

ORIGINAL MEAT PRODUCTS ON THE BASIS OF SECONDARY COLLAGEN CONTAINING RAW MATERIALS PRODUCED BY MEANS OF SAFE TECHNOLOGY OF ELECTROSTATIC SMOKING

Vecheslav Vasilenko, Victor Antyushin, Yuriy Shlyk, Alexander Kalachoyv, Pavel Ushakov

Voronezh State Technological Academy, pr-t Revolutsii, 19, 394017 Voronezh, Russia

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Background

Ability of meat processing plants in Russia to surviving under existing conditions of competition depends upon the quality of resultant products and the level of processing of secondary meat raw materials. Meat industry of Russia should take the new road of production development providing for wide application of science achievements in production, introduction of intensive non-waste technologies, improvement of quality and assortment of final products, and considerable increase of labor productivity. To realize this is impossible using only traditional methods of processing because they exhausted their possibilities.

In this connection, the most real way out of this situation is the use of physical methods of meat industry raw materials and product's processing. Processes of electrostatic treatment in combination with the infrared ones have acquired the popularity. Application of new methods in food industry, in particular in the meat one, will allow to increase the output of final production and to improve its quality, to decrease efficiency of production as a whole. Taking into account the existing problems, we consider it to be necessary to increase the level of processing of protein containing raw materials using protein preparations of plant and animal origin. by-products of the second category, secondary resources of meat processing industry.

The aim of our investigation is the increase of final products assortment on the basis of rational use meat industry secondary by-products and use of new save technologies of electrostatic smoking in combination with infrared treatment of products, and laying foundations of regimes of treatment. The main object of this work is connected with the elaboration of formulations of new meat products and estimation of their quality.

Objective

The object of the study is the meat industry secondary raw materials-pig ears and tails (by-products of the second category), in which we investigated chemical composition, biological, food and energy value. We studied amino acid composition of the raw materials and final products. One of the main stages of our work was the determination of optimum technological regimes of production.

Methods

Mass share of moisture was determined by the method [1]. Mass share of fat was determined by the method [1]. Mass share of ash by the method [1]. Mass share of protein – by the method of Kjeldahl [1]. Amino acid content of protein products was determined by the method of ion-exchange chromatography on the automatic ion analyzer AAA-881. Biological value of new products was estimated by the use of amino acid score determined with the help of calculations. The quality of ready-made products was determined according to the existing standards, organoleptic indices by [1].

Results and discussion

One of the technological operations which gives the product attractive consumption properties is smoking. Large investigations have been carried out on the improvement of the design of smoke-generators, smoking chambers, process programming with the aim of regulation of the smoking process. However, we could not make the optimal, according to its technological properties, smoke and devices allowing to measure its concentration and chemical composition. It is known, that the smoke can be considered as an aerosol of a condensation type and therefore at sorption of the particles containing in it on the smooth surface, the thickness of sorption layer has the same order of value as the size of particles. Smoke condense possesses conductivity and consequently polarization. It has been established experimentally by means of measuring interelectrode conductivity on the surface of SiO₂. Droplet-liquid particles of smoke have different times of Maxwell resistance-capacity (RC) relaxation of a dipole electric moment. Sorption of polarized particles on the surface can be stimulated by the heterogeneous electric field (dipole is pulled into the sphere of maximum field intensity). At the electrostatic sorption stimulation of smoking substances (at direct current) all particles, regards of time of relaxation, have a chance for polarization and pull into the sphere of a very heterogeneous electric field, disproportion of a condensate composition on the object of smoking in comparison with the smoke composition being practically absent. If we use high alternating voltage of a certain frequency for sorption stimulation, the particles, which have the time of relaxation less than half period of alternating voltage will be the only particles, which will acquire induced dipole moments. Therefore, changing the frequency of alternating voltage it is possible to change qualitative and quantitative composition of particles flow transporting on the object of smoking.

We studied the kinetics of smoke formation at thermal decomposition of wood and measure frequency dispersion of polarization of smoke condensate at various stages of the process at different amplitudes of input test signal. We determined the optimum time of smoking according to the content of guaiacol from phenol fraction. The determination has been carried out on samples smoked in chambers for electrostatic smoking correspondingly 10, 20, 30 and 40 min. The concentration data obtained at the given time parameters are shown in tab. 1.

