Development of enriched meat and vegetable semi-finished products chopped in a shell

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Abstract. The article considers the issue of expanding the assortment line of semi-finished products in the shell by introducing plant materials into the recipe. According to the principles of food combinatorics, the formulation and technology for the production of semi-finished products have been developed, the positive effect of the introduced plant components on the organoleptic and physico-chemical characteristics of the chopped semi-finished products has been proved, and the functional orientation of the resulting product has also been proved.

1. Introduction

According to the Federal State Statistics Service, the volume of production of minced meat products chopped increases every year. The growth dynamics of the output of this type of product in the period from 2008-2018 is presented in figure 1.

Figure 1. Dynamics of production volumes of meat semi-finished products for 2008-2018.
Such a rapid increase in production volumes is directly related to an increase in demand for this type of product and, consequently, to an increase in consumption volumes. Over the specified time period, the output of processed meat products chopped increased almost 10 times.

The meat industry in Russia includes more than 800 combines, workshops, catering enterprises that process meat. The main largest Russian producers of minced meat semi-finished products are located in the Central District of the Russian Federation, producing, respectively, a large part of the volume of semi-finished products [1]. The Siberian Federal District is also a leader (figure 2).

Figure 2. Shares of federal districts for the production of meat products.

A significant share of all types of processed meat products is chilled and frozen - about 70%. Such a large productive of this type of product is determined by large volumes of production, as well as significance as the main source of necessary nutrients. Chopped semi-finished products are considered to be in demand on the Russian market, as they are an excellent example of value for money, convenient to prepare, and represented by a large selection of assortment lines.

The implementation of agricultural development programs, as well as the healthy nutrition policy set out in the Food Security Doctrine, contribute to a dynamic increase in the production of minced meat products. That is why today manufacturers are trying to produce products enriched with the necessary macro- and micronutrients, products of a functional orientation. To achieve these goals, you can use local regional plant materials [2].

It is especially important for urban residents to consume foods that are enriched with vitamins and minerals and have high biological and nutritional values. Consumer demand for chopped semi-finished products is constantly growing, the need to create functional enriched food products is becoming obvious, so one of the main tasks of meat food producers is to expand the assortment of new types of products using various plant components.

The aim of this work was the development of new chopped semi-finished products enriched with the necessary components through the inclusion of plant components in the recipe. To achieve this goal, the following tasks were completed: marketing research of the market of minced meat and vegetable products chopped; investigation of organoleptic and physicochemical characteristics of chopped functional foods

2. Materials and research methods
Semi-finished products chopped in a shell (kapat), manufactured according to TU 9214-001-75238481-09, were used as objects of research, a control sample, and semi-finished products chopped in a shell,
made according to TU, with the addition of plant components, a prototype. All raw materials used for the manufacture of control and prototype kupat products met the requirements of TR TS 021/2011 “On food safety”.

Empirically, it was found that the optimal amount of plant ingredients introduced into the experimental sample is 7% of pumpkin pulp and 7% of hydrated rosehip flour [3]. Organoleptic evaluation of the samples was carried out using a point-based evaluation method. According to the results of the assessment, profilograms of taste, smell and a general profilogram of organoleptic characteristics were compiled.

The physicochemical parameters of the samples were determined using well-known and generally accepted methods — the mass fraction of protein was determined according to GOST 25011-81, the mass fraction of moisture was GOST 9793-74, the mass fraction of fat was GOST 23042-86, and the mass fraction of carbohydrates was GOST 31470-2012, mass fraction of ascorbic acid - GOST R 55482-2013.

3. Research results

In the course of research conducted in the field of marketing of the market for minced meat and processed foods enriched with necessary nutrients, we can conclude that there is no such product in the retail trade, which indicates that the development of meat and vegetable semi-finished products of chopped functional orientation is considered relevant.

