Justification of the choice of plant raw materials and forms of its processing for expanding the range of functional foods products

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Abstract. The article reflects the original results of the study of the chemical composition and the presence of physiologically active substances in the aboveground part of the common Aegopodium, which naturally grows in the forest-steppe zone of the Krasnoyarsk Territory. It is shown that the studied biomass is rich in vitamins A, C, group B and P-active substances, as well as macro- and microelements - magnesium, iron, manganese, selenium and copper, which determines the expediency of its use in the production of functional food products. On the basis of the use of dry powders (concentrates) of common Aegopodium and Jerusalem artichoke, a recipe for a new low-moisture bakery product has been developed, which has received the name -Breads "TopifitoSS", as well as a technological map of the specified new functional product. It has been established that the introduction of 12.5 wt.% Dry powders of common Aegopodium whitewash and Jerusalem artichoke into the classical formulation of loaves, as well as the replacement of water with whey make the organoleptic properties and nutritional value of the finished product optimal. Consumption of 100 g of the product provides an intake into the body, mg: ascorbic acid - 10.7; P-active substances - 2.4; magnesium - 18; phosphorus - 30.5; iron - 4.2; selenium - 0.21; energy value - 335 kcal. The regulated indicators of quality and safety of a new functional product have been determined. An expert assessment of organoleptic indicators revealed compliance with regulatory requirements, while experts noted a pleasant, harmonious taste of the product.

1. Introduction

In the last decade, a global trend has become a shift in emphasis from the production of products that provide the necessary nutrients for growth and maintenance of life, to products that can, in addition, provide prevention and alleviate the condition of certain diseases [1-5]. The composition of such products often includes substances of plant origin - nutraceuticals with functional properties. Their properties can reduce the risk of developing diseases associated with disorders in nutrition and assimilation of nutrients, maintain and improve health due to the presence of physiologically and biologically active food ingredients in their composition [6-9]. It is no coincidence that the efforts of...
many researchers are directed to the search for new, non-traditional types of food raw materials, promising for the introduction into the composition of functional products [10, 11, 13, 14]. Long-term studies of plants in the flora of Siberia, carried out by specialists from the Siberian Federal University, have shown that the overwhelming majority of them have a unique chemical composition and high biological activity [12, 13]. One of the most promising plants in this regard is the common Aegopodium (Aegopodium podagraria L., Apiaceae). In folk and official medicine, this plant is widely used for various diseases as a multivitamin, anti-inflammatory and general tonic [15]. Evidence-based medicine has confirmed the high detoxification and antimicrobial activity of the total extracts of substances from the herb Aegopodium podagraria L., Apiaceae (vulgaris vulgaris) [16].

Another promising and widely known plant recommended for use in dietary products is Jerusalem artichoke (Helianthus tuberosus L.) [12, 13, 17, 18]. The main advantage of the tubers of this plant is the content of inulin, a substance that has the ability to regulate and normalize blood sugar levels in the human body, and is a natural prebiotic [19, 20]. In addition, Jerusalem artichoke contains valuable dietary fiber - protopectin, soluble pectin, fiber, as well as cellulose and hemicellulose; a protein represented by eighteen amino acids; macro- and microelements: phosphorus, potassium, iron, silicon, calcium, chromium; vitamins: C, B1, B2, PP, carotene [17, 19]. The chemical composition and properties of this plant raw material determine the need to introduce into the nutrition of the population, including persons.

It is important to take into account that common Aegopodium and Jerusalem artichoke are seasonal crops, so there are certain difficulties with keeping them fresh in their natural form for a rather long period of time [12, 18, 19]. Taking into account the foregoing, it seems relevant to develop a recipe and technological solutions for obtaining functional food products using dry concentrates of the herb of common Aegopodium and Jerusalem artichoke tubers.

The purpose of this study is to scientifically substantiate the prospects for the use of dry powders of the aerial part of the common Aegopodium and Jerusalem artichoke tubers in the production of low-moisture bakery products for the functional nutrition of the population.

2. The experimental part

Young shoots and leaves of the common Aegopodium were harvested as the initial plant material. Samples for research were collected in the suburbs of Krasnoyarsk (56 ° N, forest-steppe zone) in June 2019. Immediately after harvesting, the plant biomass was dried in a drying oven at a temperature of 40-50 °C. The analytical sample was compiled by quartering from raw materials that meet the requirements of GOST NKVT 14143-69, GF-IX (article 231).

