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INFLUENCE OF PROCESSING METHODS AND ITS PARAMETERS ON QUALITY CHARACTERISTICS OF THE CONNECTIVE TISSUE FRACTION RECEIVED BY MECHANICAL SINEWING OF LOW GRADE BEEF.

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The modern status of nutrition physiology and biochemistry make us to pay attention to newly developed meat products, so that they would correspond to medical and biological requirements, would become the object of serious care.
It is known that the use of muscle proteins in mixture with connective tissue proteins provides the higher biological value of total protein content in meat products [1].
The processing of low grade raw material is a matter of technological difficulty because of the higher structural strength of its connective tissue and weak water binding ability, that leads to high energy expenditure in the process of preparing the ground meat. The use of the low grade raw material for the manufacture of cooked sausages make it necessary to apply such rates of heat processing which would guarantee cooking ability of the connective tissue. But it renders the negative influence on muscle and fat tissues proteins contained in the basic sausage mixture that leads to the deterioration of organoleptic properties (aroma,flavour) of end products.
The aim of the study was to improve technological methods and rates of processing low-grade (collagen-contained) raw material and to reveal its technological and functional properties.
Connective tissue fraction was received after the mechanical sinewing of low grade beef and processed by mechanical, thermal, and enzymatic methods.
A grinder, cutter, and micromincer were used for the mechanical processing of raw material. When used the cutter, the connective tissue fraction was prefreezed.
The heat processing was carried out in closed cooker during 1 hour after being in the boil.
Enzymatic preparations of plant origin (papain) and microbial origin (Lact casei) were used for enzymatic treatment of pregrounded connective tissue.
Papain solution was injected into the tested sample. Sodium chloride solution was used as the solvent and provided its better penetration into the raw material.
Suspension of the Lact casei bacterial culture or a mixture of this suspension and pancreatin was inoculated into the grounded connective tissue. As a result in samples tested changes in pH tended to the acid level, while in control samples - to the alkalai level. At the same time the bacteriostatic effect became apparent.
In control samples independently of the preparation method, oxiproline content was determined before and after the treatment for estimating the collagen cooking ability [2].
Microstructural analysis of samples treated as described above was carried out.
It was revealed that the mechanical processing of connective tissue fibres led to their deforming and loosening. This process became more intensive by the treatment in the cutter, that pointed out a relatively higher index of the collagen cooking ability - 64.1% (Fig.1).
Chemical analysis proved that when the connective tissue was double minced - in the grinder and then in the grinder and micromincer consecutively - the raw material treated occurred to be less deformed and loosened. That's why the index of its cooking ability became less comparing to the same raw material treated in the cutter.
When reducing sizes of raw material particles (to less than 2 mm), the phenomenon of agglomeration was observed. In that case a dense homogeneous system was formed and its changes were less apparent in the course of its further treatment. Microstructural study of the connective tissue showed deep destructive changes in fibrous components of the connective tissue subjected to described method of the heat processing. Collagen fibres swelled and disrupted till the formation of glutin (Fig.2). Index of the collagen cooking ability was equal to 65.2%.
2% of papain solution added to the raw material influenced to not considerable degree on the connective tissue structure (Fig.3). However the papain proper provoked its softening in the course of heat processing, because its optimum range of temperatures was 60° - 70°C.
Microstructural analysis of the connective tissue innoculated by suspension of Lact casei bacterial culture and by the mixture of this suspension and pancreatin revealed more considerable changes in the structure of raw material processed by the mixture (Fig.4).
Modified connective tissue was filled in casings,thermally treated, chilled and cut into pieces in order to study its mechanical and structural properties and to receive comparable data.
Connective tissue samples treated by described methods differed by their mechanical and structural characteristics (e.g. tension by compression) that permitted to divide them conditionally into two groups. Samples treated mechanically were included into the first group. The second group contained samples treated by heat and enzymes (Fig.5). Samples of the second group had fat edemas which were not observed on the samples of the first group. As appears from the above, all chemical, mechanical, and structural indices of the modified connective tissue were closely related. Therefore the control of the proper ratio of components included into the recipe and their chemical content appears to be the essential condition for right managing consistency characteristics of meat products and for stabilizing their quality.
At present the use of low grade (collagen contained) raw material in recipes of meat products is restricted because of low stability of meat emulsions and poor product consistency, correspondingly. However it may be recommended to substitute a part of the raw meat in recipes for protein combinations made of connective tissue, protein preparations, fat-contained components, and water and are evidently responsible for the formation of structures. It would improve meat products quality and make corrections of biological and nutritional value of meat products.

Reference.

