Cre ation of Innovative Food Products Based on Soybeans to Ensure Food Security of the Far Eastern Region

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Abstract. The formation of a healthy lifestyle of the population of the Russian Federation, including due to the supply of nutrition foods, is an important task that is supported at the state level. The development of innovative food technologies using regional raw materials can be positively influenced by the country's food security. Studies are aimed at studying consumer demand for enriched emulsion foods in the form of mayonnaise and mayonnaise sauces of functional appointment and the development of new recipes and technologies of the products of the specified assortment group. It was established that in the region there is a deficiency of low fatty, with a balanced fatty acid composition enriched with vitamins. The range of mayonnaise products offered by the regional trading network does not satisfy consumers and requires the development of innovative emulsion foods of functional purpose. As a result of experimental studies, the technology of mayonnaise sauce from soy protein and a vitamin and fat basis, which includes a blend of soy and sesame vegetable oils and sea buckthorn berries. The resulting mayonnaise sauce is characterized as a high-protein, low-calorie product, with the optimal ratio of polyunsaturated (ω-6: ω-3) fatty acids, enriched with β-carotene, vitamins E and C.

1. Introduction

The basis of modern state development trends is ensuring the security and independence of the country. Food security is the main link in ensuring the independence of the Russian Federation, especially in economic sanctions. To achieve the indicators of the food security doctrine in terms of providing the population with high-quality food products to improve the health of the population, it is necessary to develop new technologies for functional products using valuable vegetable raw materials produced in a particular region [1, 2].

Today, interest in a healthy lifestyle, including proper nutrition, is supported at the state level. The main trends to preserve the health of Russian citizens are reflected in «Strategies for the formation of a healthy lifestyle of the population, prevention and control of non-infectious diseases for the period up to 2025» [3]. One of the main directions of the strategy is to improve the quality of food and the development of new types of food specialized and functional food. The development of recipes and technologies of such foods is based primarily on the enrichment of mass consumption products with physiologically functional ingredients, by introducing additional components or additives into their composition [4-6].

Requirements for additives today are very serious. In addition, they must enrich the chemical composition, improve the benefits of the use of products, contribute to the prevention of alimentary-dependent diseases, at the same time to have a positive effect on organoleptic characteristics and not
reduce the overall quality of the product. Positive results in the preparation of high-quality functional products are achieved when combining various raw materials of plant origin [4, 7, 8].

Soybean is soy, the maximum volume of which is made in the Far East. Soy and products of its processing are considered as a protein component in the composition of food products, as a source of polyunsaturated fatty acids, is flavonoids, phospholipids, enzymes, carbohydrates, including dietary fibers, minerals, also vitamins E, groups B, PP and other physiologically valuable nutrients. However, it is important to use special methods for the maximum extraction of these nutrients and gentle technological processing modes [9-14].

Food production based on soybeans fully meets the requirements of the healthy nutrition policy and food security of the Far Eastern region of Russia.

In addition to improving and enriching a chemical composition in the production of functional and specialized foods, it is necessary to increase their consumer properties. For this purpose, when designing functional products, it is important to ensure the combination of ingredients that are part of the products under organoleptic indicators, structural and mechanical characteristics and medical and biological properties [8].

Special popularity is currently among the population have oil and fat products - mayonnaise and mayonnaise sauces. These products are products of mass consumption, so their enrichment will contribute to improving consumer health. They are used primarily as flavored seasoning meat, fish, vegetables and are of great importance, as they are able to influence the absorption of food, enrich the dishes with valuable food components [5, 15-18].

2. Materials and methods

2.1. Materials
In the process of experimental studies, the following raw materials were used: Soybean grain of the Amur selection of Intrigue, Cinderella (GOST 17109, TP TS 015/2011), grown in the Tambov region of the Amur region, soy refined deodorized oil (GOST 31760), sesame oil (Sesam) (GOST 8990), seabuckthorn berries collected in the Blagoveschensk district of the Amur region, ascorbic acid (GOST R 55517), as well as mayonnaise sauces prepared with their use.