We used standard and special methods of analysis published in the literature. In the process of obtaining experimental data, a set of studies was carried out:

- the content of vitamin C was determined by the method S.M. Prokoshev [21].
- vitamin B1 in accordance with instruction No. 4399-87 for the determination of vitamin B1 in food, approved on 10.07.1987.
- vitamin B2 - in accordance with instruction No. 4399-87 for the determination of vitamin B2 in food, approved on 10.07.1987.
- flavonoids in terms of rutin - according to the guidelines for quality control and safety of biologically active food additives R 4.1.1672-03.
- ash - according to GOST 28552-90.
- titratable acidity - according to GOST 28555.0-82.
- masses - according to GOST 29329-92.
- sugars and fat - according to MU No. 1-40 / 3805.
- fiber - according to GOST 28553-90.
- moisture - according to GOST 52088-2003.
- mass fraction of fat - according to GOST R 50817-95.
- mass fraction of reducing sugars and total sugar - according to GOST 5903-89.
- mineral elements - on the atomic absorption spectrometer AAS-30, including copper - according to GOST 30178-96, iron - according to GOST 30178-96, calcium - by weight calcium-pectate method according to I.M. Skurikhin [22]. Organoleptic tests of the finished product were carried out in accordance with GOST R 53104-2008.

To establish the chemical composition of extractive substances, we used the method of fractional extraction of dried plant biomass with organic solvents of increasing polarity. The quantitative content was established by the decrease in the mass of the sample after exhaustive extraction in a Soxhlet apparatus for 20 or more hours with further drying at 105 °C. Extracts of the preparation with weakly and non-polar solvents were differentiated into acidic, neutral and phenolic fractions. The content of various classes of chemical compounds was determined by the absorption of UV and visible radiation by extracts [23].

Descriptive statistics for quantitative values in the case of a normal distribution according to the Shapiro-Wilks test are presented as the mean (M) and standard deviation of the mean (SD). Differences were assessed as statistically significantly different, starting with a p-value <0.05. The results were processed using Microsoft Office programs (Excel application package).

### 3. Discussion of the results

Proceeding from the fact that plant biomass is supposed to be used for food purposes, first of all, the content of heavy metals in the raw materials under study was established by the method of atomic absorption analysis (table 1).

| The component being defined | Content, mg / kg |
|-----------------------------|------------------|
| Lead                        | 1.16 ± 0.05      |
| Cadmium                     | 0.34 ± 0.02      |
| Arsenic                     | 1.23 ± 0.05      |
| Mercury                     | 0.21 ± 0.01      |

According to the data obtained, the aboveground part of the common Aegopodium contains ions of heavy metals in significantly smaller quantities than their maximum permissible concentrations. Thus, the raw materials under study are safe for this class of pollutants and can be used for food purposes.

The results of the study of the chemical composition of the aboveground part of the common Aegopodium growing in the forest-steppe zone of the Krasnoyarsk Territory are presented in table 2.

| The component being defined | Content, wt % |
|-----------------------------|---------------|
| Humidity                    | 4.0 ± 0.05    |
| Ash content                 | 6.1 ± 0.05    |
| Cellulose                   | 0.8 ± 0.02    |
| Lignin                      | 35.9 ± 0.1    |
| Extractive substances       | 57.1 ± 0.1    |

The rather high ash content of the analyzed biomass made us turn to the study of its mineral complex. The results are shown in table 3.
Table 3. Macro- and microelement composition of the aboveground part of the common Aegopodium.

| Trace elements (μg / g) | Macronutrients (μg / g) |
|------------------------|------------------------|
| Iron       | 38.20                | Potassium     | 42263        |
| Selenium  | 0.21                 | Calcium       | 6 632        |
| Copper     | 14.16                | Magnesium     | 1598         |
| Chromium  | 0.93                 | Phosphorus    | 2 678        |
| Manganese | 32.30                |              |              |

As follows from the experimental data obtained, the content of iron, manganese and copper in 100 g of common Aegopodium exceeds the daily norm for these microelements for an adult.

The main chemical components of the aerial part of the studied plant are fiber (0.8% by weight), lignin (35.9% by weight) and extractives (57.1% by weight). The high content of extractive substances raised the question of studying their qualitative composition. To determine the classes of substances extracted by solvents of different polarity, the absorption of electromagnetic radiation in the visible and UV regions was studied by the extracts.

