eISSN: 09748369

Formulation and development of production technology of meat products – therapeutic cutlets

Biology and Medicine

Short Communication

Volume 7, Issue 1, Article ID: BM-062-15, 2015

Indexed by Scopus (Elsevier)

www.biolmedonline.com

Formulation and development of production technology of meat products – therapeutic cutlets

Isayeva Kuralay Smetkanovna*, Kazhibaeva Galiya Tuleuevna
S. Toraighyrov Pavlodar State University, Lomova Street, 64, 140000, Pavlodar, The Republic of Kazakhstan.

***Corresponding author**

Citation: Smetkanovna IK, Tuleuevna KG (2015) Formulation and development of production technology of meat products – therapeutic cutlets. Biol Med 7(1), Article ID: BM-062-15, 5 pages.

Received: 24th Dec 2014; Accepted: 8th Jan 2015; Published: XX XXX 2015

Abstract
This article reviews the issues of development of competitive food products, in particular semi-finished cutlets, meat-based with adjustable, predetermined characteristics of food and biological value, enriched with functional ingredients that have a positive effect on the individual functions of the body or the body as a whole. The data on the theoretical, experimental studies on the optimization of the composition of meat products and a comprehensive assessment of the quality of semi-finished meat on the physico-chemical, microbiological, and organoleptic characteristics are provided; the formulation of new kinds of meat and fish products is optimized.

Keywords: Meat; vegetable raw materials; therapeutic food products; functional nutrition; meat cutlets.

Introduction

Solving the problem of reducing morbidity caused by adverse environmental conditions in RK is possible in two directions: improvement of the environment and the creation of new functional food products that allow to correct the nutritional status by neutralizing the harmful effects of the environment.

From this perspective, the creation of multicomponent functional products is an urgent task that has ecological, scientific, and social importance for the population of the RK. Functional orientation of new products is mainly provided by introduction of additional sources of protein of animal and vegetable origin with radioprotective properties into the formulation.

Currently, functional food products make up less than 3% of all known food products. According to the forecasts, their share will reach 30-50% of the total food market in the coming decades. Functional drinks managed to gain serious credibility in the market – 48%, bakery products – 27%, and dairy products – 6%. Market segment of functional meat products is underdeveloped today, which is due to the peculiarities of their production technology [1,2].

In contrast to the rational or balanced diet advocated by nutritionists of past years, functional nutrition takes into account not only (or even mainly) the nutritional value of the products (the presence of fats, proteins, and carbohydrates), but rather their functionality (utility) or biological value [3,4].

Research methods

According to the experiment, it involved the study of set of qualitative and safety indicators using standard methods to obtain information about the composition and properties of the objects of study.

The research involved the study of change of bioactive substances (proteins, fats, carbohydrates, and minerals), before and after the heat treatment of the product.

To evaluate the composition and properties of the objects, the following indicators were defined:

Organoleptic estimation was determined according to GOST 9959-91: appearance, smell, texture, color, and taste.

The samples of finished goods presented at the tasting are valued by the Tasting Commission at a five-point system.

The moisture content in the product was determined by drying the batch weight to a constant weight in an oven at a temperature of 100-105° C.

pH of raw materials was defined using a pH-meter, according to ST RK "Meat and meat products. Determination of pH. Reference method" ST RK ISO 2917 – 2009.

Ash (mineral matter) content was determined by using accelerated method with magnesium acetate.

In view of the fact that influence of harmful environmental factors in ecologically unfavorable regions is accompanied by severe metabolic disorders resulting in a deficiency of micronutrients in the diet in the human body, such as vitamins (C, P, PP, A, E, B, and others), individual macro- and micronutrients (calcium, magnesium, zinc, selenium, iodine), dietary fiber, essential amino acids, and other compounds, the task was to develop new functional therapeutic food products. The therapeutic nutrition aims to eliminate micronutrient deficiencies through the introduction of essential nutrients with radioprotective properties [5].

Dietary fiber is used in the meat industry in the production of all groups of meat products, namely all kinds of sausage products, including baby food products, canned, precooked and gourmet products [6].

In order to enrich the meat products with fiber, all groups of sources of dietary fiber are used, in particular natural foods rich in dietary fiber, secondary products of processing of vegetable raw materials and purified preparations of dietary fiber [7].

Use of processed grain products in the combined meat products technology can improve nutritional and biological value of the product, contributes to sustainable and equitable distribution of the ingredients, resulting in a product of consistent quality [8].

The easiest way to enrich the meat products with dietary fiber is use of natural foods rich in these functional ingredients in their production.

Starch-containing raw products are traditionally used in meat production: grains (wheat, rice, and barley) and wheat flour [9].

Preventative focus of recommended diets is achieved by inclusion into a set of products enriched with antioxidant vitamins. Functional focus of the product is mainly ensured by introduction into the formulation of dietary supplements (DS). One additional source of protein and DS is vegetable raw material. Combined products are created based on a combination of animal protein and vegetable protein [10].

