

*Materials of Conferences***THE EXPERIENCE OF ENZYME PREPARATIONS APPLICATION IN THE PROCESSING OF ANIMAL ORIGIN RAW MATERIALS**

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The significant progress in practical human activities has been achieved due to the emergence and development of biotechnology. It has deeply penetrated in food production as well. Vast knowledge of biological processes mechanisms in raw materials and products during storage and processing has allowed to develop products of high biological value based on the rational combination of food systems, to create environmentally friendly low-waste technologies, to get significant economic results with the application of living cells and enzymes, to implement intensive and non-traditional technologies of food and feed products, to create their new forms and sources. Currently enzymatic preparations for food and processing industry are very popular due to the possibility to change the structure of biopolymers molecules under mild conditions and at high speed, with the formation of substances adjusted to human physiology, where proteins are the most essential. Enzyme collagenase is produced by the joint-stock company "Bio-progress (Shchelkovo town, Moscow region) of hepatopankreas of Kamchatka crab (*Paralithodes camchatica*) in accordance with the approved documentation with the standard level of (proteolytic) activity equal to 70 units per gram. While studying the physico-chemical properties and biological activity we used recommendations [1].

It is established that the preparation has the highest activity in the range of 35 to 45 °C and pH 6, 7, 5. The calculation of kinetic parameters of hydrolysis of water-soluble, salt-soluble and alkali-soluble meat proteins showed that collagenase shows the least affinity with water-soluble proteins and shows a frank affinity with native collagen, differing by the highest rate of hydrolysis of the substrate. It gives to the preparation the advantage in the field of differentiated modifications of connective tissue proteins, and consequently of tissue in the structure of meat in general. The experimental studies found collagenase to be sustainable in saline environment within concentrations with technological value.

To study the influence of the preparation on the meat tissue we used microstructural analysis method after processing of objects with a solution of enzyme preparation and without it. Previously, crystal table salt (2.5%) and dry enzyme preparation (0,1%) had been put into distilled water, simulating

brine salting conditions. Processing of samples was carried out by dipping them into solutions in flasks with vibroshaking at a temperature of 0–4 °C. The sampling of prototypes was conducted at 4, 8, 12 hours intervals. The results are presented in fig. 1.

Reducing of the thickness of connective tissue membranes of muscle fibers, the reduction of loose connective tissue, weakening of the links between the fiber, and, as consequence, increase of the gaps between them, the weakened cross striation have been marked under the influence of the preparation on the meat of the superior quality (Fig. 1, c).

Such a character of changes confirms the activity of the enzyme preparation in relation to connective tissue proteins and actomyosin complex.

The described structural changes have a considerable effect on the functional and technological properties. It has been found in the course of experimental studies that moisture-adhesive and moisture-retaining power is significantly stimulated in large pieces of meat, but it is quickly decreased when the material is crushed due to the effectiveness of collagenase action. However, treatment with enzyme preparation leads to a sharp decrease in efforts of cutting along and across the fiber. Analysis of the output of meat after heat treatment has showed a positive effect of the preparation with 2,0–2,5 times reducing of exposure in salting.

Enzyme preparation "Protepsin" is produced on the base of CJSC "Plant of endocrine ferments", Rzhavki village, Moscow region.

Protepsin is an enzyme preparation of animal origin, made of chicken stomachs, it contains a complex of acid proteinases, its standard level of proteolytic activity is 100 u/g. As the results of research have shown, the preparation has the highest activity at pH 4,0–4,5 and 42–45 °C. Research studies of its substrate specificity, the calculation of kinematic characteristics in the hydrolysis of various substrates have allowed classifying it as a synergetic enzyme of the digestive tract, notably pepsin. Due to the effect on all of muscle protepsin increases moisture-adhesive ability and hydration of proteins without destroying the indispensable amino acids. This leads to a loosening of the meat structure, to an increase of the degree of penetration, to an increase of immobilized moisture volume and an increase of output by 10–20%.

Thus, the approaches and ways of application of the preparation in technology of processing of meat have been established.

The range of such products is quite wide. Domestic industry produces a wide assortment range of products on the basis of the developed technical documentation: rolls of beef, horse meat, mutton; ham of various types of raw materials and their combinations; various pork smoked products; protein-fat emulsion.

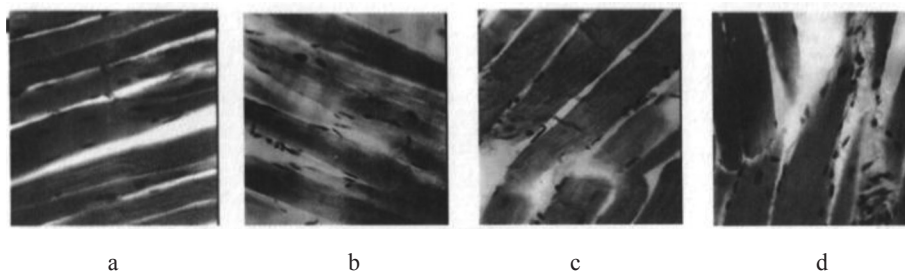


Fig. 1. The changes of the microstructure of superior quality beef under the action of collagenase: a) control (no treatment); b) the duration of treatment to 4 h; c) the duration of treatment – 8 h; d) the duration of treatment – 12 h



Fig. 2. The Range of cosmetic products on the basis of hydrolyzed keratin

The preparation “Protosubtilin G 10X” is derived from microbial source of *Bacillus subtilis* in conditions of the enzyme preparations plant, village Zelenogorsk, Tver region. The product is widely used for the production of hydrolysates from not assimilated proteins of meat origin and in preparative purposes. The active principle of enzyme preparation is endopeptidase with a molecular mass of 227000 kDa. Optimum action is pH 5–8,0, thermal optimum 40–45°C. Standard activity is 100 U/g. Electro physical and chromatographic studies have shown high heterogeneity of protein composition of the preparation. It was interesting to explore its possibilities to influence on the protein keratin, which is the main component of the feather, horns, hooves, skin, hair. The interest to these proteins is that keratin-containing wastes make up to 7%. They have very limited application because of the specific chemical and spatial structures.

At the same time it is known that their amino acid composition is practically identical to the casein of milk, but by the content of sulfur-bearing amino acids (methionine, cystine, cysteine) they far exceed other natural proteins.

In the result of the fitting of conditions of disulfide bridges destruction, stabilizing molecule of keratin, we managed to get a soluble form of feather-downy raw material, which can be the basis for some

of useful products: hydrolysates of food and forage values, concentrate of sulfur-bearing amino acids for poultry. Even more convincing were the results in the receiving and application of hydrolysates in the composition of cosmetic products withing the conditions of production of concern “Techcon” (Moscow). The range of cosmetic products is successfully realized on the domestic market and it is in demand (fig. 2).

Thus, the promotion of enzyme technologies in industrial production is due to the scientific basis of the approaches and the development of innovative technical solutions. It is difficult to overvalue the availability, economic advisability, ecological and social importance of this direction of biotechnology in the practical human activity.

References

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The work is submitted to the International Scientific Conference “Research Graduate School in priority areas of science and technology”, Switzerland, 27 April–03 may 2015, came to the editorial office on 02.04.2015.