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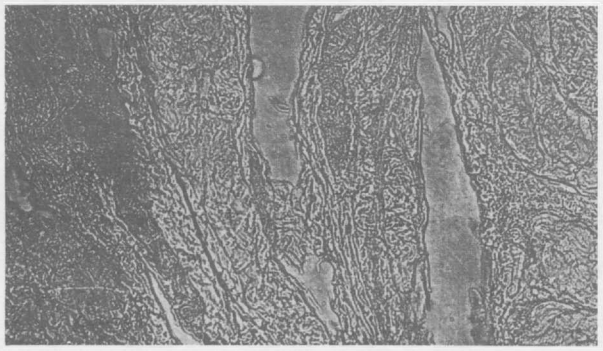


Fig.1 Microstructure of the connective tissue fraction processed in cutter.

Fig.2 Microstructure of the connective tissue fraction after heat processing.

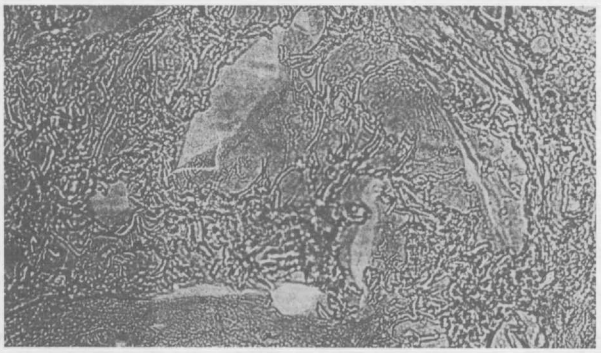


Fig.3 Microstructure of the connective tissue fraction treated by the papain solution.

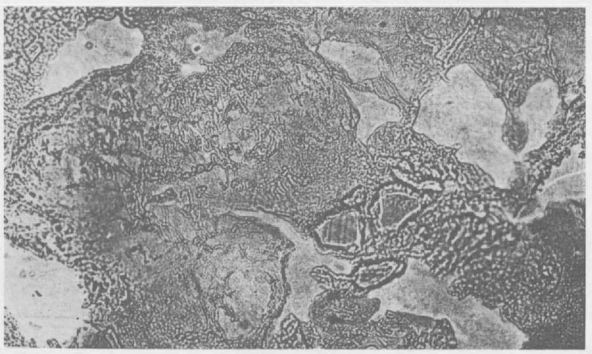
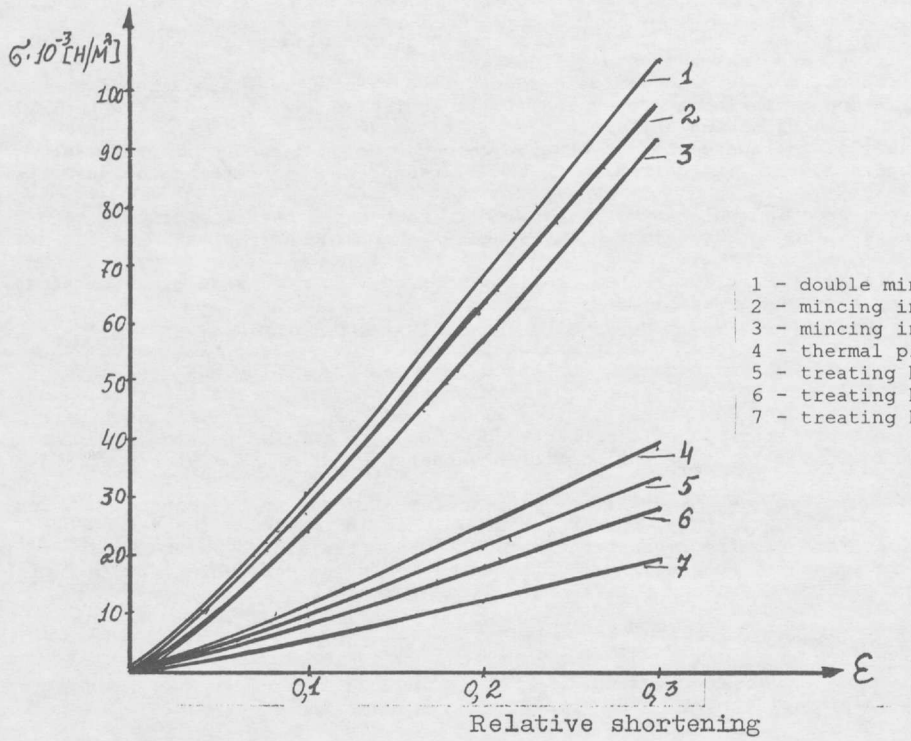


Fig.4 Microstructure of the connective tissue fraction treated by the mixture of Lact casei suspension and pancreatin.



1 - double mincing (in grinder and micromincer),
2 - mincing in grinder,
3 - mincing in cutter,
4 - thermal processing,
5 - treating by Lact casei strain,
6 - treating by the strain + pancreatin,
7 - treating by papain solution.

Fig.5 Compressive ability of connective tissue fraction treated by different methods.