The quantitative composition of the extractive substances of the aboveground part of the studied samples of the common Aegopodium, isolated by solvents of increasing polarity, is presented in table 4.

Table 4. The quantitative composition of the extractive substances of the aboveground part of the common Aegopodium.

| Extractant    | The yield of extractive substances. % of a.s.n. |
|---------------|-----------------------------------------------|
| Diethyl ether | 7.8 ± 0.05                                    |
| Ethyl acetate | 5.6 ± 0.05                                    |
| Isopropanol   | 3.4 ± 0.04                                    |
| Water         | 40.3 ± 0.1                                    |
| Total         | 57.1 ± 0.1                                    |

It is known that most of the extractive substances are biologically active substances. As a result of the spectrophotometric study, it was found that the main substances extracted from the analyzed biomass by diethyl ether are hydroxybenzoic acids (max absorption at 260-270 nm), hydroxycinnamic acids (max at 290-320 nm), flavonols, flavonones, coumarins, terpenoids (max at 290 and 325). The antispasmodic activity of the plant material under study is apparently associated with the presence of coumarins in the aerial part of the common Aegopodium.

The isopropanol fraction contains esters of oxybenzoic and hydroxycinnamic acids, leukoanthocyanins (270-280 nm), as well as polyphenolic compounds (320-350 nm). The phenolic fraction has a pronounced absorption maximum at 275 nm, indicating the presence of free phenol, and a weak one at 340 nm, indicating the presence of polyphenols. Phenolic compounds, the total content of which in the aerial part of the common Aegopodium is about 8% by weight, apparently determine its anti-inflammatory and bactericidal action, and are also powerful antioxidants.

The water extract of dream contains carbohydrate components, tannins (~ 350 nm) and water-soluble acids: valeric, isovaleric and acetic. It is known that tannins have the ability to form chemical bonds with proteins, as well as insoluble compounds with salts of heavy metals, therefore, the leaves and stems of the common Aegopodium can be considered as an astringent and intoxicant in case of poisoning with heavy metals.

Our earlier analysis [24] of the vitamin composition of the aboveground part of the common Aegopodium revealed a significant content of vitamins A, C, as well as B1, B2 and P-active substances (table 5).
Table 5. Vitamin composition of the aboveground part of the common Aegopodium.

| Defined parameter         | Content, mg / 100 g. |
|---------------------------|----------------------|
| Ascorbic acid (vitamin C) | 46.5 ± 0.2           |
| Carotene (provitamin A)   | 0.21 ± 0.01          |
| Thiamin (vitamin B1)      | 0.016 ± 0.005        |
| Riboflavin (vitamin B2)   | 0.11 ± 0.01          |
| P-active substances       | 17.3 ± 0.1           |

It is known that vitamin C is involved in redox reactions, the functioning of the immune system. Deficiency of ascorbic acid leads to looseness and bleeding of the gums, nosebleeds due to increased permeability and fragility of blood capillaries [25]. More than 50% of the recommended daily intake of vitamin C for an adult is contained in 100 g of the studied plant materials.

The amount of P-active substances (the sum of catechins and flavonoids in terms of rutin) in the analyzed biomass was more than 17 mg / 100g, with a daily dose of 35-50 mg. The presence of P-active substances in combination with ascorbic acid determines the high capillary-strengthening ability of preparations from the aerial part of the common Aegopodium. In addition, P-active substances are strong antioxidants capable of binding and neutralizing toxic compounds formed under the action of radiation exposure. It is these properties that have allowed a number of researchers to recommend the use of common Aegopodium as part of herbal teas to relieve the intoxication of the body of cancer patients after undergoing radiation and chemotherapy [26].

The content of substances of the group of vitamin A in terms of vitamin A is about 0.3 mg per 100 g of leaves of common Aegopodium. It is known that vitamin A is responsible for the normal development of the human body, reproductive function, health of the skin and eyes, and has antioxidant properties [25].

Vitamin B1, contained in the aerial part of the vulgaris in an amount of 0.016 mg%, plays an important role in carbohydrate, protein and fat metabolism, and also regulates the stable functioning of the human nervous system. Vitamin B2 plays an important role in the overall metabolism and energy metabolism in the body and must be taken with food. Its content in the analyzed biomass in an amount of more than 0.1 mg% makes the aboveground part of the bilge a promising raw material for the production of functional food products.