The data obtained have the sense of nomograms, t. g. if we know the needed concentrations of guaiacol in smoked products, upposed in sausages (1,4 mg/100 g), we can find the optimum time of smoking of pig tails (cut in the form of straws 3-5 mm thick) and pig tails (cut in the form of sticks 50-70 mm long), which is 25 min and 21 min respectively. The product obtained has a pleasant smoked flavor and attractive golden color. The results of study of a chemical composition and food value of the raw materials and

final products are given in tab. 2.

Rather large content of proteins and high food value of the raw materials and final dry meat products may be explained by high mass share of proteins of the connective tissue. Study of amino acids composition of the raw material and final dry meat products is given in tab. 3 on the example «Straws for beer».

At the same time we have established that the content of phenyl alanine, (the essential amino acid) increases from 1,904 to 2,24 mg/1 g. Results show that the regimes of treatment do not influence and even improve the food value of final products, and testify to the fact that smoking slightly changes the content of all limited amino acids.

Estimation of the amino acid balance and biological value of products was carried out according to the following indices: amino acid score of products; coefficient of amino acid score difference; biological value of food protein. The obtained values are: coefficient of difference of amino acid score of the raw material-29,5, coefficient of difference of amino acid score of the final product-27,3. Biological value food protein in the raw material and final product is $BV_{\text{raw material}}$ 70,5 % and $BV_{\text{final product}}$ 72,7 % respectively.

Study on argumentation of drying regimes of meat products was carried out on infrared-dryer. At meat products drying in the infrared dryer, we carried out sampling and determined products moisture content in different intervals of time. Drying was carried out at different temperatures: at 65 °C and at 85 °C up to a certain value of equilibrium moisture content which is 25 % and 30 % for «Straws for beer» and «Anniversary sticks» respectively. Sampling was carried out in 20, 40, 60, 80, 100, 120min respectively after bringing product in the dryer. Determination of moisture was carried out in a drying chamber up to equilibrium mass according to the known procedure. The data obtained allow to make a content in certain time of drying.

We can see that in order to obtain the product «Straws for beer» it is necessary to dry it up to equilibrium moisture content 25 % at t^0 65 °C for 2 h, at t^0 85 °C 1,5 h, and optimum regimes of drying for «Anniversary sticks» are: at t^0 65 °C for-2 h, at t^0 85 °C-1,5 h.

Conclusion

1. Good indices of food and biological value of products produced according to a new safe technology of electrostatic smoking meet the requirements to dry meat products and have high consumption properties.
2. Industrial testing and tasting of dry meat products demonstrate good consumer properties, economic expediency of their production.
3. New technology of dry original meat products has been patented.

References

1. Zhuravskaya N.K., Alehina L.I., Otryashenkova L.M. Study and control of meat and meat products quality. M.: Agropromizdat, 1985. – 296 p.

Table 1

Dependence of guaiacol concentration in time of smoking in dry meat products.

Name	Time of smoking, min	Concentration, mg/100 g
1	2	3
Smoked pig ears	10	0,60
	20	1,1
	30	1,65
	40	2,4
Smoked pig tails	10	0,81
	20	1,35
	30	1,93
	40	2,68

Table 2

Chemical composition of row materials and final products.

Product		Content, %			
		Moisture	Fat	Ash	Protein
1		2	3	4	5
Row-materials	Pig ears	60,9	14,1	0,7	21,0
	Pig tails	43,2	39,4	0,51	0,51
Final products	«Straws for beer»	25	42,3	0,63	24,7
	«Anniversary sticks»	30	46,1	0,48	18,9

Table 3

Amino acid content of raw materials and final product

Amino acid	Row materials, mg/g	«Straws for beer»	Protein by FAO/VOZ, mg/g
1	2	3	4
Thr	34,62	30,29	40
Val	41,44	49,45	50
Met+Cys	16,4	18,71	35
Ile	22,58	26,37	40
Leu	48,75	54,17	70
Phe+Tyr	49,12	63,73	60
Lys	76,34	62,63	55