Practical basics of the functional fermented milk desserts development with fruit and berry additives

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Abstract. A technology for the production of homogenized purees from sea buckthorn and celery, intended for use in the production of dairy desserts, has been developed. The chemical composition of the homogenized sea buckthorn and celery purees was studied. The optimal modes of the fermented milk desserts production with vegetable purees from sea buckthorn and celery are established, which allow producing a product with the improved organoleptic and rheological parameters. The ratio of milk components of cottage cheese and sour cream is (2:1), the dose of mashed sea buckthorn and celery - 13% by weight of the product, the ratio of sea buckthorn to celery is 60:40. The technology of the “Milk squirrel” parfait fermented milk desserts and cottage cheese-sour cream mousse “Spring” production with the addition of mashed sea buckthorn and celery has been developed. In the fermented milk desserts, the content of vitamin C, A and E is increased.

1. Introduction
One of the most important problems of Russia and other economically developed countries is the problem of the food fortification with various micro- and macro-nutrients. Despite the need to reduce significantly the daily energy value of food, there is a need to increase the level of the essential nutrients consumption, in particular vitamins. Therefore, the most reasonable and effective way to improve the supply of vitamins to the population in the country is to add them to the products of the mass consumption.

Currently, much attention is paid to the dairy products creation for the dessert purposes, such as yogurts, dessert creams, whipped cream, mousses, puddings. The composition of these products, in addition to the milk base, includes fillers and a stabilization system, which improves the consistency and makes these products more attractive. These products have good consumer qualities, high nutritional value, low cost. The most attractive dessert products are for children, and this is one of the ways to introduce fermented milk products into their diet [1, 2]. Desserts are a popular category of dishes, both in public catering establishments and in retail stores. To increase the vitamin and mineral value of fermented milk products, a huge range of different additives is used.

Recently, the use of local fruit and berry crops in the production of fillers for the fermented milk products has been widely developed, which contributes to significant cost savings of the expensive raw materials, reduces the cost of their delivery, and is also characterized by a high content of vitamins and other biologically active substances. These crops include celery and sea buckthorn.

As products that are additionally enriched with vitamins, we have selected a group of desserts based on fermented milk, in particular mousses and parfaits. This type of product is quite simple to be prepared,
and in the process of the technological processing it is not subjected to the thermal effects, which allows to maximize the vitamins and minerals preservation in it, while increasing the biological value.

As enriching products, we have chosen sea buckthorn and celery - products rich in micro- and macronutrient composition, as well as in their biological effect on the human body.

Sea buckthorn is a multivitamin plant. According to the qualitative and quantitative content of the biologically active substances, sea buckthorn surpasses many fruit and berry crops. It has been currently found that sea buckthorn fruits contain 10 vitamins, the most valuable of which are vitamins C, P, B₁, B₂, K, and E. Berries are an important source of beta-carotene, which is a provitamin of vitamin A. Sea buckthorn is an oilseed crop containing sea buckthorn oil, which is a concentrate of beta-carotene. [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17].

Celery contains vitamin and mineral complexes, micro elements and amino acids (valine, isoleucine, tryptophan, aspartic acid). The vitamin complex in celery is dominated by vitamin A (beta-carotene) - 4.5 mg and vitamin C - 38 mg. Also in the composition of greens and root vegetables there are folic acid (B₉), B₁, B₅, B₆, and vitamin E (tocopherol). 100 g of the plant contains 163% of the required daily value of rubidium-an antihistamine component that prevents the development of allergies, relieves inflammatory processes in the body and nervous tension; magnesium-13% of the daily value; potassium and sodium (17.2% and 15.4%); calcium and iron (7.2% and 7.2%); phosphorus and vitamin K (9.6% and 24.4%).

Thus, due to the presence in its composition of the complex of minerals, pectins, organic substances, vitamins and other organic compounds, celery and sea buckthorn berries have a high nutritional and biological value.

