TECHNOLOGICAL ASPECTS OF THE ENZYMATIC TREATMENT OF THE MEAT AND POULTRY PROCESSING INDUSTRY COLLAGEN CONTAINING RAW MATERIAL

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New approaches to the usage of the meat and poultry processing industry collagen containing raw material are necessary nowadays in order to solve the problem of the existing deficit of the animal proteins and to prepare products with the optimum ratio of the food substances. The reserves of the animal proteins are considerable but their use is limited due to the low functional qualities. Meanwhile it has been established that proteins of the connective tiscues are necessary elements of the well-balanced nutrition because in combination with muscle proteins give good quality of the products and enable the normal functioning of the digestive tract. Potential possibilites of such raw materials in the production of various products can be widely revealed with the help of the enzymatic conversion of the proteins.

The aim of this work is to study the possibility of the definite modification of the collagen containing raw material with the help of the enzymatic conversion at the production of the definite products for special use, required level of the functional and technological qualites .

DETAILS OF THE OBJECTIVES

Native industrial enzyme preparations with the proteolytic action and enzyme preparations based on the use of microscopic fungi and actynomycetes prepared by co-workers of the academy have been tested.

The objects of the investigation were: homogenate of the heads and legs of the land birds; overcooked and homogenized tankage, obtained at rendering of fat from fat containing tissues of slaughter animals; secondary collagen containing resources of the animals' slaughter and treatment: by-products of the hides and gut raw material, by-products obtained at meat trimming in sausage and canning production.

EXPERIMENTAL METHODS

The total proteolytic activity of the enzyme preparations has been determined by the method of Anson in Kaverzneva's modification [1]; collagenase activity due to the content of oxyproline in mixture, formed in the result of the enzymatic action on the native collagen [2].

X-ray-phase analysis of the collagens in the composition of the raw material and collagen half-finished products on its base has been carried out on the DRON 4-07 (X-ray defractometer of the common use with the average accuracy).

The source of the characteric radiation was X-ray tube БSV - 29, voltage up to 60 kv, radiation stability-0.03-0.1%. CuKα-radiation was used for the investigation of samples; $\lambda = 1.5414$ A.

PRINCIPAL RESULTS

It has been established that enzyme preparations with the high level of the collagenase activity are the most effective in the production of the protein and fat-protein additives to be used in minced meat products. Their use allow to obtain protein and fat-protein additives with the improved functional and biological qualities and to reach 60-65% hydrolysis degree of the collagens.

In the result of the enzymatic hydrolysis there has been observed the growth of peptides and amino nitrogen in the composition of the hydrolyzates ; transision of some essential amino acids from hard digestible into easy digestible form: isoleicyne, phenylalanine, lysine, methyonine, valine and also the accumulation of the considerable amount of the glutamic acid, playing the important role in the formation of the product flavour. The ratio of the amino acids and peptides is 1.5:1. Besides, it is important to point out that peptide fraction stimulates the secretion function of the intestines, improves the digestability, takes part in the formation of flavour, increases the water-binding and water-holding capacities.

These obtained qualities of the protein systems guarantee good sausage-meat formation, plasticity, food value. They allow to substitute up to 25% of the raw materials without changing the total chemical composition at the improvement of the biological qualities and the increase of the product out put.

Samples of the products prepared with the addition of these composition are enriched by the products of the collagen degradation and have more tender consistency and pleasant flavour .

However, it should be noted that many kinds of the collagen containing raw materials are interesting for the manufacture of products by means of isolation and treatment of the collagen proteins: films, edible sausage casings, moulding materials. The absolute advantage is the purification from the accompanying high molecular substances by means of the enzymatic destruction. Here of some interenst are enzymes which do not posses collagenase activity, e.g. megaterin chosen in the result of analysis of the collagen structure's changes. The evaluation of the preparation activity containing the set of enzymes for the analysis of the collagen fractions was carried out with the use of the X-ray phase analysis on the difractometer DRON 4-07. X-ray-gramms of the initial raw material (the cattle small guts) and collagen mass produced on its base showed (fig 1.), that at the use of the enzymatic hydrolysis by preparations characterized by the minimum levels of the coelagenaze activity (megaterin, protosublilin) fractions of the crystalline collagen are saved completely with practically fully removal accompanying proteins (albumines and globulines).The same results are characteristic for the other kinds of the collagen containing raw materials.

This reveals new applied aspects of usage of the special enzymatic preparations and their composition in the production of pure collagen substances used in the technology of the edible sausage casings and films where if is necessary to isolate the collagen from tissues in the pure form saving the main molecular characterisitics and native structure.

The composition of the obtained collagen semi- finished products is similar to that of the calele hide split used in the technology of the artificial sausage casings of the "belkosin", "naturin" and "kutisin" types which are characterized by high

functional qualities and biological value.

That is why these collagen semi-finished products may be used for the production of the edible food coverings for meat products and casings.

CONCLUSION

It has been shown that in the solution of the applied tasks of the production of the edible products with the different functionality on the base of the collagen containing raw materials fermentation it is necessary to study the abilities of different proteolytic enzymes to transform proteins of the definite structure. Specificity action of some microbial enzymatic preparations in the processes connected with the collagen transformation in the structure of the animal tissues has been determined.

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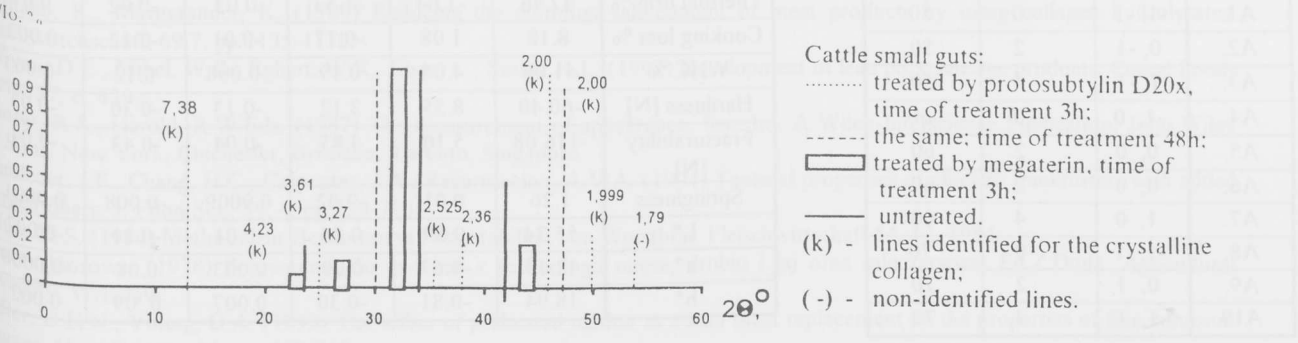

Fig.1. Shade diagramma of the difractogramms of the collagen containing raw material and half-finished products on its base.