ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Meat Loaf Processing Technology.

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ABSTRACT

The purpose of this study is to develop the technology of meat loaf with adding food protein additive. For production of food protein additive the neck and back parts with skin and bones of broiler carcass are used. The technology of meat loaf consist of meat preparation, chopping, salting, maturation, grinding; adding food protein supplement, mixing, adding of flavoring ingredients; formation, baking and cooling. The designed meat loaf has better sensory characteristics, increased product yield and higher nutritive value than the prototype.

Keywords: meat loaf, broiler, boning, technology, food protein additive

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ISSN: 0975-8585

INTRODUCTION

In terms of technology meat loaf is a meat product, made from the minced or chopped meat, which shaped like loaf of the bread. As the meat is a main ingredient for meat loaf preparing it can be used any variety of meat: pork, beef, veal, and lamb, deer or poultry meat. Chopped or minced meat is mixed with various fillings, such as boiled eggs, bakery products soaked in liquid (milk, water or red wine) [1, 2]

Meat loaf is a source of complete protein, fat, minerals and vitamins. During the production all nutrients necessary for developing and supporting the human body are preserved in meat loaf as far as possible [3].

For production of meat loaf is widely used as an ingredient the poultry or poultry meat by-products. Poultry is a dietary product and contains less fat and connective tissue in comparison with beef and pork and has more essential amino acids. The poultry ground mass is used as natural semi-finished products (poultry whole round, fillet with and without bone, ham, etc.). Also from the poultry meat is produced different kind of meat products: sausage (ham, boiled and half-smoked sausages, frankfurters, loafs), culinary products (cutlets, meat balls, pate, etc.), semi-finished products (natural and chopped), canned food (forcemeat, pate) and baby food [4, 5].

The analysis of the morphological structure of broilers shows that 6.08% of broiler carcass is neck piece, and 18.21% is back part. This part of carcass is not trimmed during the mechanical boning, and demands high labor cost and time during the hand boning. Usually these parts of carcass are realized to trade markets as the end cuts which are unprofitable for producer [4].

The boning process also influences to the chemical composition of broilers meat.

Table 1: Chemical composition of broilers meat with the type of boning

Broiler meat	Content, g/100g		
	protein	fat	moisture
Broiler meat of hand boning	23.1	5.2	71.7
Broiler meat of mechanical boning	13.2	14.4	65.0

From the table 1 it is estimated that the protein content had lowered down to 40% in the broiler meat of mechanical boning due to the kind of meat and used equipment [6] Moreover, pressing off the fat from the skin and bones lead to increasing the total fat content in the broiler meat of mechanical boning. Bone crushing is contributed to the transfer of bone marrow to the minced meat which contains heme pigments. This has resulted brighter color of broiler meat of mechanical boning comparing with the broiler meat of hand boning [7].

It is estimated that for 1000 ton of eviscerated poultry about 138.5 ton and in case of more careful trimming 273.5 ton of low value by-products is trimmed. This takes about 12% of the total mass of poultry, which contain 18-24% of proteins [8].

Poultry skin consists of connective and fat tissue. Due to the high content of subcutaneous fat, good cooking quality the poultry skin is a good ingredient for meat products [9].

Use of food protein additive from neck and back part of poultry carcasses together with bones has that advantage that the bone marrow contains fats, phosphatides, mineral and protein substances which are vital for human body. Poultry skin gives to the finished cooked product good flavor taste and promotes better utilization of product.

The purpose of this work is developing the technology of meat loaf with high nutritional value and improved sensory, functional and technological indicators with rational use of poultry by-products.

ISSN: 0975-8585

MATERIALS AND METHODS

The technology of meat loaf consist of next stages (fig. 1): meat preparation, chopping, salting, maturation, grinding; adding food protein supplement, mixing, adding of flavoring ingredients; formation, baking and cooling.