All of the above was the basis for the research conduction on the possibility of creating combined fermented milk desserts using sea buckthorn berries and celery stalk as fillers. As an enriched dairy product, a sour-milk dessert on a curd-sour cream basis with the use of gelatin as a stabilizing system was chosen.

The purpose of this work is to develop recipes and technologies for fermented milk desserts using sea buckthorn and celery puree.

To achieve this goal, the following tasks were consistently solved in the course of the study:

- to justify the feasibility of the sea buckthorn and celery use in the production of fermented milk desserts for the functional purposes;
- develop technologies for the preparation of homogenized puree from sea buckthorn and celery;
- to study the chemical composition and properties of homogenized sea buckthorn and celery puree in connection with their use in the production of the fermented milk desserts;
- to study the functional properties of the homogenized puree to predict their behavior in the process of the technological processing;
- to investigate the effect of the components ratio (cottage cheese and sour cream) on the properties of the fermented milk desserts;
- to investigate the effect of the applied sea buckthorn and celery puree concentration, as well as their ratio, on the composition and properties of the fermented milk desserts;
- to investigate the quality and safety indicators of the developed fermented milk desserts;
- develop technologies for the fermented milk desserts production using homogenized puree of sea buckthorn and celery as fillers;
- develop regulatory and technical documentation for the fermented milk desserts with the filling of sea buckthorn and celery.

2. Research results

The practical significance of the work is confirmed by the development of the recipes and technology for the preparation of the technological documents for the fermented milk desserts with sea buckthorn and celery puree; the possibility to introduce the developed dishes in the public catering enterprises.
The research was carried out on the basis of the Department of TOPC of the Institute of Trade and Services of SFU in accordance with the set tasks. The entire research cycle consists of five stages:

At the first stage, scientific and literary sources, as well as educational literature and statistical data on the research problem were studied and analyzed using the collections of scientific libraries and the Internet.

The second stage was devoted to the study of the plant additives effect (sea buckthorn and celery) on the quality of the functional fermented milk desserts. The raw materials for the new dessert type preparation were considered, in terms of the necessary vitamins availability, as well as approaches to enriching new dishes were considered.

At the third stage, new types of the functional sour-milk desserts were developed – "Milk squirrel" parfait (with the addition of sea buckthorn and celery puree) and "Spring" cottage cheese-sour cream mousse (with the addition of sea buckthorn and celery puree). This stage includes research on the optimization of recipes and technology of the new functional desserts. During this stage, the technology of the new fermented milk desserts preparing was developed, and the effect of the different components ratios on the quality of desserts and vitamin composition was studied.

Also, at the third stage, the technical documentation for functional fermented milk desserts was developed.

At the fifth stage, the risk analysis of the new fermented milk desserts production was carried out, as well as calculations of the economic efficiency of their introduction into production were made.

The effect of the ratio and concentration of the homogenized sea buckthorn and celery purees on the composition and properties of the fermented milk desserts.

One of the main ways to increase the nutritional and biological value of the dairy products is the use of fillers. Fillers like sea buckthorn and celery puree have a good mineral composition, contain a whole complex of biologically active substances, in particular, they are a rich source of vitamins C, A and E, carotenoids, pectins, which will increase the biological value of the fermented milk desserts.

In addition, since vegetable purees contain pectins, they will contribute to the structure formation and improve the consistency of the fermented milk desserts.

Purees have a rich, pronounced taste, color and smell inherent in sea buckthorn and celery. Therefore, adding even a small amount of sea buckthorn and celery puree, we will significantly affect the organoleptic parameters of the fermented milk dessert.

In connection with the above, it is of interest to trace the effect of the applied dose of sea buckthorn and celery puree on the organoleptic and physico-chemical parameters of the fermented milk desserts. In addition to the function of fortification, sea buckthorn puree is a very important flavor additive, introduced to hide the bitterness and the specific smell of celery.

