Innovative approach to combined healthy food

E N Tretyakova, A G Necheporuk, V A Babushkin, I B Kirina, A G Pershikova
Michurinsk State Agrarian University, 101, International st., Michurinsk, 393760, Russia
E-mail: telena303@mail.ru

Abstract. The paper analyzes the possibility of not only expanding the range of healthy food products, but also reducing its cost due to the combination of natural animal and plant raw materials. The possibility of introducing an innovative approach to the creation of products aimed at healthy nutrition was considered. It was found that the inclusion of plant additives into traditional meat-containing products will not only contribute to high quality products, but also products with increased nutritional and biological value. It was proved that the inclusion of plant ingredients ensures products with functional properties, high physicochemical and organoleptic indices. It was revealed that the proposed technological scheme and formula of a new type of meat-containing semi-product in dough with the introduction of vegetal raw materials will make the product more functional. The obtained results showed that the inclusion of wheat bran, nettle and onions in minced white meat will make it possible to enrich the product with essential nutrients. The obtained results of the study show that the combination of natural and plant raw materials makes it possible to obtain a product with high quality at a low cost aimed at improving the health of large population groups.

1. Introduction
Currently, the technology of storing and processing agricultural products in Russia is based on advanced research methods. Plant and animal raw materials are stored in fresh, unprocessed form without suppressing biological processes. For longer storage of raw materials it is possible to use artificial retardation of anabiotic processes by freezing, salting, drying, etc. [1-3]. In this regard, food producers obtain high-quality raw materials later used for food production.

However, at present, most food producers prefer the production of cheap products using additives of a mainly chemical nature, while the quality of products is sidelined, which, in turn, has a negative impact on human immunity, and as a result on the general health of large population groups [2-5].

Besides, the modern pace of life dictates the need to reduce cooking time, and thereby provoking the consumption of ever growing number of different prefabricated products. The assortment minimum presented on the market does not always meet the requirements of healthy nutrition.

In this regard, the scientific justification of technological principles for the development of food products balanced in composition, including prefabricated products, which, in turn, will allow not only combining animal and plant raw materials, but also specifically regulating their functional properties, becomes especially relevant. The analysis of the presented assortment minimum and focus on the consumer preference of the population justifies that the creation of combined food products of high
quality, nutrient adequacy, extended shelf life will not only be in high demand among the population, but also contribute to health promotion [1, 3, 6].

In this regard, a new type of competitive prefabricated meat-containing products in dough obtained by combining meat and vegetable raw materials, in particular white poultry meat, wheat bran, nettle and onions, was developed on the basis of the training and research laboratory of functional food products Michurinsk State Agrarian University.

The inclusion of plant ingredients in the dough of traditional prefabricated meat-containing products will reduce caloric content, enrich it with essential nutrients, as well as make the product more functional [7].

Poultry white meat has high taste qualities, is considered a dietary product, which contains complete animal protein and lipids with a high level of essential fatty acids. B vitamins predominate among other vitamins, vitamin A is also contained. Micro- and macroelements, which are found in poultry meat in significant quantities, include phosphorus, potassium, sodium, calcium, magnesium, copper, manganese and zinc.

Wheat bran is a valuable food product that brings a large amount of dietary fiber, vitamins B, E, PP, carotene, microelements (zinc, chromium, selenium, potassium and magnesium salts, copper, etc.) to the human body [3, 4].

Nettle is a valuable multivitamin plant, a natural concentrate of vitamins. It contains almost all vitamins, many microelements, organic acids, as well as phytoncides and tannins. Nettle is rich in biologically active substances such as glycoside, urticine, flavonides and phenolic acids [8].

Onion is the source of many biologically active substances (vitamins, mineral nutrients, etc.).

The purpose of the study is to expand the range of healthy foods with biological and nutritional value, enriched with essential nutrients.

2. Materials and methods
The methodology of the study is based on scientific provisions set forth in research works of domestic and foreign authors [8-10]. The experimental work utilized research methods using modern certified equipment.

3. Results of the study to determine the optimal formula
The technology and the formula of a new type of product for healthy nutrition was developed and formulated. The cooking technology includes the following operations: preparation of flour, egg products, dough, meat raw materials, wheat bran, nettle, onions, mince, molding of prefabricated products, freezing, grinding.

A mince formula of a new type of prefabricated meat-containing product in dough with optimal dosage of additives was developed (Table 1).

| Components                   | Amount, g |
|------------------------------|-----------|
| Poultry white meat           | 377.5     |
| Bulb onion                   | 48        |
| Wheat bran                   | 100       |
| Nettle                       | 20        |
| Ground black pepper          | 0.5       |
| Salt                         | 9         |
| Sugar                        | 1         |
| Eggs                         | 20        |

Raw materials of white poultry meat were ground on a meat grinder with a diameter of 3 mm to prepare a minced mixture. Then a mixture of bulb onions, wheat bran, nettle, pepper, salt and sugar
was added. Eggs were also added. Ground meat raw materials and all prepared vegetable components were added to a mixer to prepare a mince formula.

According to the developed technology and formula, an experimental batch of a new type of prefabricated meat-containing product in dough was developed, in which organoleptic and physicochemical quality indicators were determined.

