

UTILIZATION OF PROTEIN COMPONENTS OF BONES IN FOODSTUFFS

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W-6A.10

SUMMARY

New types of various combination food products containing protein components of bones of slaughter animals have been developed, these products showing low calorie level, high solubility and good assimilability.

Introduction

Unbalanceness of foodstuffs by the main components, high calorie content of consumed food stipulate early ageing of a human organism to a great extent, as well as the development of arteriosclerosis and of other cardio-vascular diseases, cause extra weight problems. In this connection the development of new products based on combination use of vegetable and animal raw materials acquires importance. Bones of slaughter animals in this respect deserve attention serious as a valuable source of protein, mineral (mainly phospho-calcium) salts and highly assimilable fat. Application of different technological methods of processing of said material may ensure obtaining of separate bone components (including protein ones) or the necessary compositions thereof. Research has been conducted aiming at development of new types of products containing these components.

Advisability of creation of such foodstuffs, containing protein components of bones is supported with the important role of connective tissue (bone tissue being its kind) for improvement of biological value of meat products.

According to the method of extraction, protein components of bones are characterised by the following parameters (table 1).

Taste and flavour of protein components are well-developed in these products which lack unpleasant off - taste and off-flavour. Irrespective of the extraction method, they form turbid solutions when dissolved at 40°C.

Functional properties of bone protein components are shown in table 2.

Data presented in table 2 point out to advisability of usage of bone protein components for manufacturing of foodstuffs as an extending agent and a surface-active substance. This is also confirmed by the data on availability of the full complex of indispensable amino acids in these protein components.

Hence, the sum of the difference of amino acid scores totals 177, coefficient of the difference of amino acid scores constitutes 22/177:8/, and resulting biological value is expressed as 78%. When bones with a small amount of meat tissue are used (the latter case being caused by difficulties in separation of meat in certain anatomic sites of a carcass, i.e. vertebrae, etc.), the computed biological value of its protein component equals 85%.

According to the content of macro- and micro-elements, bone protein components meet requirements for the allowed concentrations, established for meat and meat products.

High solubility of the protein components of bones made possible their application for manufacturing of instant foodstuffs, and the good emulsifying ability - of high-viscosity emulsions and pastes like pates.

Several types of instant food products have been developed: broths and soup concentrates. Three types of dry broths differing by levels of protein component, fat and salt were developed and test-manufactured.

The main indices for the composition and physico-chemical characteristics of these products are given in table 4.

These broths also contain β -carotin, vitamins B₁, B₂, PP and C. During comparison of indices of these broths with characteristics of soup and gravy bases, manufactured in USA and other countries, it was noted that

protein content in the "Estonian" and "Summer" broths is 1.5 times higher than in the base produced in USA by the standard EE-V-575D-80 (18% against 15.6%).

In case of the "Russian" broth this index by 1.3 times exceeds the analogue (20% against 15.6%) at approximately equal values of moisture, fat and salt content.

Along with the developed food broths, bone-extracted protein components are used in the suggested formulations for first lunch courses: soup with pasta and broth; soup with mashed potatoes and broth, broth-based- soup with pearl barley; borsch with broth, etc.

Nutritional and energetic value of these products is characterised by the following data (table 5).

From the presented data it is seen, that the developed concentrates possess almost equal energetic value and are characterised by close protein and fat content, the latter being slightly higher in borsch, taking into account specifics of its formulations. Advantage of concentrates is supported by short cooking period and availability of a fast ready food.

With the account of the high emulsifying ability of bone protein components, the "high-calorie" pate has been developed, including fat pork as a main component, which is difficult to use in traditional sausages. The developed product contains protein approximately at the level of 15.0-16.3% and fat - at the level of 25.5-30.7%. The obtained mixture is spreadable and has soft and tender consistency. The total content of essential (or indispensable) amino acids as dependent on formulation, ranges within 36.0-43%. The yield of the finished product is 100-110% of the weight of uncured raw material and depends on the type of the used casing. High biological value of the developed pate was confirmed by biological tests on laboratory animals.

Chemical composition, nutritive value and functional properties of the bone protein components were used during development of new types of combination products by their combining with the raw material of vegetable origin. Different types of porridge concentrates are suggested, based on buckwheat, pearl, wheat and rice cereals, fat and dry protein component of bones. New decisions in the field of creation of combination food products on the basis of vegetable and animal raw material become possible due to application of the extrusion technology.

Depending on the parameters of the extrusion process, half-finished and finished products can be obtained fully meeting requirements for a cooking degree.

For these purposes corn cereal and semolina were used along with the dry protein component of bone. For these products one of the three types of broths can be used (see table 4). In the result of extrusion the products possessed the following parameters: moisture content - 7.9% and density in the crushed condition - 0.35 g/cm³ (density of the initial mixture being 0.73 g/cm³). Having a granulated shape, the product, however, shows a porous structure.

The application of combination thermomechanical action towards initial raw material under rigid short-time conditions ensures formation of new lipoprotein complexes. The main volume of the obtained granules is occupied by shallow air-pockets which stipulate porosity and also high solubility of the product. The developed products are characterised by elevated (as compared to the initial raw material) amount of the limiting amino acids.

Table 6 shows data on the chemical composition and energetic value of the extruded products based on corn cereals, semolina and broths.

The given data evidence about approximately equal energetic value of the new finished ready-to-eat products.

The developed technologies of manufacturing of different food products create favourable conditions for the wide use of full processing of bones at meat industry enterprises, which will help not only the increase of food products manufacturing, but also will widen sphere of application of this raw material.

Table 1. The Main Chemical Characteristics of Protein Components Derived from Bones of Slaughter Animals by Different Methods

Table 2. Functional Properties of Bone Protein Components

Table 3. Biological Value of Bone Protein Components

Table 4. Chemical Composition and the Main Physico-Chemical Indices of broths Containing Dry Protein Component of Bones

Table 5. Nutritional and Energetic Value of Soup Concentrates Containing Dry Protein Component of Bones

Table 6. Chemical Composition and Energetic Value of the Extruded Products