Development of poly-component cooled dessert recipe based on pumpkin and apples processing products

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Abstract. The issue of providing the residents of the Russian Federation with food for a healthy diet is still currently relevant. The population lacks essential biological substances. The inclusion of various types of agricultural raw materials in food products enables to improve the quality indicators of finished products. The article presents the outcomes of research on the development of a technology for the manufacture of a multicomponent chilled dessert for proper nutrition using a locally produced plant component, namely pumpkin and apples, as the main raw material. As additional components the following ones are used: yogurt, honey, ginger syrup, stevia, blackberry, pine nuts, orange. The authors have developed three product formulations and for each of its samples the quality and quantitative characteristics assessment, the nutritional and energy value, the concentration of minerals and vitamins have been established. Based on the test results, the relevance of the production of a multicomponent chilled dessert based on pumpkin and apple processing products has been justified. The product is recommended for all population groups as a product for proper nutrition. A portion of the developed multicomponent chilled dessert with a volume of 110 to 125 g (depending on the recipe) contributes to the satisfaction of more than 15% of a person’s daily need for potassium, and with the addition of orange – for vitamin C.

1. Introduction

The issue of providing the population of the Russian Federation with healthy food remains relevant. The diet lacks vitamins, dietary fiber, proteins, and trace elements. In the formation of recipes for new food products, there is a promising direction for the combination of different types of agricultural raw materials. This technique allows enriching the resulting products with useful substances, regulating the composition and increasing the nutritional value with regards to the main provisions of balanced nutrition theory. To create combined products, it is advisable to use a variety of raw materials of plant and animal origin characterized by good technological properties, containing vitamins, ballast carbohydrates and mineral elements. It is known that plant proteins usually have lower biological value than animal proteins. Nevertheless, in combination, they may even exceed the latter [1, 2].

Due to its pleasant taste, chilled and frozen desserts, namely mousses, ice cream (parfait) on its base is now becoming more popular, especially among children. At the same time, desserts based on regional raw materials are of particular interest. They are characterized by freshness, originality and...
excellent taste, contain a moderate amount of carbohydrates and are low in calories. The choice of ingredients for preparation depends on the type of desserts and the methods of their further refrigeration and storage [3]. The purpose of this work was to develop a parfait recipe for proper nutrition for different age groups as well as to study the effect of the combined introduction of fruit and vegetable mass, natural yogurt, ginger syrup and pine nuts on the quality of a multicomponent chilled dessert.

2. Materials and methods
Raw ingredients were used as research materials, namely pumpkin, apples, Greek yogurt, gelatin, pine nuts, sesame seeds, pumpkin seeds, honey, blackberries, stevia, orange (Table 1) and, directly, samples of the produced chilled dessert. The food raw materials used for the preparation of the chilled dessert complied with the normative materials in terms of the main quality indicators.

When developing recipes for a multicomponent chilled dessert, the following principle was taken as a basis: high nutritional, biological value and physiological activity of the product is predetermined by the high quality of raw materials as fillers, which expands the prospects for processing inexpensive regional raw materials of the Belgorod region.

| Products          | Protein | Fats   | Carbohydrates | C     | K     |
|-------------------|---------|--------|---------------|-------|-------|
|                   | g       | g      | g             | mg    | mg    |
| Pumpkin           | 0.35    | 0.0345 | 1.518         | 2.76  | 70.38 |
| Apples            | 0.15    | 0.15   | 3.675         | 3.75  | 104.25|
| Greek yogurt      | 2.00    | 1.28   | 1.4           | 0.24  | 60.8  |
| Honey             | 0.08    | 0      | 8.03          | 0     | 3.6   |
| Gelatin           | 1.31    | 0.006  | 0.0105        | 0     | 0.015 |
| Pine nut          | 0.27    | 1.368  | 0.262         | 0.016 | 11.94 |
| Sesame            | 0.10    | 0.2435 | 0.061         | 0     | 2.485 |
| Pumpkin seeds     | 0.15    | 0.24525| 0.05355       | 0.0095| 4.045 |
| Stevia            | 0.00    | 0      | 5             | 0     | 0     |
| Orange            | 0.14    | 0.03   | 1.215         | 9     | 29.55 |
| Ginger syrup      | 0.01    | 0.0035 | 3.5           | 0     | 2.075 |
| Blackberry        | 0.21    | 0.0735 | 1.44          | 3.15  | 24.3  |

Table 1. Chemical composition of raw materials used in dessert recipes

During a series of preliminary model experiments, 3 product formulations were selected (table 2) with optimal component ratios. Losses in the production of samples ranged from 12 to 30% during cold processing and from 17 to 20% during thermal processing.