**Table 2.** Organoleptical quality indicators of a new type of prefabricated meat-containing product in dough

| Indicator | Characteristics of finished products |
|-----------|-------------------------------------|
| Appearance and cutting view | Traditional prefabricated meat-containing products in dough | New type of prefabricated meat-containing products in dough |
| Shape, condition of the surface and when cut corresponding to this prefabricated product, taking into account the formula components | Shape, condition of the surface and when cut corresponding to this prefabricated product, taking into account the formula components, including spices, bran, nettle and onions |
| Taste and smell | Typical for this prefabricated product, taking into account the formula components |
| Color | Typical for the color of the prefabricated product of steak or crushed meat raw materials, taking into account the formula components |
| Typical for the color of white poultry meat, taking into account the formula components, including spices, bran, nettle and onions |

*The taste of the prefabricated product was evaluated after heat treatment*

**Table 3.** Physicochemical quality indicators of a new type of prefabricated meat-containing product in the dough

| Indicator | Characteristics of finished products |
|-----------|-------------------------------------|
| Protein weight fraction, %, not less than | Traditional prefabricated meat-containing products in dough | New type of prefabricated meat-containing products in dough |
| 5.0 | 7.0 |
| Fat weight fraction, %, not more than | 35 | 30 |
| Starch weight fraction, %, not more than | 6 | 3 |
| Sodium chloride weight fraction, %, not more than | 1.8 | 1.8 |

The data show that according to organoleptic quality indicators, a new type of prefabricated meat-containing product in dough meets the requirements of GOST 32951-2014. “Meat and meat-containing prefabricated products. General Specifications”.

To justify the possibility of using a new type of prefabricated meat-containing product in dough in a healthy diet, we determined and evaluated its nutritional value and caloric content (Table 4).

The analysis of the nutritional value of a new type of prefabricated meat-containing product in dough showed an increase in protein content by 19.8%, dietary fibers (fiber, pectin) – by 6.5 times, reduced fat content – 7.2 g. A positive aspect is the absence of starch in the composition. The energy value of the new product is 94.2 kcal. This may be explained by a decrease in fat and better digestibility of carbohydrates in the new product.
Table 4. Nutritional value and calorific content of a new type of prefabricated meat-containing product in dough (100 g of finished product)

| Indicators                                      | Satisfaction level, % of adequate daily consumption | Norms of physiological need for foodstuff |
|------------------------------------------------|-----------------------------------------------------|------------------------------------------|
|                                                  | Traditional prefabricated meat-containing products in dough | New type of prefabricated meat-containing products in dough |
| Protein                                         | 14.36                                               | 19.8                                     | 75                                      |
| Fat                                             | 4.5                                                 | 7.2                                      | 83                                      |
| Digestible carbohydrates, including starch       | 1.05                                                | 0.16                                     | 365                                     |
| Food fibers, including fiber and pectin          | 2.6                                                 | 14.4                                     | 18                                      |
|                                                  | 1.3                                                 | 65                                       | 2                                       |
| Vitamin B1, mg                                   | 0.01                                                | 0.7                                      | 1.5                                     |
| Vitamin C, mg                                    | 2.6                                                 | 3.7                                      | 70                                      |
| Potassium, mg                                    | 29.8                                                | 0.85                                     | 3500                                    |
| Calcium, mg                                      | 16.4                                                | 1.6                                      | 1000                                    |
| Phosphorus, mg                                   | 44.8                                                | 11.2                                     | 400                                     |
| Copper, mg                                       | 0.6                                                 | 5.0                                      | 12                                      |
| Caloric content, kcal                            | 102.15                                              | 94.2                                     | 2500                                    |

4. Conclusion
Thus, the creation of a new type of prefabricated meat-containing product in dough allows increasing the biological and nutritional value of the product, improving organoleptic and physicochemical parameters of the finished product quality, increasing the product storage time and expanding the range of meat products aimed at healthy nutrition of the population.

References
[1] Suhareva T N, Sergienko I V 2020 Projecting of functional structure of fish product IOP Conference Series: Earth and Environmental Science 422(1) 012055
[2]Perfilova O V, Babushkin V A, Bryksina K V 2020 The effect of microwave heating of fruit and vegetable raw materials on the water-soluble antioxidants content Journal of Physics: Conference Series 1679(4) 042055
[3] Krasnikova E S, Krasnikov A V, Babushkin V A 2020 The influence of composite flour mixtures on Saccharomyces cerevisiae biotechnological properties and bread quality IOP Conference Series: Earth and Environmental Science 421(2) 022008
[4] Martins V, Alves M R, Pinheiro R 2021 Analysis of microstructure and texture of gluten- and lactose-free cereal bars, produced with different hydrocolloids and drying temperatures and no-added sugar Journal of Food Processing and Preservation 45(4) e15238
[5] Planes-Muñoz D, Frontela-Saset C, Ros-Berruezo G, López-Nicolás R 2021 Effect of gazpacho, hummus and ajoblanco on satiety and appetite in adult humans: A randomised crossover study Foods 10(3) 606
[6] Glanz K, Metcalfe J J, Folt A S C, Brown A, Fiese B 2021 Diet and health benefits associated with in-home eating and sharing meals at home: A systematic review International Journal of Environmental Research and Public Health 18(4) 1577, 1-20
[7] Luo J, Si H, Jia Z, Liu D 2021 Dietary anti-aging polyphenols and potential mechanisms Antioxidants 10(2) 283, 1-20
[8] Campos M, Pomeroy J, Mays M H, Lopez A, Palacios C 2020 Intervention to promote physical activation and improve sleep and response feeding in infants for preventing obesity early in life, the baby-act trial: Rationale and design Contemporary Clinical Trials 99 106185

[9] Blinnikova O M, Babushkin V A, Akindinov V V,Perfilova O V, Novikova I M 2020 Production technology and mathematical method for modeling the formulation of fruit and jelly candies enriched with collagen IOP Conference Series: Materials Science and Engineering 919(5) 052036

[10] Suhareva T, Sergienko I, Kutsova A, Ratushny A 2019 Mathematical planning when choosing rational dosages of ingredients for adjusting the composition of bakery products International Journal of Engineering and Advanced Technology 8(6) 4562-4565