After determining the relevance of the development, it was experimentally determined the optimal amount of plant ingredients to be added to the kupat recipe - 7% pumpkin pulp and 7% flour from rose hips (table 1) [4]. The organoleptic characteristics of the control and experimental samples were evaluated, the results are presented in table 2. Also, on the basis of the obtained estimates, profilograms of smell and taste, as well as the general profilogram of organoleptic indicators were constructed (figure 3) [5].

Table 1. Recipe for meat and vegetable semi-finished products chopped in a shell, kg per 100 kg of raw materials.

| Component            | Weight, kg |
|----------------------|------------|
| Fat pork             | 85         |
| Onion                | 13         |
| Garlic               | 2          |
| Vinegar 9%           | 3          |
| Salt                 | 1.5        |
| Black pepper         | 0.5        |
| Pumpkin pulp         | 7          |
| Dog rose fruit       | 7          |
| Water                | 3.5        |

Table 2. Organoleptic characteristics of the developed samples of semi-finished products.

| Indicator        | For experienced sample | For controlled sample |
|------------------|------------------------|-----------------------|
| Appearance       | crushed homogeneous mass without bones, cartilage, tendons, rough connective tissue, blood clots and films, evenly mixed | minced meat is well mixed, homogeneous mass with inclusion of re-ingredients |
| Sectional view   | minced meat is well mixed, homogeneous mass | minced meat is well mixed, homogeneous mass |
| Color            | Gray pink with orange inclusions | Gray pink |
| Smell            | with aroma of vinegar, meat, odorless | |
| Taste            | meaty, brackish, without extraneous flavors | |
Figure 3. Profilograms of organoleptic characteristics of the control and prototypes: 1 - profilogram of taste; 2 - profilogram of a smell; 3 - profilogram of the general organoleptic assessment.

The next step was the conduct of physico-chemical studies of the indicators of the control and experimental samples of chopped semi-finished products. The research results are presented in table 3.

Table 3. Physico-chemical characteristics of the semi-finished products chopped in the shell.

| Name of ingredient                  | Actual value of indicators | Controlled sample | Experienced sample |
|-------------------------------------|----------------------------|-------------------|--------------------|
| Mass fraction of carbohydrates in terms of glucose, % | 5.2±0.7                  | 56.2±0.2          | 15.9±0.1           |
| Mass fraction of fat, %             | 24.3±0.1                  | 10.9±0.3          | 64.2±0.2           |
| Mass fraction of moisture, %        | 56.2±0.2                  | 10.9±0.3          | 64.2±0.2           |
| Mass fraction of protein, %         | 15.9±0.1                  | 11.2±0.3          | 64.2±0.2           |

According to the table, it is obvious that in the experimental sample, kupat has a higher moisture content, a lower proportion of fat, carbohydrates are present. The introduction of plant components in the recipes of kupat contributed to the enrichment of the product with carbohydrates, which are necessary for the normal functioning of the human digestive system, increased moisture, which gives juiciness to the semi-finished products, and also reduced lipid content [6]. In addition, the prototype kupat contains in its composition vitamin C in an amount that gives the product a functional focus. The amount of vitamin was determined in kupat raw and ready-made, brought to culinary readiness by roasting. The obtained value of the vitamin C content in the test product is explained by the fact that the
presence of vinegar favorably affects the preservation of ascorbic acid when exposed to heat treatment, which in turn prevents the conversion of ascorbic acid to dehydroascorbic acid under the influence of high temperatures [7, 8].

4. Conclusion

Studies on the technological aspects of the use of such vegetable raw materials as pumpkin and dogrose in the recipes of kupat prove the positive effect of introducing these ingredients into the composition of chopped semi-finished products. Thus, the resulting meat and vegetable semi-finished products have increased nutritional and biological values, are a product of a functional orientation due to the presence of vitamin C, and have better organoleptic characteristics. And also due to the fact that pumpkin and dogrose are regional products of the Volgograd region, their use in the production of kupat contributes to the solution of import substitution and the involvement of regional resources.

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