Ingredients and Technical Parameters of a New Type of Semi-Finished Meat Containing Dutch Cabbages

Anna Dashtoyan[ID]
Armenian National Agrarian University

Yana Baluyants[ID]
"Bacon Product" LLC

Lilit Hovsepyan[ID]
Armenian National Agrarian University

annad-1976@mail.ru, bal.yana@mail.ru, lilit-hovsepyan-01@mail.ru

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ABSTRACT

Increasing demand for semi-finished meat has led manufacturers to increase production volumes, renewing and modernizing their assortments in parallel. Technologies and recipes for semi-finished products production are known, in which animal and vegetable raw materials are combined. In addition, it contributes to the rational use of raw materials, the provision of quality food, and the improvement of technical and economic indicators. As a dietary raw material, white cabbage is an effective raw material to use in the production of semi-finished products.

Introduction

Slaughtered animals and birds are considered valuable food products. As a result, it contains almost all of the nutrients the human body needs to function normally. The human body can completely assimilate meat proteins, unlike vegetable proteins. Meat's total protein content does not fully describe its nutritional value, since different parts of meat contain incomplete and complete proteins in varying proportions. Raw materials of plant origin are increasing in meat products for this reason (Antipova and Zherebtsov, 1991). The quality of meat products decreased along with the increase in meat products. This may be due to the increase in meat raw materials prices and the shortage.

The purpose of this research is to find a solution to this problem. It is based on the development of the recipe and production technological parameters of a new type of semi-finished meat, with the partial replacement of meat raw materials with plant raw materials.

We were interested in using white cabbage in the production of vegetable semi-finished products, specifically cutlets, after studying various research works. Because cabbage has such high quality and useful properties, we concluded that its use will be more effective in producing meat semi-finished products (www.xcook.info).

Besides being rich in minerals and vitamins, cabbage contains 87 % water, 3.9 % sugars, 3.3 % nitrogenous

substances, 1.2 % fiber, and 35-50 mg/% aspartic acid. Vitamin *C* is naturally found in cabbage. There are more of these valuable compounds in cabbage than in subtropical lemons and oranges. Cabbage is also an excellent source of *B, P,* and *K* vitamins. As well as sulfur, calcium, potassium, and phosphorus, cabbage contains a bactericidal enzyme called lysozyme.

Cabbage is also rich in phytoncides, and due to its low carbohydrate content, it is a great food for diabetics. The protein content of cabbage is higher than that of carrots and beets. Amino acids (threonine, lysine, methionine) are found in cabbage proteins, which help regenerate and grow tissues, stimulate hematopoiesis, improve thyroid gland function, stimulate kidney and adrenal gland function, and solve and remove foreign proteins that are harmful to the body. In cabbage, there is almost no starch, and the sugar content is low, which makes it suitable for diabetics (www.Fitaudit.ru; www.syl.ru).

Material and methods

It is the objective of this research to develop the technical parameters for producing semi-finished meat with white cabbage, to determine the composition, to calculate the cost of a new type of semi-finished product, to determine the right amount of cabbage to add, and to examine the finished product from a sensory and physicochemical perspective. Sensory and physicochemical research determines cabbage's effects on semi-finished products, technological processes, and the quality of finished products.

The test samples were prepared, tasted, and analyzed in the laboratory by "Bacon Product" LLC. The samples were prepared with the same technological process, with partial substitution of meat raw materials. In three samples, raw meat was partially replaced by white cabbage in the following proportions:

1. Adding 6 kg of white cabbage per 100 kg of raw material

2. Adding 8 kg of white cabbage per 100 kg of raw material

3. Adding 10 kg of white cabbage per 100 kg of raw material

The ingredient was tested for sensory and physicochemical effectiveness. As a test sample, the "homemade" cutlet was prepared according to GOST 32951-2014 (technical regulation of the EEU Customs Union 034 on meat and meat products safety). These studies led to the selection of the options with the highest positive indicators.

Table 1 shows an increase of 8 kg in white cabbage. Due to the mass, the moisture in the product reaches 74.8 %, the minced meat is homogeneous (typical of minced beef for cutlets), and the taste and smell are well expressed.

Table 1. Sensory and physicochemical parameters of cutlets influenced by white cabbage amounts

Raw material type	Quantity %	Moisture %	Sensory evaluation
Dutch cabbage	6	72.9	Taste and smell correspond to the cutlet›s taste and smell, homogeneous consistency (typical of patty mince), characteristic color
Dutch cabbage	8	74.8	Well-defined taste, well-defined cutlet characteristic smell, homogeneous fine consistency (characteristic of cutlet mince), characteristic color
Dutch cabbage	10	75.6	Weak flavor, poor smell, a non-homogeneous consistency, and a lighter color

*Composed by authors.

As a result of adding 6 kg of white cabbage, version 1 mince was homogenous, tasted and smelled well, and had a moisture content of 72.9 %. As a result, there have been almost no changes observed compared to the control sample, there are almost no changes observed. This allows us to conclude that partial meat raw materials replacement is not appropriate in this case. As a result of the third version, the minced meat had a faint meat taste, the cabbage taste was dominant, a slightly bitter aftertaste, a weak odor, a non-homogeneous consistency (unusually for minced meat used for cutlets), a lighter color, and 75.6 % moisture content.

Table 2. The ingredients of check and test samples*

Names of raw and main materials	Test sample.kg	Check sample. g
2nd type of without-tendon meat	34	43
Semi-fatty pork meat	34	45
Cellulose	12	-
White cabbage	8	-
Breadcrumbs	6	6
Salt	1.5	1.5
Black pepper	0.03	0.06
Onion	4	4
Egg	2	2

*Composed by the authors.