Having analyzed the existing methods of enrichment of meat products, in particular chopped semi-finished products, we can conclude that one of the promising methods is to improve the technology of meat products due to their enrichment with dietary fiber, which has beneficial effects on the intestine, and reducing the cholesterol levels, which allows their use in the prevention and treatment of many diseases.

For further research of ready semi-finished meat cutlets "Homy" with the addition of millet, we should first study the qualitative characteristics of millet and other grains, as well as provide the comparative data on the study.

This is necessary to justify the use of millet as a source of fiber for the production of enriched semi-finished meat products (cutlets "Homy").

The comparison was made for grains produced in accordance with GOSTs: millet, rice, buckwheat, semolina, corn.

Comparative data are given in Table 1.

It can be concluded from the data of Table 1 that the qualitative performance of millet is superior to other grains. Millet is manufactured from switch grass, which is rich in minerals, such as potassium and magnesium. It is advisable to include millet porridge and soups with millet in diets of nutritional therapy for diseases of the cardiovascular system. Besides, millet has the bracing effect on the body, and it is believed that it promotes the excretion of antibiotics and toxins from the body.

Millet is one of the least allergenic grains. It is easily absorbed by the body, so it is suitable even for people with sensitive digestion.

When using millet as an additive to meat products, there is a positive change in the structure and consistency of the final product.

Based on these studies, the technology of therapeutic meat-based cutlets "Homy", containing millet as a vegetarian supplement, was developed.

The optimum amount of addition of shredded millet in a minced system was established experimentally – complete replacement of bread for shredded millet.

Various percentages of replacement of bread for shredded millet were considered – the

Table 1: Qualitative characteristics of grains (100 g).

Indicator	Millet	Rice	Buckwheat	Semolina	Corn
Purity (%)	99.20	98.20	99.20	98.80	98.60
Moistness (%)	14.00	15.50	14.00	15.50	14.00
Cooking property (min)	0.80	1.00	1.20	0.90	1.50
Infestation	Not allowed				
CGB	Not allowed				
Minerals (%)	1.10	0.80	0.65	0.60	0.75
Vitamin B_1 (mg)	684.45	260.11	325.64	483.15	125.20
Vitamin B_2 (mg)	835.14	145.15	265.75	658.32	458.59
Fiber content (mg)	3076	1950	2085	1765	2100
The ability to remove toxins (carcinogens) (%)	78-80	65-67	50-55	45-50	55-60

replacement of 20% of bread, 50% of bread, and a total replacement of bread. Replacement of bread in an amount of 20% is impractical, because the required amount of fiber is insufficient in finished product, and consistency of the finished product is too friable and inhomogeneous, which is not typical for this kind of products.

Replacement of bread in an amount of 50% is also impractical because there is considerable flexibility and mince becomes "watery". This dramatically reduces the organoleptic characteristics of the product.

Based on the data in Table 2, we can conclude that at the complete replacement of bread for shredded millet, there is no significant difference between organoleptic indicators and there is a significant enrichment of the meat product with bioactive substances (vitamins, minerals, dietary fiber) compared with cutlets "Homy" produced by traditional recipe.

Manufacturing process: preparation of raw meat, preparation of vegetarian supplement, preparation of onion, preparation of crackers and salt, making mince, forming, cooling, or freezing.

Chilled or frozen raw material is used for the manufacture of cutlets. Beef of grades 1 and 2 in the ratio of 40% and 60%, respectively, is used as the raw material.

After grinding the frozen meat blocks, the raw meat is sent to a spinning top with diameter of lattice holes of 2-3 mm.

Fresh onion is peeled, washed with cold water and shredded at a spinning top with diameter of lattice holes of 2-3 mm.

At the preparation of minced meat for cutlets, the ingredients are weighed according to the recipe.

When comparing the cutlets "Homy" made by the traditional recipe, cutlets "Homy" with the addition of cranberry pulp, and cutlets "Homy" (No. MPK A23L1/317 – Method of producing meat cutlets) with the addition of millet, no significant fluctuations in the mass fraction of moisture occurs.

When determining the protein content in the cutlets "Homy" with addition of shredded millet by the method described above, we got a value equal to 11.10 g per 100 g of product. The prototype had this value as 10.50 g per 100 g of product, the analog – 8.76 g per 100 g of product. As can be seen, the protein content increased in comparison with the analog (since it includes cranberry pulp,

Table 2: Comparison of organoleptic characteristics.

Organoleptic characteristics	Prototype (traditional recipe)	Analog (with the addition of cranberry pulp)	Sample (50% replacement of bread for shredded millet)	Sample (total replacement of bread for shredded millet)
Appearance	The surface is clean, uncracked	The surface is clean, uncracked	The surface is clean, uncracked	The surface is clean, uncracked
Shape	Oval, valid	Oval	Oval	Oval
Consistency	Solid	Soft	Watery	Soft, homogeneous
Smell and taste	Without odd tastes and smells	Specific taste	Without odd tastes and smells	Without odd tastes and smells
Outcome (%)	100	103 ± 2	103 ± 1	103 ± 3

and the content of proteins is insignificant, which leads to a decrease in protein content in the ready product), which is a positive result, since delivery of the protein to the body is vital.

