Optimal composition of poultry balls based on natural brown flax bran

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Abstract. The paper established that depending on the number of natural brown flax bran and squash the prefabricated poultry meat does not significantly change its indicators, but the most optimal is sample No. 2 – with the replacement of the wheat bread norm with 50% natural brown flax bran; with the replacement of the water norm with 50% squash – Kurazh. The content of amino acids in Kurazh balls was higher than in the control sample, which indicates their biological value and quality. The study of the content of such acute deficient amino acids as lysine, methionine and tryptophan showed that the Kurage balls exceed the control sample in amino acids: lysine – by 77.6%, methionine – by 125.5%, tryptophane – by 78.1, respectively. A new kind of balls with functional ingredients has a number of useful properties for the human body and may be recommended for gerodietetic nutrition.

1. Introduction
An important task of the state policy in the field of nutrition of the population is the production of health-improving food products to preserve and improve the health of older people and prevent their diseases. As a result, there is increased importance of functional food products that have ingredients (protein, mineral, etc.) that increase the resistance of the human body to diseases, thus giving the opportunity to maintain an active lifestyle for a long time [1-3].

Traditional poultry meat products lack important nutrients that meet the needs of the body, such as some vitamins, microelements, organic acids, easily digestible carbohydrates, and dietary fibers. In order to maximize the nutritional value of poultry meat products and ensure normal metabolic processes in the body, poultry meat products are produced with the addition of various micronutrients. Their introduction into the formula not only enriches the products with proteins, vitamins and minerals, but also significantly reduces the caloric content [4-7].

The addition of a small amount of natural brown flax bran to dishes increases appetite, production of intestinal secretion, improves the body’s defenses in combating infections, stimulates the production of red blood cells and calms the nervous system. Plant fibers effectively combat dysbacteriosis, serve as a nutrient medium for useful intestinal microflora, an adsorbent of harmful substances, including allergens. Natural brown flax bran contributes to recovery from allergic diseases. Moving along the intestine the natural brown flax bran increase in volume due to liquids and contribute to intestinal peristalsis. This effect is used to control constipation. Fiber swelling in the gastrointestinal tract provokes a feeling of fullness, which allows reducing the portions for overweight people and favorably fights obesity.
Fresh fruits of squash contain about 90% of water and only 18 kcal per 100 g of pulp. At the same time, the vegetable is rich in vegetable proteins, useful food fibers, potassium mineral salts, phosphorus, magnesium, calcium, iron, vitamins E and B, in orange specimens the content of carotene and ascorbic acid is high.

Squash is a valuable source of mineral salts: calcium, phosphorus, potassium, sodium, iron, cobalt, molybdenum, titanium, aluminum, lithium, zinc and other microelements. It also contains vitamins: B₁, B₂, carotene and ascorbic acid are present in yellow fruits. They contain more vitamin E than zucchini and pumpkin.

Due to low calorie content and high fiber content, squash is widely used in dietary nutrition. It normalizes metabolism, prevents diseases of the cardiovascular system, kidneys, and liver [6, 8].

Squash is used for the prevention and treatment of atherosclerosis, hypertonosis and anemia.

It was found that orange squash contributes to the elimination of cholesterol from the body, and also contains 3-5 times more lutein than other varieties. Once in blood, lutein begins to act as an antioxidant preventing the formation of blood clots, strengthening immunity, as well as neutralizing free radicals, which are the cause of various diseases. Another beneficial property of lutein is its positive effect on vision, which is very important for the elderly [8].

2. Materials and methods

The formula considered the possibility of partially replacing the wheat bread norm with natural brown flax bran and water norms with a squash.

Table 1. Formula of Kurazh balls.

| Products, prefabricated products | gross weight | net weight |
|---------------------------------|-------------|-----------|
| Chicken                         | 74          | 74        |
| Wheat bread                     | 9           | 9         |
| Natural brown flax bran         | 9           | 9         |
| Water                           | 13          | 13        |
| Squash                          | 13          | 13        |
| Interior fat                    | 3           | 3         |
| Prefabricated product weight    | 114         | 114       |
| Butter                          | 2           | 2         |
| Weight of parboiled balls       | 100         |           |

The use of natural brown flax bran and squash will make it possible to enrich the product with food fibers, micro- and macroelements, vitamins. To determine the optimal percentage of vegetal raw material, the samples with the amount of natural brown flax bran and squash – 25, 50 and 75% – were considered [9, 10]. Higher percentage has a poor effect on the organoleptic properties of the new product [11].

The samples were made to determine the optimal functional-technological and organoleptic characteristics of the prefabricated product formula. Prepared prototypes of poultry balls with addition of vegetal raw materials for functional nutrition and the control sample “chopped poultry balls” were checked for quality according to physicochemical and organoleptic indices. Depending on the number of natural brown flax bran and squash the prefabricated poultry meat does not significantly change its indicators, but the most optimal is sample No. 2 – with the replacement of the wheat bread norm with 50% natural brown flax bran; with the replacement of the water norm with 50% squash – Kurazh. The formula of Kurazh poultry balls is presented in Table 1.