Table 2 shows that white cabbage with a mass of 8 kg per 100 kg of raw material was the optimal criterion. As a result of adding white cabbage to test samples, excess water was created, resulting in poor quality. As a precaution, we added a highly water-absorbent component. So in this case, fiber was decided upon as it has water-binding properties and is common in the production of meat semi-finished products (Zabashta, et.al, 2001). After the mincemeat had been prepared, it was shaped, arranged in boxes, and frozen.

The cutlets can be stored for 1 month at -10 ^{0}C (Araksyants et al., 2005; Irkitova, 2017). It is therefore possible to make a new type of cutlet with white cabbage using fiber, as shown in the table. As with all meat products, cutlet recipes were also given per 100 kilograms of raw material.

parts of the batch, depending on the volume of the semi-finished product, in the following quantities: 3 units (up to 10-unit packs), 5 (11 to 100 unit packs), 10 (101 to 1000 unit packs), etc. 10 samples of semi-finished products are taken from these packages for physicochemical tests (Hambardzumyan, 2008; Senchenko, 2001). Lab tests were performed at "Bacon Product" LLC, and the results are presented in the Table 4.

Because the test sample had a high moisture content, the semi-finished product became more delicate, and the low-fat content made it easier to digest (Table 5). The amount of fats and proteins and the amount of energy they release are the most important indicators of a food's nutritional value (Senchenko, 2001).

Table 3. Production parameters for white cabbage cutlets*

Parameter name	Index
Raw material acceptance	12-16ºC
Cutting	0,5-1 kg
Remove bones and tendons	10-16ºC
Grinding with a meat grinder	10-16 mm
Cabbage shredding	8 kg
Cellulose preparation	12 kg
Minced meat preparation	10-15 ^{0}C, 7-10 minute
Shaped into patties, Coating with breadcrumbs	75-100 gr
Storage, packaging	-10, -11 ^{0}C, 1 month

*Composed by the authors.

The control sample contains 10 kg more meat raw material than the experimental sample, as shown in Table 3. Consequently, the consumer will benefit from a product richer in carbohydrates and vitamins due to its partial replacement with white cabbage, which will reduce the cost of the finished product. It is possible to determine technological parameters for producing fiber-rich cutlets after studying all the changes and results.

Results and Discussions

The semi-finished products were assessed using an average sample. Sampling is performed from different

Table 4. Control and test cutlets' sensory indicators*

Index name	Check sample	Test sample
Product appearance	Shaped and coated with breadcrumbs, no cracks	
The taste	After roasting, the flavor of onions was evident, salty	After roasting, it was delicate, slightly pronounced taste, salty
The smell	characteristic of a given type of semi-finished product	delicately expressed, characteristic of a given type of semi-finished product
Consistency	Thick consistency, a bit of a stretchy	Thick, tender, juicy

Table 5. Physicochemical indicators of check and test cutlets*

Index name	Check sample. %	Test sample. %
Moisture	64.84	74.8
Fat content	15.3	10.6
Minerals (including salt)	1.6	1.8
Salt	1.91	1.68
Protein content	16.35	11.12

*Composed by the authors.

Table 6 shows that 100 grams of our cutlet with fiber and white cabbage contain 178.28 kcal of energy, while 100 grams of the control contain 203.1 kcal. In addition to the

ease of digestion of the new type of cutlet prepared by us, the addition of fiber and white cabbage also contributes to the cutlet's carbohydrate content. Taking into account the finished product output, raw materials and auxiliary materials must first be calculated for meat semi-finished products. Since the addition of fiber leads to an increase in the finished product yield, it is necessary to perform a raw material calculation.

According to the calculation, one kilogram of cutlets with white cabbage will cost 133.5 AMD. The test sample cost AMD 1786.4 per 1 kg. White cabbage was used in the experimental sample in place of expensive meat raw materials, which explains the low cost of 1 kg of the sample at 451.33 drams.

Table 6. Energy value of fiber cutlets*

Index name	Check sample	Test sample
Protein content, %	16.35	11.12
Fat, %	15.3	10.6
Carbohydrates. %	-	9.6
Energy value, kCal	203.1	178.28

Table 7. Calculation of check and test sample cost*

Names of raw and main materials	Test sample, kg	Cost, 1000 AMD	Check sample, kg	Cost, 1000 AMD
2nd type of without-tendon meat	29.82	65.6	43	94.6
Semi-fatty pork meat	29.82	53.68	45	81
Cellulose	10.52	10.52	-	-
White cabbage	7.01	1.05	-	-
Breadcrumbs	5.26	0.79	6	0.9
Salt	1.32	0.13	1.5	0.15
Black pepper	0.026	0.039	0.06	0.09
Onion	3.75	0.5	4	0.6
Egg	1.75	1.2	2	1.3
Total cost, AMD		133.2		178.64

*Composed by the authors.

Conclusion

There is a need to control not only the receipt and preservation of meat raw materials in factories to obtain high-quality meat raw materials, but also the correct maintenance of technological processes, the condition of production equipment, and the composition of new products to ensure meat raw materials are safe and high-quality.

Based on the scientific work, we can conclude:

The recipe for a novel semi-finished product was developed, in which meat raw materials were partially replaced by vegetables, which have high-quality characteristics in comparison with the test sample. Sensory and physicochemical indicators were used to assess the quality of a newly developed semi-finished product; It contained 178.28 kcal of energy.

Based on the cost of check and test samples, it was proven that the new formulation reduced the cost per kilogram by 454.33 AMD. In light of the conclusions, it can be suggested that: To provide consumers with high-quality and easy-to-use food and to enhance the efficiency of meat processing organizations, this novel type of semi-finished product needs to be produced.

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Declarations of interest

The authors declare no conflict of interest concerning the research, authorship, and/or publication of this article.