STUDYING THE POSSIBILITY OF MANUFACTURE OF HIGH-QUALITY CANNED MEAT PRODUCTS FROM LOW-GRADE BEEF TREATED WITH ENZYME PREPARATION

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Background

Usage of enzyme preparation (EP) with high content of connective tissue for modification of meat raw material, in order to change its properties, is one of perspective trends in manufacture of meat products permitting to efficiently use raw materials and develop waste-free technologies.

At the same time practical use of enzymes during meat raw material processing is rather effective for improvement of meat tenderness and juiciness, intensification of production technological processes, with the result that the volume of output of high-quality meat products increases and meat resources are used more efficiently.

Enzyme preparations of animal, vegetable and microbe origin are usually used with this aim in national and foreign practice. However, not all enzyme preparations have the desired effect, as in most cases they affect proteins of muscular fibers.

Effect on proteins of connective tissue is minimal, but just these proteins are responsible for meat toughness.

Investigations carried out earlier [1, 2, 4] showed that a number of EP, in particular, vegetable enzyme papain, animal enzymes pancreatin and collagenase had expressed activity in respect to connective tissue proteins. However, the above enzymes don't act selectively as regards active collagen, and their main disadvantage is high activity in relation to muscular proteins. In practice search for enzymes having effect on connective tissue proteins is of interest.

At the same time a positive role of natrium chloride and phosphates contributing to raising of cathepsin activity was determined by a number of authors. The process of curing also positively affected the enzyme activity. Simultaneously a negative effect of natrium nitrite was marked [3].

Objectives

The objective of this investigation was to study the possibility of usage of animal enzyme preparations having higher collagenase activity for processing of low-grade meat raw materials.

Materials and Methods

Results of studying the possibility of usage of collagenase manufactured from hepatopancreas Paralithodes Camtschatica are given in this paper [5].

During performance of works the following research methods were used: determination of proteolytic and collagenase activity of EP; pH value; mass share of protein, fat, salt; water-binding capacity; plasticity; degree of penetration and critical dynamic share stress, and losses from heat treatment.

Results and Discussion

In the process of carrying out investigations it was established that collagenase had rather high proteolytic and collagenase activity.

It was shown that the maximum proteolytic activity manifested itself at pH of phosphate buffer 7.0 and at 37 °C. Inactivation of the preparation took place at >65 °C.

The enzyme effect on low-grade raw materials was studied on model meat systems (MMS) subjected to preliminary curing according to a certain scheme, with introduction of various EP amounts into the brine (0.01-0.1 %) depending on the kind of the used raw material, mass share of connective tissue, and degree of grinding. Changes taking place in muscles in the process of curing and enzyme treatment testified, that in so doing pH index of medium slightly shifted to the alkaline side, while the amount of the introduced preparation didn't affect the above index.

It was established that during enzyme treatment of meat raw materials water-binding capacity (WBC), plasticity and degree of penetration increased (Fig. 1), what pointed to the fact that curing and fermentation processes had a positive effect on structural and functional changes in meat raw materials.

When heating MMS consisting of low-grade beef up to 75 °C, a certain regularity regarding EP effect was manifested.

Proceeding from the findings, one can see that water-binding capacity and plasticity of MMS increased with the growth of amount of the introduced enzyme preparation.

Study of effect of fermentation and temperature load on low-grade beef is shown in Fig. 2.

A certain regularity by action of the enzyme preparation on a number of structural and functional changes in the systems was established. It was shown that the losses from heat treatment were the least in the model systems treated with 0.0018 % EP (25.24 %). At the same time, the maximum bound moisture content (55.13 %) and degree of penetration (15.9 mm) were observed in those samples. Simultaneously, in other model systems, both treated with a great amount of EP and in the control (model system without enzyme), those indices were worse, being the lowest in the control: losses at heat treatment – 34.2 %, degree of penetration – 121.25 mm, bound moisture – 34.48 %.

As for the samples treated with a great amount of EP (0.0135 and 0.018 %), such indices as losses from heat treatment and the bound moisture content exceeded the control ones, but were inferior to those of the 1st experimental variant, where 0.009 % of the enzyme were used for treatment.

Investigations carried out on the sample ground to 2-3 mm fragments and treated with 0.009 % of the enzyme showed that in the given variant maximum values by all indices were obtained. However, the above investigations overstepped the limits of the task set, as the raw material had rather fine grinding, what was unacceptable for production of canned ham.

Thus, it was shown that enzyme treatment of low-grade beef with collagenase had a positive effect on structural and functional characteristics of the finished product.

Conclusions

1. Investigations carried out showed that the enzyme preparation "collagenase" obtained from crab pancreas had high proteolytic and collagenase activity, its optimum pH effect being 7,0 and temperature – 37 °C.
2. It was shown that plasticity, water-binding capacity and degree of penetration in the process of curing increased to a considerable extent.
3. With regard to heat treatment of fermented meat, the optimal concentration of enzyme preparation was determined, as a result of which MMS had the maximum degree of penetration and the bound moisture content at the least heat losses.

References

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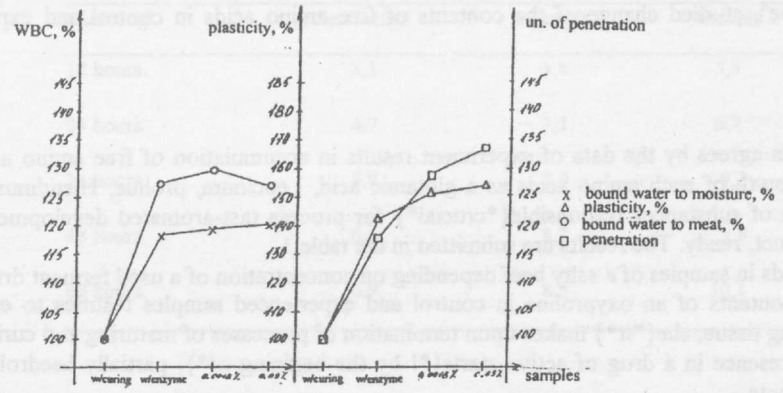

Fig. 1. Change in functional characteristics of L.dorsi in the process of curing

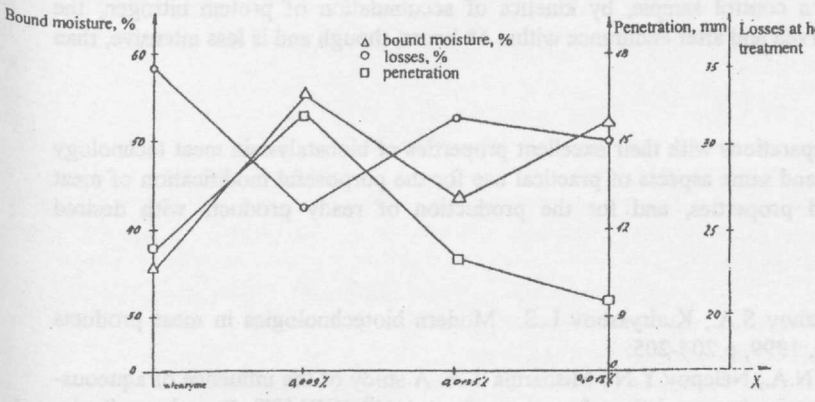

Fig. 2. Change in structural and functional characteristic of low- grade beef under the action of EP in the process of heat treatment