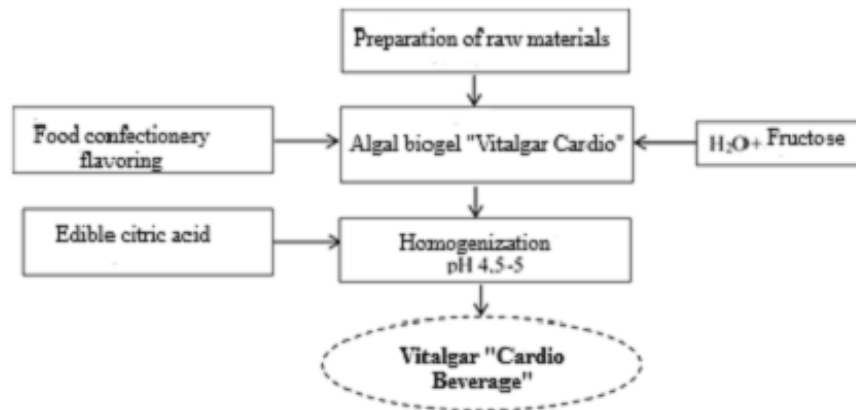


Figure 1: Diagram of the technological process of producing biogel-based beverages.

TABLE 3: Recipes of algal desserts based on "Vitalgar Cardio" biogel.

Name of ingredient	№. of the recipe		
	1	2	3
Mass content of the ingredient, g / 200 g			
"Vitalgar Cardio" biogel	32,65	34,04	31,87
Mango	75,21	-	-
Strawberry	-	73,46	-
Blueberry	-	-	74,48
Sugar	3,51	6,80	6,82
Water	63,31	61,22	62,02
Cream (20% fat)	25,32	24,48	24,81
Total	200,0	200,0	200,0

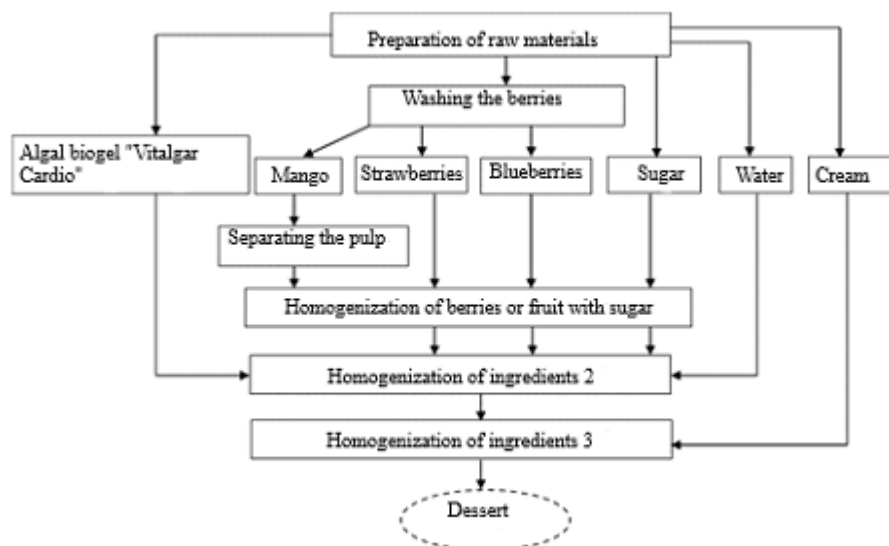
amount of flavoring agent), characteristic of the respective fruit and a pleasant, high-quality taste characteristic of fresh algae, with a slight aftertaste of the corresponding fruit.

### 3.2. Technology for producing desserts from "Vitalgar Cardio" biogel

The recipes for desserts (mousses) based on the "Vitalgar Cardio" biogel were created experimentally. The results of calculating the mass content of the ingredients that make up the recipe are presented in table 3.

The technological process consists of the following procedures:

1. Preparation of the required amount of biogel at room temperature.



**Figure 2:** Diagram of the technological process of producing biogel-based desserts.

2. Preparation of the required amount of berries and fruits (washing, peeling, mashing with sugar).
3. Mixing of components and homogenization.
4. Packaging of the finished product.

A diagram of the technological process of producing biogel-based desserts is shown in Fig. 2.

A series of experiments determined that the ratio of biogel and water required to obtain the desired consistency of desserts needs to be equal to 1: 3. Cold milk or cream with a fat content of 20% is poured in a thin stream, the mixture being continuously stirred.

The resulting desserts are a homogeneous airy mass, the color of which is characteristic of the fruits and berries added to it, pleasant aroma and appearance. The products were approved at the tasting council meeting.

## 4. Conclusion

The "Vitalgar Cardio"-based beverages and desserts developed by us possess outstanding organoleptic characteristics and are considered to be promising for mass production. Beverages and desserts will be produced in single-portion, small package sizes (no more than 200 ml), corresponding to a single consumption. It is obvious that such products with therapeutic and prophylactic properties should be in demand among

the population. The use of natural flavorings, as well as fruits and berries, will make it possible to expand the range of food products during the production and sale of biogel.

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