The analysis of the presented formulations showed that the development and manufacture of the product does not require expensive raw materials and additional equipment.
Table 2. Recipe for samples of multicomponent chilled dessert based on processed products of pumpkin and apples

| Sample No. 1 | Component           | Consumption | Finished product weight, g |
|--------------|---------------------|-------------|---------------------------|
|              |                     | Gross, g    | Net, g                   |
| Pumpkin      | 49                  | 34.5        | 30                        |
| Boiled pumpkin mass | -                  | 30          | -                         |
| Apples       | 42.5                | 37.5        | 30                        |
| Baked apple mass | -                  | 30          | -                         |
| Greek yogurt | 40                  | 40          | -                         |
| Honey        | 10                  | 10          | -                         |
| Gelatin      | 1.50                | 1.50        | -                         |
| Water for gelatin | 5.00               | 5.00        | -                         |
| Mass of ready-made dessert | -             | 110         | -                         |
| Pine nut     | 2.0                 | 2.0         | -                         |
| Sesame       | 0.5                 | 0.5         | -                         |
| Pumpkin seeds| 0.5                 | 0.5         | -                         |
| OUTPUT       | 110/4               |             |                           |

| Sample No. 2 | Component           | Consumption | Finished product weight, g |
|--------------|---------------------|-------------|---------------------------|
|              |                     | Gross, g    | Net, g                   |
| Pumpkin      | 49                  | 34.5        | 30                        |
| Mass of boiled pumpkin | -                  | 30          | -                         |
| Apples       | 42.5                | 37.5        | 30                        |
| Baked apple mass | -                  | 30          | -                         |
| Greek yogurt | 40                  | 40          | -                         |
| Stevia       | 5                   | 5           | -                         |
| Orange       | 22                  | 15          | -                         |
| Gelatin      | 1.50                | 1.50        | -                         |
| Water for gelatin | 5.00               | 5.00        | -                         |
| Mass of ready-made dessert | -             | 115         | -                         |
| Pine nut     | 2.0                 | 2.0         | -                         |
| Sesame       | 0.5                 | 0.5         | -                         |
| Pumpkin seeds| 0.5                 | 0.5         | -                         |
| OUTPUT       | 125/4               |             |                           |
### Sample No. 3

| Component                  | Consumption | Finished product weight, g |
|----------------------------|-------------|----------------------------|
|                            | Gross, g    | Net, g                     |
| Pumpkin                    | 49          | 34,5                       | 30                           |
| Mass of boiled pumpkin     | -           | 30                         | -                            |
| Apples                     | 42,5        | 37,5                       | 30                           |
| Baked apple mass           | -           | 30                         | -                            |
| Greek yogurt               | 40          | 40                         | -                            |
| Ginger syrup               | 5           | 5                          | -                            |
| Blackberry                 | 17,5        | 15                         |                               |
| Gelatin                    | 1,50        | 1,50                       | -                            |
| Water for gelatin          | 5,00        | 5,00                       | -                            |
| Mass of ready-made dessert | -           | 115                        | -                            |
| Pine nut                   | 2,0         | 2,0                        | -                            |
| Sesame                     | 0,5         | 0,5                        | -                            |
| Pumpkin seeds              | 0,5         | 0,5                        | -                            |
| OUTPUT                     |             |                             | 125/4                        |

### 3. Results

According to the traditional technology, parfaits are made from thick whipped cream. The cream used for cooking often has a high cost and calorie content (more than 322 kcal per 100 g). It is suggested to use natural yogurt as an alternative to cream [4,5].

Fermented milk products are perfect sources of essential nutritional components and are recommended for the nutrition of people of all ages, especially children and adolescents. Due to having a high mass fraction of dry substances, yogurt is a favorite drink of various segments of the population. A starter based on beneficial microorganisms, whose activity contributes to the normalization of gastrointestinal microflora is used in its production [6,7].

Pumpkin-apple puree is to be used as a vegetable raw material and a component of the developed dessert.

The choice is stipulated by the fact that pumpkin and apples are popular among agricultural producers and have kept their valuable consumer qualities for a long time.