Product characteristics.
The product of oval-flattened shape. The color is characteristic of the used raw materials with a grayish tint.

Raw materials and materials used in production shall comply with the requirements of the current regulatory and technical documentation.

The following raw materials are used to make poultry balls with vegetable raw materials for functional nutrition:
- chicken meat (carcasses of hens, chickens, broilers and their part) GOST 31962-2013;
- butter, GOST 32261-2013;
- edible salt at least the first grade GOST 13830-97;
- natural brown flax bran TU 9290-001-11759291-2016;
- fresh squash GOST 34324-2017.

3. Results and Discussion

Proteins are the most important and complex chemical substances constituting the muscle and connective tissue of poultry meat. They are built of various dispensable and indispensable amino acids.

Table 2. Amino acid composition of poultry meat balls for functional nutrition

| Indicators                        | Control | Kurazh |
|----------------------------------|---------|--------|
| Essential amino acids, including|         |        |
| valine                           | 0.475   | 1.133  |
| isoleucine                       | 0.380   | 1.149  |
| leucine                          | 0.750   | 1.050  |
| lysine                           | 0.850   | 1.510  |
| methionine                       | 0.360   | 0.812  |
| threonine                        | 0.425   | 0.976  |
| triptophane                      | 0.160   | 0.285  |
| phenylalanine                    | 0.690   | 1.311  |

Amino acids provide the formation of a plastic reserve of the human body. This is muscle, connective, bone, fat and nerve tissues. The studies of amino acid content in poultry meat with plant raw materials are shown in Table 2.

Table 2 shows that the amino acid content in Kurazh balls was higher than in the control sample, indicating their biological value and quality. When studying the content of such acute deficient amino acids as lysine, methionine and tryptophan, Kurazh balls exceed the control sample in amino acids: lysine – by 77.6%, methionine – by 125.5%, tryptophan – by 78.1, and in the content of amino acids that affect the growth and development process (leucine, isoleucine and threonine) – by 40%; 202.3% and 129.6%, respectively, compared to control samples.

The satisfaction of the daily nutrient need of Kurazh balls compared to chopped poultry balls is shown in Table 3.

Table 3 shows that when natural brown flax bran and squash are added to poultry meat balls (with the replacement of the wheat bread norm with 50% natural brown flax bran; with the replacement of the water norm with 50% squash) compared to the control, the satisfaction of the daily need for food fibers increases by 21.6%; potassium – by 4.8%, phosphorus – by 5.3%, magnesium – by 7.8%, iron – by 13%, vitamins: B₂ – by 4%, B₁ – by 7.7%, vitamin C – by 3.38%, vitamin PP – by 5.7%.
Table 3. Satisfaction of the daily nutrient need of older women

| Nutritional value | Daily need, g | Chopped poultry balls, control | Kurazh balls |
|-------------------|--------------|-------------------------------|--------------|
|                   | Content, in 100 g | Daily need satisfaction level, % | Content, in 100 g | Daily need satisfaction level, % |
| Carbohydrates, g  | 305          | 9.3                           | 5.83         | 1.9                        |
| Proteins, g       | 63           | 18.6                          | 18.06        | 28.7                       |
| Fat, g            | 70           | 7.2                           | 8.0          | 11.4                       |
| Food fiber, g     | 20           | 0.7                           | 4.32         | 21.6                       |
| Mineral substances|              |                               |              |                            |
| Sodium            | 4000         | 2048                          | 51.2         |                            |
| Potassium         | 2500         | 208                           | 8.3          | 327.6                      | 13.10                      |
| Calcium           | 800          | 50                            | 6.3          | 51.86                      | 6.48                       |
| Magnesium         | 400          | 30                            | 7.5          | 61.30                      | 15.30                      |
| Phosphorus        | 1200         | 160                           | 13.3         | 222.8                      | 18.60                      |
| Iron              | 10.0         | 1.4                           | 14.0         | 2.7                        | 27.0                       |
| Vitamins          |              |                               |              |                            |
| A µg %            | 800          | 40                            | 5.0          | 25.36                      | 3.17                       |
| B1                | 1.3          | 0.06                          | 4.6          | 0.16                       | 12.3                       |
| B2                | 1.5          | 0.09                          | 6.0          | 0.15                       | 10.0                       |
| PP mg %           | 16.0         | 5.1                           | 31.8         | 6.0                        | 37.5                       |
| C mg %            | 80.0         | 0                             | 0            | 2.7                        | 3.38                       |

4. Conclusion
A new kind of balls with functional ingredients has a number of useful properties for the human body and may be recommended for gerodietetic food products.

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