2.2. Methods
The determination of physicochemical, organoleptic, microbiological indicators and safety indicators of raw materials and finished products was carried out in accordance with the standard methods set forth in the regulatory documentation. The processing of experimental data was carried out by statistical analysis methods (Microsoft Excel, Statistika 6.0).

3. Results and discussion
Analysis of marketing research results showed [19] that the consumer market of the Amur region is sufficiently saturated with oil and fat emulsion products, all trading points implement mayonnaise and mayonnaise sauces of a similar range. The assortment of mayonnaise and mayonnaise sauces is characterized by various types of fat content and included additional ingredients.

The main share of 72 % of mayonnaise and mayonnaise sauces in the structure of the trade assortment of the Amur region are among domestic producers, which are represented by trading companies from the Central Strip of Russia ‘Petrosyuz’, ‘Maheyev’, company group ‘NMHK’, ‘Unilever Rus’, ‘Nefis’, a large share of mayonnaise in the trading assortment (more than 20 %) is represented by the brand of ‘Yanta’ of the Irkutsk oil and waged. From the enterprises of the Far Eastern region, mayonnaise products are represented by two manufacturers - this is the ‘Blagoveschensk Cold’ and LLC ‘Blagoveschensk Mascavrokombinat’, which is part of the company group ‘Integral’. Imported products are no more than 2 % and is represented by the Mayonnaise of the brand ‘Golden’ production of the Republic of Korea and mayonnaise sauces trademark ‘Mr. Djemius Zero’ produced in Estonia.
A significant proportion in the overall assortment, primarily on mayonnaise sauces (26%), accounted for products of foreign trade brands produced in the territory of the Russian Federation (trademark ‘Astoria’, ‘Mr. Ricco’, trademark ‘Heinz’ and others).

In the process of studying the market of mayonnaise and mayonnaise sauces, it is established that products with different fat content are being implemented in the Amur region market. Thus, trading networks are present as mayonnaise with fat content of more than 67%, and mayonnaise sauces with a mass fraction of fat 20-50% (labeled as ‘light’).

Analysis of the structure of the assortment of mayonnaise products in the sales network of the Amur region testifies to the presence of products mainly high fat, while the range of mayonnaise sauces is limited and amounts to no more than 20% of the entire range of mayonnaise products.

Mayonnaise sauces implemented in the trading network contain additional components that affect only taste characteristics, and do not allow to significantly increasing the food value of products.

Also, studies of marking selected samples of mayonnaise and mayonnaise sauces have shown that in the overwhelming majority cases on the package, the type of vegetable oil used is not specified.

The objectives of the study by survey consumers included: identifying consumer preferences and satisfaction with the presented assortment of mayonnaise and mayonnaise sauces; interest and determination of the competitiveness of mayonnaise sauces enriched with protein, ω-3, ω-6 with fatty acids, vitamins; the frequency of purchase, and, for what reason the consumer chooses one or another product.

During the survey of consumers, it has been established that enriched mayonnaise and mayonnaise sauces are a little-known product, in connection with this, the study of consumer relations to them is of great importance. Studies have shown that most of the consumers of this product (91%) do not buy mayonnaise products enriched with taste additives, while 89% of respondents expressed the view that such products are not enough in the Amur retail network. It should be noted that 99% of the respondents participating in the survey are ready to acquire mayonnaise sauces enriched with protein, ω-3 and ω-6 with fatty acids and vitamins with low fat content.

Thus, the analysis of the range and consumer preferences made it possible to establish that on the consumer market of the Amur region there are practically no mayonnaise sauces of improved composition with high nutritional value, in any sample of mayonnaise and mayonnaise sauces not used as the main component Bared oil with a balanced fatty acid composition, fortified, with improved composition. Studies have established that a wide range of mayonnaise products does not satisfy consumers and requires the development of innovative emulsion food products of functional purpose.

In this connection, the task of further research was the development of a mayonnaise sauce technology with a balanced chemical composition containing physiologically functional ingredients. To do this, we used vegetable raw materials: the basis for obtaining a mayonnaise sauce was the soy protein component and a vitamin and fatty complex from a blend of soy and sesame oil and sea buckthorn fruits [20, 21].