Pumpkin is valued for the accumulation of carotenoids, sugars, dietary fiber, vitamins, pectin substances, macro- and microelements amid low calorie content.

The benefits of pectin and β-carotene are proven by research in the field of nutrition: pectin has an excellent absorbing effect and β-carotene is synthesized into retinol (vitamin A) when entering the body [8].

Ripe fresh apples are rich in vitamins, natural sugars, pectins and have a caloric value of 42-47 kcal per 100 g. Apples accumulate organic acids, natural antibiotics [9].

To provide the developed product with an additional healing effect, it is proposed to introduce ginger syrup and pine nuts into the recipe.

Spicy aromatic plants are an important source of adaptogens being biologically active substances. Ginger is a widespread spice in the food industry. Its rhizome is used in dried and ground form. Ginger is pungent, its aroma is pleasant. It contains more than 14% proteins, 3.2% fat, over 3% sugars, at least
5% fiber and about 65% starch. As well, the rhizome accumulates up to 33% of essential amino acids from their total content, potassium, magnesium, copper and manganese, ascorbic acid, unsaturated fatty acids, essential oil. Ginger possesses bactericidal properties, which result in a longer products preservation [10].

Pine nut kernels are rich in vitamins, phosphorus, copper, magnesium, iron, manganese, rich in fats and protein. At the same time, the fat composition of pine nuts is distinguished by a high content of polyunsaturated fatty acids, while the protein composition is characterized by the accumulation of amino acids, with prevailing amount of arginine. In addition, pine nut proteins are easily digestible. Pine nuts contain a complex of vitamins B, E and P. Kernels are used in the food industry as an ingredient in confectionery, cereals and other dishes [11].

To prepare a moderately sweet dessert in the recipe of sample No. 1 honey is used. Honey is a good fortifying agent that stimulates the immune system, activates metabolic processes and accelerates the process of tissue repair [12].

The introduction of stevia into the recipe of sample No. 2 is due to the need to improve the taste characteristics of the product and reduce its calorie content [13].

The use of orange enables to additionally enrich the chilled dessert with such vitamins as A, B1, B2, C, PP, C and the following minerals: Mg, P, Na, K, Ca and Fe [14].

In the recipe of sample No. 3, the sweetness of the product is achieved by the sweet properties of the components.

The introduction of blackberries contributes to the increase in nutrients and pharmacological substances of the finished product [15].

The technological scheme of a chilled dessert is shown in Figure 1.

The chilled dessert production technology began with the choice of raw materials. Plant raw materials were cleaned and crushed. The thickener was dissolved. Puree was made from pumpkins and apples. Gelatin, honey, or stevia were added to the yoghurt. We formed layers in special high bowls moistened with water so that the layers did not mix and were clearly identified. Afterwards the dessert was left in the refrigerator to obtain a jelly-like consistency. Before serving, the parfait was decorated with berries, sesame seeds, pine nuts, pumpkin seeds.

![Technological scheme for production of a chilled dessert based on pumpkin and apples](image-url)

**Figure 1.** Technological scheme for production of a chilled dessert based on pumpkin and apples
4. Discussion

In the dessert samples, the following is determined: nutritional and energy value, concentration of minerals (Figure 2-4) and vitamins.

The protein content in parfait varied from 4.38 to 4.51 g; fat – from 3.31 to 3.38 g; carbohydrates – from 11.59 to 14.54 g.

Analysis of the data obtained showed that the use of stevia and orange instead of honey helped to reduce the calorie content of the finished product from 105.42 to 98.65 kcal; the use of ginger syrup and blackberries – from 105.42 to 94.84 kcal.

The choice of components did not significantly affect the concentration of sodium, iron, thiamine, riboflavin, niacin in the samples.

The use of citrus and berry components contributed to an increase in the content of calcium, magnesium, phosphorus, vitamins A and C in the finished product.
5. Conclusion
A multicomponent chilled dessert based on pumpkin pulp, apples and yogurt is recommended for all groups of the population as a product for proper nutrition. The new product is a source of vitamins and minerals. In accordance with GOST R 52349-2005 “Food products. Functional food products. Terms and definitions”, three samples of dessert distinguished by the potassium accumulation can be attributed to functional foods. The dessert containing orange and stevia confirms the functionality and the concentration of vitamin C.

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