Thus, the obtained results of the analysis of the chemical composition of the aboveground part of the common Aegopodium testify to the relatively high nutritional value of the studied plant raw materials, the possibility of its use in the food industry and public catering for the production of specialized products of various functional orientations.

It is important to note that for all its useful properties, Aegopodium has absolutely neutral organoleptic characteristics, which is very valuable when used in food. Therefore, it is proposed to introduce it into the composition of bakery products for everyday consumption. In this regard, the authors consider the most feasible option to add whitewash to a low-moisture bakery product. The advantages of this category of goods are: long shelf life, simple technological process, high demand in the consumer market due to the active promotion of healthy nutrition [27-29].

The growth in consumption of refined carbohydrates by the population of the country, including in the composition of bakery products, leads to disruption of carbohydrate metabolism in the body and, as a result, to the emergence of one of the most severe and widespread diseases of the endocrine system - diabetes mellitus. In order to minimize these risks, the authors of the study consider it expedient to use dry Jerusalem artichoke concentrate (Helianthus tuberosus L.), which is 100% of the biomass of the tubers of the specified plant and contains the polysaccharide inulin (up to 70%), pectins (up to 10%), proteins (up to 7%), fats (up to 0.7%), fiber (up to 7%), organic acids, vitamins (B1, B2, B6, PP), carotenoids, amino acids, biogenic mineral complex (silicon, potassium, magnesium, iron, chromium, phosphorus, manganese, zinc, copper). In the present study, we used dry Jerusalem artichoke concentrate produced by the Ryazanskie Prostory LLC (Moscow) and having the appearance of a grayish-white
powder with a light beige tint. The product meets the requirements of TU 9741-001-11866470-94, TU 9741-002-11866470-94, TU 9379-003-11866470-95.

Thus, the main task of the next stage of the study was to develop a recipe and a technological scheme for the production of crispbreads, called "TopifitoSS". For this purpose, a test baking of products was carried out in laboratory conditions, which was carried out in accordance with GOST 27669-88.

When compiling the formula for the dough, a basic recipe for wheat breads was used, in which part of the wheat bread flour was replaced with crushed dried biomass of the ordinary and dry Jerusalem artichoke concentrate, and instead of water, whey was used and the amount of table salt was reduced three times relative to the basic recipe of the breads.

The studies have shown that when adding 12.5% powder of common Aegopodium and dry Jerusalem artichoke concentrate from the mass of flour, the obtained samples of the loaves had the best physicochemical and organoleptic characteristics.

On the basis of test baking, a recipe for bakery products with low moisture content was compiled - Breads "TopifitoSS" with an output of finished products of 500 g (table 6). As a control sample, a sample of wheat loaves prepared in the traditional way was taken.

**Table 6. Recipe for a prototype of TopifitoSS crispbread.**

| name of raw materials                  | The amount of raw materials introduced |
|----------------------------------------|----------------------------------------|
| Breads "TopifitoSS"                    | Control sample                         |
| Baking wheat flour of the highest grade, g | 416                                     |
| Common Aegopodium powder, g            | 52                                      |
| Jerusalem artichoke dry concentrate, g | 52                                      |
| Table salt, g                          | 2.5                                    |
| Water ml                               | 7.5                                    |
| Milk serum, ml                         | 250                                    |

The evaluation of the organoleptic characteristics of the TopifitoSS crispbread was carried out 18-20 hours after baking and drying according to the following indicators: shape, surface, color, brittleness, fractured appearance, smell, taste. The results of the sensory evaluation of the finished product in comparison with the control sample are shown in table 7.

**Table 7. Organoleptic evaluation of TopifitoSS crispbread.**

| Indicator name          | Product characteristics                  | Control sample                     |
|-------------------------|-----------------------------------------|------------------------------------|
| The form                | Crispbreads are thin, rectangular,       | Crispbreads are thin, rectangular,  |
|                         | without cracks                          | without cracks                      |
| Surface                 | Rough with pricks and relief, the       | Smooth with pricks and relief, the |
|                         | underside is mealy                      | underside is mealy                 |
| Color                   | The color is uniform, from golden yellow| The color is uniform, from golden   |
|                         | to light brown with minor blotches      | yellow to light brown               |
| Fragility               | Products are fragile, easily breakable   | Products are fragile, easily       |
| Broken view             | Baked, dry, with small inclusions,       | breakable                          |
|                         | without traces of impurities            | Baked, dry, no traces of impurities|
| Taste                   | Peculiar to grain products, slightly    | Inherent to this type of product,   |
|                         | sweetish, without foreign flavors       | without foreign tastes              |
| Smell                   | Fragrant, pleasant grain, no foreign    | Fragrant, grainy, without foreign   |
|                         | odors                                   | odors                              |
On the basis of the traditional technological scheme for the production of low-moisture bakery products and the crispbreads "TopifitoSS" recipe, a technological map for the developed product has been drawn up (table 8).