The protein component of the formulation was obtained as follows. Soybean grain washed, soaked, then crushed in water at hydro module 1 : 7, the resulting suspension was heated to a temperature of 90-100 °C and kept at this temperature for 5-7 minutes. The suspension was filtered, separating the liquid protein basis from the solid soy socio. Further studies used a liquid fraction.

In a soy protein base with a temperature of 60 °C, thermo acid coagulation was carried out with an aqueous solution of ascorbic acid (vitamin C) of 5% concentration and left to form a clot. The resulting curd was separated from the formed whey, bringing its moisture content to 60-65%. The curd has a soft plastic consistency, odorless, with a neutral taste and sourish aftertaste, white with shades, in addition to protein, vitamins C and E are present in the clot in significant amounts [22, 23].

To obtain the fat component of the mayonnaise sauce, ripe sea buckthorn berries were washed, dried and loaded into a grinder, an oil base was also added there - a mixture of soybean and sesame oil in a ratio of 70:30, while the ratio of berries and oil blend corresponded to 1:2 in weight ratio. Then the sea buckthorn was ground in oil to a puree-like consistency. The mixture was left alone in a dark place for 24 hours to extract fat-soluble substances, primarily vitamins E, K, A into oil. During this time, the
suspension is divided into two fractions: a vitamin-fatty base and an insoluble residue, which includes dietary fiber, water-soluble vitamins, and some minerals. The vitamin-fatty base was separated from the residue to obtain a vitamin-fatty complex [24, 25].

Mayonnaise sauce was prepared by mixing the components in accordance with the recipe (table 1). The mixture was homogenized to obtain a finely dispersed stable emulsion, packed and packaged under aseptic conditions.

| Name of ingredients       | Number, kg |
|---------------------------|------------|
| Protein clot              | 74.8       |
| Vitamin-fat base          | 21.4       |
| Salt                      | 1.1        |
| Sugar                     | 1.4        |
| Acetic acid 70 %          | 0.56       |
| Mustard powder            | 0.74       |
| Total                     | 100.0      |

The finished mayonnaise sauce is a homogeneous sour cream product, light yellow homogeneous over the entire mass of color, with a pleasant delicate taste and aroma of sea buckthorn, without extraneous tastes and smells. The resulting mayonnaise sauce was highly evaluated for organoleptic indicators at the tasting meeting.

Studies of the chemical composition of the obtained mayonnaise sauce, presented in table 2, characterize the product as a high-protein, low-caloriene, with the optimal ratio of polyunsaturated fatty acids of linoleic and linolenic (ω-6: ω-3) like 8.3:10, enriched with β-carotene, vitamins C and E.

| Name of Indicator | Quantity | The degree of satisfaction of the daily need of a person, % |
|-------------------|----------|----------------------------------------------------------|
| Proteins, g       | 16.32    | 20.0                                                     |
| Fat, g            | 18.65    | 23.3                                                     |
| Carbohydrates, g, | 9.82     | 2.5                                                      |
| Food fibers, g    | 1.72     | 8.6                                                      |
| Vitamin E, mg     | 8.78     | 58.5                                                     |
| Vitamin C, mg     | 35.50    | 40.0                                                     |
| β-carotene, mg    | 2.3      | 46.0                                                     |
| Minerals, g       | 3.88     | -                                                        |
| Energy value, Kcal| 272.41   | -                                                        |

4. Conclusion

The mayonnaise sauce obtained according to the developed technology is a functional food product containing vegetable protein, including all indispensable amino acids, vegetable oil containing polyunsaturated fatty acids, enriched with antioxidant complex, combining β-carotene, vitamins C and E in functionally significant amounts. This product is recommended to be used as seasoning to meat, fish, vegetable dishes and flour culinary products, it will be useful to consumers leading a healthy lifestyle. The use of soy raw materials to obtain an innovative food product functional product will allow to establish production and positively influence the food security and independence of the Far Eastern Region of Russia.
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