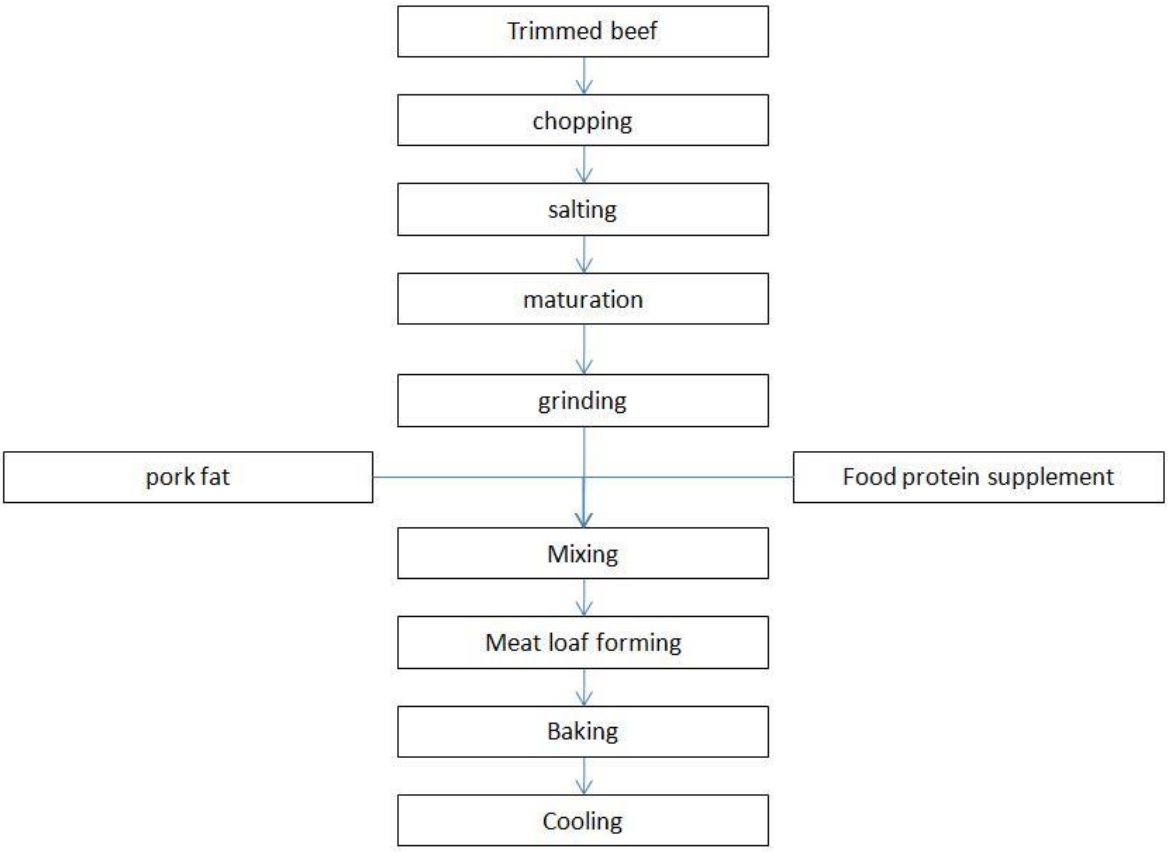

Fig. 1: Technology of meatloaf production

By the content of three major nutrients – protein (P), fat (F) and carbohydrates © the energy value (EV) of the product is calculated (kcal/100g):

$$EV=(4P + 9F + 3.8C),$$

where 4; 9; 3.8 – the coefficients of energy value of protein, fat and carbohydrates (kcal/g)

Determination of total chemical composition of meat loaf is based on the consistent determination of moisture, fat, ash and protein in one hinge-plate according to the standard GOST 9793-74, GOST R 51479-99 and GOST 23042-86 [10].

RESULTS AND DISCUSSION

Cooking process of meat loaf at high temperature provides good microbiological indicators of the finished product.

The offered method of production of meat loaf is carried out as follows. Beef after trimming is cut into pieces weighing 400 g. For each 100 kg of cut beef is added 2,5 kg of salt, 5,6 g of sodium nitrite and 110 g of sugar. Salted meat is matured from 48 to 72 hour at 3-4 °C.

The salted and matured beef meat is chopped to 2-6 mm on the meat grinder. Separately the food protein additive is prepared. For this purpose the neck and back parts with skin and bones of broiler carcass are boiled in the autoclave at 100-110 °C within 0,5-1,5 hour. The chopped meat is minced on the cutter for 3-5 min with pouring of ice or cold water in quantity of 35% of total mass of raw materials, then the food protein additive and spices are added.

Next step is molding of minced meat to the metal forms preliminary greased with rendered fat. The metallic forms are densely filled by vacuum filling pump with minced meat, without pores and air void spaces. The weight of minced meat in each form is 2-2,5 kg. After that the minced meat in the forms is placed into the rotary oven chamber at 130-150°C and baked within 150 min until it has reached 69-71 °C temperature in the center of loaf. Baked meat loafs are removed from the forms and stored for 30 min at 130-150 °C in the oven for formation of golden crust.

