Amino acid analysis of a semi-finished meat-containing product for gerodietic nutrition

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Abstract. In the gerodietic nutrition production technology there are a lot of questions that today remain unanswered. The development of recipe compositions that are fully balanced in terms of amino acids, macro- and microelements and vitamins based solely on the internal reserves of raw materials is a difficult task. As a result of our research we suggest the cutlet recipe with vitamins for gerodietic nutrition. The recipe composition includes chickpea flour, vegetables and amino acid additives - Amur grape seed flour. The proposed product meets the established requirements for gerodietic products.

1. Introduction
Meat products are in high demand among the population [1–5], so the development of new types of meat products is actual [6–10]. The assessment of compliance with the requirements for quality and safety of meat products is carried out in accordance with international rules and regulations [11–15]. Gerodietic foods should provide a functional and balanced diet. Such products for special purposes are intended for nutrition of various population groups and oriented at people’s age and degree of physical activity.

When designing food products, the gerodietic direction adheres to five main rules [16–18]:

- maximally balanced foods for the elderly;
- products or their complex aimed at maximum correction of nutrition;
- use of corrective nutritional supplements, both in the daily diet and a single meal;
- use of biologically active components to enhance certain properties of the product;
- products with directed action used to treat or prevent disease in the elderly.

In old age, metabolism in people decreases, and therefore, macro- and micronutrients, vitamins, antioxidants are vital in their diet in addition to the main components – proteins, fats and carbohydrates. Given the deterioration in the digestibility of many components associated with the aging of the body, food should be in the most accessible form for the body of the elderly people [19–21].
To provide elderly people with full-fledged nutrition, it is necessary to develop special products that are additionally enriched with all the necessary nutrients and microelements [22–26].

The aim of this work is to develop a model mincemeat of chopped semi-finished product with the addition of plant components based on amino acid balance.

2. Materials and methods

As a model system, minced cutlet meat was chosen. The composition included: veal of the 1st category, pre-hydrated chickpea flour, pearl barley (pre-washed and dried), chopped white cabbage, carrots, salt, spices and spices. Grape seed flour introduced as an antioxidant supplement [19].

Laboratory studies were carried out in accordance with the methods specified in the publication [24].

Production was carried out under the conditions of the “Agrobiotech Processing Research” and production complex at the Faculty of Processing Technologies. The preparation of recipe ingredients and mincemeat was made in accordance with general technological requirements. Mincemeat was made in a cutter; meat and vegetable raw materials were preliminarily grinded on a spinning top with a lattice diameter of 3 mm. During the mixing process, hydrated chickpea flour in a ratio of 20% was introduced into the cutlet mass. At the second stage, pre-soaked and chopped pearl barley and vegetable ingredients in a ratio of 27% were introduced into the cutlet mass, then salt and spices were added [18].

3. Results and discussion

In accordance with the norms and requirements for the nutrition of older people, the optimal ratio of proteins, fats and carbohydrates in food should be 1 : 0,8 : 3,5 respectively. In the process of developing a new product for gerodiestic nutrition, the optimal ratio of meat raw materials, vegetable raw materials and chickpea flour is 39,75 : 20 : 21 respectively [20]. An antioxidant additive, Amur grape seed flour is added 2 g per 100 g of the finished product.

The model mincemeat is prepared by the following method.

At the first stage, veal meat is grinded on a spinning top with a diameter of 3 mm lattice holes and is sent to compile the model mincemeat. Water is supplied to the cutter to hydrate the flour at a temperature of 15–20 ºC. The chickpea flour is added to the cutter bowl and mixed together with the cutlet mass for 3–4 min. After that, we add to the cutlet mass the chopped pearl barley previously soaked and kept for 48 hours at a temperature of 14° C, and chopped white cabbage with carrots. At the last stage, an amino acid supplement is added – Amur grape seed flour. The cutlet mass is mixed for 4-6 minutes until a homogeneous consistency is obtained [21].

From the finished cutlet mass, cutlets 100 g are formed, breaded in crumbs and sent for freezing at temperatures from – 30 to – 35 ºC. After freezing, cutlets are packed and sent for sale.

In the proposed recipe composition, the main raw material is veal meat. This raw material is optimal in ratio of protein : fat [25, 26]. In basic amino acids, veal differs from the WHO/FAO scale (table 1), which necessitated the introduction of plant components in the product in order to correct the balance of amino acids in accordance with generally accepted standards [19].

| Table 1. Correspondence of the chemical and biochemical composition of veal scale WHO/FAO. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Index           | Contained in veal | Scale WHO/FAO   |                  |                  |                  |
| Tryptophan      | 0,25             | 1,00            |                  |                  |                  |
| Phenylalanine   | 0,79             | 6,00            |                  |                  |                  |
| Leucine         | 1,48             | 7,00            |                  |                  |                  |

One of the promising plant components in the chopped semi-finished products recipes is chickpea flour. The analysis of chickpea flour showed that the content of essential amino acids in 100 g exceeds the standard indicators. These amino acids include leucine – 18%, valine – 10% and theonin – 4%.
Analysis of the chemical composition and nutritional value of chickpea flour has demonstrated the feasibility of introducing it into the composition of cutlets (figure 1).

Figure 1. Analysis of the biological value of chickpea flour.

Figure 2 shows the analysis of amino acids and plant components in the model mincemeat for gerodietic nutrition.

The analysis of the amino acid composition of the model mincemeat of the semi-finished products shown in Figure 2 showed a value very close value to the reference one. The predominant amino acids are methionine + cysteine – 164%, threonine – 153.33% and leucine – 144.71%.

Figure 3 shows the finished product in different shapes.
Figure 3. Semi-finished product shape options.

4. Conclusion
The addition of plant components helps to establish the amino acid composition balance in the finished product. The introduction of chickpea flour in a ratio of 1:0.5 in relation to raw meat, composed with vegetables and amino acid additives (Amur grape seed flour) makes the proposed cutlets a maximally balanced food meeting the established requirements for gerodietic nutrition.

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