**Table 8.** Technological map of preparation of functional bakery product of low humidity - Bread "TopifitoSS".

| name of raw materials                  | Raw material consumption, g per 1 kg of product | Raw material consumption, kg per 1 ton of product |
|----------------------------------------|-------------------------------------------------|--------------------------------------------------|
| Wheat baking flour, premium grade      | 832                                             | 832.00                                           |
| Common Aegopodium powder               | 104                                             | 104.00                                           |
| Jerusalem artichoke dry concentrate    | 104                                             | 104.00                                           |
| Table salt                             | five                                            | 5.00                                             |
| Milk serum                             | 500 *                                           | 500.00 *                                         |
| Dough weight:                          | 1545                                            | 1545                                             |
| Semi-finished product weight:          | 1530 **                                         | 1530 **                                          |
| Finished product yield:                | 1000 ***                                        | 1000 ***                                         |

* - of the total amount of whey according to the recipe, a small amount is used as a solvent for table salt; ** - losses during dough cutting and shaping are 1%; *** - losses during baking and drying of products are 34.7%.

The technological process of obtaining crispbreads "TopifitoSS" includes the stage of preparation of raw materials to the stage of grinding the dried herb of whitewash to a fraction of 1-2 mm. This is followed by dosing and mixing of wheat flour, herbal powder and Jerusalem artichoke until smooth, followed by the addition of whey, a solution of sodium chloride in whey and kneading the dough. The temperature when kneading the dough is 25-30 °C, the moisture content of the dough is 39-40%.

To improve the rheological properties, better swelling of the dry components of the recipe mixture, after kneading the dough undergoes a maturation stage without rolling at a temperature of 20-25 °C with protection of the surface from drying out using food polymer covering materials. Dough aging time - 60 minutes.

This is followed by rolling the dough and its patterned pricking, cutting the dough tape into rectangular plates and baking at a temperature of 180-200 °C, the baking time is 10-15 minutes. The baked bread is dried at a temperature of 45-55 °C for 30-40 minutes, after which it is cooled at room temperature for 4 hours.

**Table 9.** Nutritional value of TopifitoSS crispbreads per 100 g.

| Caloric content, kcal (kJ) / 100 g | Macronutrients, mg | Trace elements, μg | Proteins, g | Fat, g | Carbohydrates, g |
|------------------------------------|--------------------|--------------------|--------------|--------|------------------|
| 335 (1400)                         | 69.12              | 65.24              | 12.5        | 7.0    | 56.5             |

By the calculation method, it was found that the consumption of 100 g of a new functional product - TopifitoSS Breads provides the body with, mg: ascorbic acid - 10.7, which is one fifth of the daily human need; P-active substances - 2.4 or a tenth of the daily requirement; the same amount of vitamins of group B. The dominants of the biogenic mineral complex is: magnesium - 18 mg at a daily rate of 400 mg; iron - 4.2 mg with a daily requirement of 10-30 mg; phosphorus - 30.5 mg, selenium - 0.21 mg.
Evaluation of the quality of the obtained bakery products of low humidity - crispbreads "TopifitoSS" - was carried out 18-20 hours after baking. The results of evaluating the physicochemical indicators of finished products are presented in table 10.

Table 10. Physical and chemical indicators of finished bakery products of low humidity.

| Indicator name | Indicator value | GOST 9846-88 | Breads "TopifitoSS" | Control sample |
|----------------|----------------|--------------|---------------------|----------------|
| Humidity, %    | no more than 9 | 5.3          | 5.4                 |                |
| Acidity, deg.  | no more than 8 | 7.3          | 7.3                 | 5.6            |

Hygienic safety indicators of bakery products are regulated by SaNPiN 2.3.2.1078-01 [30]. Table 11 shows the values of individual safety indicators for a new functional bakery product - TopifitoSS crispbread.