Based on the organoleptic evaluation, the range of variation in the concentration of sea buckthorn and celery puree from 7 to 17% per 100 g of the product was established. According to the developed technology, nine experimental sets of the fermented milk desserts with a certain concentration of the added puree in certain ratios of the added additive (buckthorn:celery) were produced. To prepare desserts, low-fat cottage cheese with an acidity of 220° T and sour cream with 10% fat content were used. A dessert without filling was taken for control. In the studied samples, the effect of the mashed potatoes dose on the organoleptic and physico-chemical properties of the finished dessert was determined.

Organoleptic evaluation of the obtained samples was carried out on a 100-point scale.

The concentration of the applied puree has a significant effect on the structure and consistency of the finished product. With an increase in the amount of puree, the consistency becomes more liquid and fluid.

Depending on the dose of the applied puree, the taste and aroma of the finished desserts change significantly. When adding a vegetable component in the amount of 7%, desserts have an insufficiently pronounced taste and aroma. When applying 17%, the taste becomes excessively acidic in the ratio of sea buckthorn puree to celery puree (60:40), and with an increase in the amount of introduced celery puree, a bitter specific taste and smell begins to appear.
According to the results of the organoleptic evaluation, it was found that for the required consistency and whipping, the concentration of the injected puree of 13 % is optimal for the dessert being developed. It is necessary to determine which ratio of the introduced ingredient (sea buckthorn:celery) has the optimal physical and chemical parameters, as well as the best vitamin content.

According to the results of the experiments, diagrams of changes in the vitamin composition of fermented milk desserts are constructed depending on the ratio of the vegetable purees from sea buckthorn and celery (figures 1 and 2).

**Figure 1.** Diagram of changes in the content of vitamins A and E in the fermented milk desserts, depending on the ratio of sea buckthorn and celery puree content.

**Figure 2.** Diagram of changes in the content of vitamin C in the fermented milk desserts, depending on the sea buckthorn puree and celery puree content.
Diagrams 1 and 2 show that when the content of sea buckthorn puree decreases, the content of vitamin C and E decreases as well, and vitamin A slightly increases.

Analyzing the physico-chemical, organoleptic parameters and the dynamics of the changes in the vitamin composition of the developed desserts, it was revealed that the optimal concentration of the introduced vegetable puree is 13%, the ratio of the introduced puree (sea buckthorn:celery) is (60:40).

Summarizing the obtained results, we can conclude that the amount of vitamins introduced with vegetable puree significantly increases the biological value of the fermented milk desserts.

Thus, summarizing the results, we came to the conclusion that the best structure and consistency, as well as whipping, are the fermented milk desserts prepared with the addition of vegetable puree in an amount of 13% with a ratio of sea buckthorn puree to celery puree of 60:40, and the optimal ratio (cottage cheese:sour cream) is 2:1. Sea buckthorn dessert in this case has an acidity of 224°T.

3. Conclusion

The possibility of the fermented milk desserts with sea buckthorn and celery puree production has been proven, which allows to expand the range and increase the nutritional value of the products.

A technology for the production of homogenized purees from sea buckthorn and celery, intended for use in the production of dairy desserts, has been developed.

The chemical composition of the homogenized sea buckthorn and celery purees was studied.

The optimal modes of the fermented milk desserts production with vegetable purees from sea buckthorn and celery are established, which allow producing a product with the improved organoleptic and rheological parameters. The ratio of milk components of cottage cheese and sour cream is (2:1), the dose of mashed sea buckthorn and celery-13% by weight of the product, the ratio of sea buckthorn to celery is 60:40.

The technology of the "Milk squirrel" parfait fermented milk desserts and cottage cheese-sour cream mousse "Spring" production with the addition of mashed sea buckthorn and celery has been developed. In the fermented milk desserts, the content of vitamin C, A and E is increased.

A draft of the technical specifications and technological instructions has been developed for the new fermented milk desserts.

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