Meat loaves are stacked in line on the non-corrosive metal tables and cooled at the temperature not above 4 °C up to the temperature in the thickness of loaf 0-15 °C. The cooled meat loaves are turned in napkins from cellophane, parchment, subparchment and packed in a reverse container [11].

Comparative data on the quantity of meat and protein semi-finished product are provided in table 2.

Table 2: Formulations of the meat loaf with different mass of food protein supplement

Ingredients, kg/100 kg	1 sample	2sample	3 sample	Control
Trimmed beef	45.0	40.0	35.0	60.0
Wheat flour, starch	-	-	-	2
Food protein supplement	55.0	60.0	65.0	-
Spices, g/100 kg				
Sodium nitrite	5.6	5.6	5.6	5.5
Granulated sugar	110	110	110	150
Black pepper	85	85	85	100
Coriander	55	55	55	50
Salt	2500	2500	2500	2450

Table 3 shows the physical and chemical parameters of designed meat loaves compared with control sample.

Table 3: Physical and chemical properties of designed meat loaves

Index	Test samples			Control sample
	1 sample	2sample	3 sample	
Product yield, %	111	111	111	100
Protein, %	16.56	19.61	16.99	15.76
Fat, %	27.27	21.36	25.87	27.75
Moisture, %	59.75	55.96	59.88	58.81
Sodium chloride, %	2.37	2.37	2.37	2.37
Sodium nitrite, %	0.005	0.005	0.005	0.005

The sensory characteristics are presented in the table 4.

Table 4: Sensory characteristics of meat loaves

Index	1 sample	2sample	3 sample	Control
Appearance	Meat loaf with clean, smooth, dry, equal fried surface			
Consistence	elastic	elastic	elastic	poor elastic
Visual appearance	Light-pink, fine grinded, homogeneous	Light-pink, fine grinded, homogeneous	Light-pink, fine grinded, homogeneous	pink, fine grinded, homogeneous
Flavor and taste	Specific to such kind of product with spices flavor			
Storage period	No more than 72 h	No more than 72 h	No more than 72 h	No more than 72 h

As table 3 and 4 show, the designed meat loaf has better sensory characteristics, increased product yield and higher nutritive value than the prototype. As Table 2 shows, the protein content of designed meat loaves is higher than in control one. The highest value is determined in the sample 2 (19.6 %) and this is more up to 24% than in the control sample (15.75%). Sample 1 and sample 2 show the similar content of protein as the control. With increasing of protein content the fat is decreased in the test samples. For instance, the meat loaf with low fat content is determined in the test sample 2 (21.36%), while in other test samples the fat occupied 25.87% in the sample 3 and 27.27% in the test sample 1. The highest content of fat is in the control sample 27.75%. Fat changing can be explained by the food protein supplement which is low fat additive.

The offered technology of meat loaf production allows receiving the protein rich product with high nutrition value, improved sensory indexes. Also, it increases the product yield, reduces the prime costs and expands the assortment of meat loaf by rational using of secondary poultry by-products.

REFERENCES

[1] Bazhina K.A., Gavrilova Y.V. Plant components in the formulation of meat loaf in terms of functional nutrition. Young scientist, 2014, 16:59-60.
[2] Ranken M.D. Handbook of meat product technology. Blackwell Science Ltd. 2000. – 245p.
[3] Lisitsyn A.B. Meat food production on the base of biotechnology. Moscow, VNIIMP, - 2005. 304p.
[4] Miklyashevsky P., Pryanishnikov V.V. Journal “Vsye o myase”, 2007, 1:25-32.
[5] Amirkhanov K.Z., Assenova B.K., Nurgazezova A.N., Kassymov S.K., Baitukenova S.B. Current state and prospects of development of functional meat products. Almaty, 2013. 126p.
[6] Khvylya S.I. Problems of evaluation of mechanical boning meat quality. Vsye o myase, 4, 2001: 5-7.
[7] Tretyakov N.P., Bessabarov B.F. Poultry processing. Moscow, Kolos, 1985. 285p.
[8] Nesterenko I.F. Chemical composition of food. Moscow, Pishevaya Promyshlennost, 1979. 226p.
[9] Gonotsky V.A., Fedina L.P. Meat industry, 2008. 4:24-27.
[10] Antipova L.V., Glotova I.A., Zharinov A.I. Research method of meat and meat products. Voronezh, VGTA, 2000. 332p.
[11] Patent #30201 of Republic of Kazakhstan Method of meat loaf production. Inventors Nurymkhan G.N., Tumenova G.T., Serikbayeva S.Sh., Nurgazezova A.N. Application number 2014/0726.1; date of publication 17.08.2015, bul. 8.