As follows from the data presented in tables 10 and 11, the physicochemical indicators of the quality and safety of the new functional bakery product of low humidity - TopifitoSS breads, as well as the indicators of the nutritional and energy value of the finished product correspond to the standard values for this group of food products. The taste of the resulting product was generally assessed positively. The tasters agreed that the appearance of the product is quite attractive, the taste is pleasant, the color and texture are typical for this type of product, and there are no extraneous odors.

Table 11. Hygienic requirements for bakery products.

| Indicators | The values Permissible level, no more (SaNPiN 2.3.2.1078-01) | Breads "TopifitoSS" |
|------------|-------------------------------------------------------------|---------------------|
| Toxic elements: |                                              |                     |
| - lead      | 0.35                                                        | 0.00116             |
| - arsenic   | 0.15                                                        | 0.00123             |
| - cadmium   | 0.07                                                        | 0.00034             |
| - mercury   | 0.015                                                       | 0.00021             |
| Mycotoxins: |                                                             |                     |
| - aflatoxin B1 |                                                | traces             |
| Pesticides: |                                                             |                     |
| - hexachlorocyclohexane (α-, β-, γ-isomers) | 0.5 | traces             |
| - DDT and its metabolites | 0.02 | -                 |
| - hexachlorobenzene | 0.01 | -                 |
| - organic mercury pesticides | not allowed | -                 |
| - 2.4 D acid, its salts, esters | not allowed | were not determined |
| Radionuclides: |                                              |                     |
| - cesium-137 | 40 Bq / kg | <10.60          |
| - strontium-90 | 20 Bq / kg | <10.20          |

Thus, the assessment of the quality and safety indicators of the finished product - a new functional bakery product of low humidity - crispbreads"TopifitoSS" - confirmed its compliance with the requirements of the current regulatory documents and can serve as a basis for obtaining an official sanitary and epidemiological conclusion.

4. Conclusions
The chemical composition of the aboveground part of the common Aegopodium growing in the forest-steppe zone of the Krasnoyarsk Territory has been investigated. The revealed vitamin and mineral
composition of the analyzed biomass, as well as the presence of certain classes of extractive substances (coumarins, phenolic compounds, tannins) indicates its high nutritional value, physiological activity, which determines the possibility of using it as a local raw material in the production of functional food products.

The regulated indicators of the safety of the common Aegopodium growing in the central regions of the Krasnoyarsk Territory have been determined. It has been established that the studied biomass contains ions of heavy metals (lead, cadmium, arsenic, mercury, zinc) in quantities significantly lower than their maximum permissible concentrations. This circumstance testifies to the ecological safety of the studied plant raw materials and the possibility of using it as a source of micronutrients of natural origin for the enrichment of food with the latter.

A recipe and a technological scheme for a new specialized bakery product of low moisture content - crispbreads "TopifitoSS", in which wheat bakery flour is partially replaced with crushed dried biomass of common Aegopodium and dry Jerusalem artichoke concentrate, was developed, and milk whey was used instead of water and the amount of table salt was reduced. It has been shown that with the addition of 12.5% powder of common Aegopodium and dry Jerusalem artichoke concentrate, the samples of loaves have the best physicochemical and organoleptic characteristics.

A technological map of a functional product based on the investigated plant biomass has been created. The regulated quality indicators have been determined. It was established by the calculation method that the consumption of 100 g of a new functional product provides an intake into the body, mg: ascorbic acid - 10.7; P-active substances - 2.4; magnesium - 18; phosphorus - 30.5; iron - 4.2; selenium - 0.21; energy value - 335 cal.

An expert assessment of the organoleptic characteristics of a new functional bakery product of low moisture content - crispbreads "TopifitoSS" was carried out. Compliance with regulatory requirements was established, and pleasant, harmonious taste of the product was noted.

Based on the foregoing, it can be concluded that it is advisable to further improve the recipes of bakery products using processed products of unconventional plant raw materials - dumplings and Jerusalem artichoke, as well as the implementation of extensive research in the study of consumer demand and the promotion of a new functional product in the consumer market. In the future, it will be possible to develop other products containing functional components from the aboveground part of the common Aegopodium, with the addition of Jerusalem artichoke concentrate, which will offer the consumer the opportunity to diversify their diet with high-quality healthy products.

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