When determining the fiber content in the cutlets "Homy" with addition of shredded millet in the manner specified above, the content was determined equal to 400.03 mg per 100 g of product. No fiber content was found in the prototype, and nor it was in the analog.

Fiber content found at cutlets "Homy" with the addition of millet at the use of 100 g of product covers 1/6 of the daily range required by the body. From this, we can conclude that the goal set out above is achieved, since the product obtained with the addition of millet is enriched with fiber.

In addition, the content of vitamins B_1 and B_2 was determined in the semi-finished meat. The content of vitamin B_1 in the cutlets "Homy" with the addition of shredded millet was 368.01 mg per 100 g of product, in the prototype – 215.33 mg, in the analog – 10.12 mg. The content of vitamin B_2 in cutlets "Homy" with the addition of shredded millet was 130.01 mg per 100 g of product, in the prototype – 103.33 mg, in the analog – 90.01 mg. As can be seen, the content of B vitamins in the sample is significantly higher than that in the prototype and analog, which also is important for a nutritive value of products.

The content of vitamins B_1 and B_2 significantly increased in cutlets with addition of millet, and the fiber content was 400.03 mg per 100 g of product. As for characteristics such as organoleptic, content of fat, protein, carbohydrates, calories, ash, and moisture, they do not differ much from the prototype and analog. Based on all the data, we can conclude that the production of cutlets with the addition of shredded millet would be more appropriate, as this product is rich in vitamins and fiber, which has a positive effect on the cardiovascular system and helps eliminate carcinogens from the body.

The sample contains all essential amino acids, and some (methionine, tryptophan, leucine) are much higher than the control. The results of the amino acid score prove the high biological value of the new product.

In humans, the daily requirement of vitamin should be: A – 450 mg, E – 7 mg, L – 10 g, B_1 – 0.8 mg, B_2 – 0.9 mg, B_6 – 0.9 mg, B_{12} – 1 mg, PP – 10 mg, C – 15. The contents of vitamins in the functional ingredients are listed in Table 12.

Thus, as a result of experimental studies on the basis of the data obtained, we concluded that the developed functional food products have the best chemical composition, the content of essential amino acids is significantly higher than the control, samples have the optimum ratio of fatty acids, are a good source of minerals. The developed functional products with radioprotective properties can be recommended for both mass and special, therapeutic nutrition.

Conclusions

The feasibility of developing functional food products, namely semi-meat cutlets, which improve health and reduce the risk of disease due to the presence in their composition of functional ingredients, was theoretically proved.

An analysis was carried out of the development of efficient, environmentally friendly products and improvement of the existing technologies with the use of vegetable raw materials in order to improve the output and quality of the finished product, and produce new functional products using the resource-saving technologies.

According to scientific experiments, they involved the study of qualitative and quantitative indicators of nutritional and biological value of the finished functional product, safety performance, with the use of standard and original methods to obtain information on the composition and properties of the objects of study.

The studies found that one of the promising methods is to improve the technology of meat products due to their enrichment with dietary fiber, which has beneficial effects on the intestine, and reducing the cholesterol levels, which allows their use in the prevention and treatment of many diseases.

Acknowledgment

This article was prepared as part of the research project funded by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan on the topic "Technology of meat and fish products."

References

1. Bazarnova YuG, Esaulov SV (2007) Ionized calcium in the composition of protein formulations that substitute meat. Meat Industry 12: 30-33.

2. Pryanishnikov VV (2011) Protein components in meat technology. Meat Industry 11: 34-36.

3. Pilate TL (2002) Types of nutrition and ways to optimize them. In the Proceedings of the VI International Symposium: Bioactive Food Supplements and Nutrition Optimization Problems, Sochi, pp. 215-217.

4. Glazova GV, Shilenok OI (2007) Characterization of functional properties of protein preparations. Meat Industry 3: 48-50.

5. Gyro TM, Chirkova OI (2007) Meat products with vegetarian ingredients for functional nutrition. Meat Industry 1: 43-46.

6. Derenzhi PV (2005) The latest biotechnology to improve the quality of food products. Food Industry 4: 25.

7. Martínez-Tomé M, Vera AM, Antonia Murcia M (2000) Improving the control of food production in catering establishments with particular reference to the safety of salads. Food Control 11(6): 437-445.

8. Tikhomirova NA (2007) Technology of Functional Food Products (2nd Edition, enlarged and revised), Moscow: Frantera, p. 246.

9. Schmidl MK (2005) International Trends in Functional Food Development/Opportunities and Challenges for Today's Global Food Industry. In the Proceedings of the Shanghai Symposium.

10. Isaeva KS (2004) Development of Technology for Use of Wheat Sprout in the Production of Spread, Thesis of a Candidate of Technical Sciences, Shakarim Semipalatinsk State University, Semipalatinsk.