IMPROVEMENT OF PROCESSING TECHNOLOGY FOR BROILER CHICKENS AND LAYING HENS

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Introduction
In connection with the greatly increased requirement of small enterprises dealing with poultry processing for an accelerated technological cycle of the finished product manufacture, a necessity for development of new approaches to the problem of intensification of industrial poultry processing based on utilization of efficient and rational technological procedures appeared [1, 2, 3]. A possible way of solving the above problem is utilization of raw materials at the most early stages of development of postmortem autolytic changes in meat. The findings point to the possibility of using the poultry meat at earlier stages as it obtains acceptable tenderness in 4-6 hours after slaughter.

Objectives
The objective of the study was to investigate a complex of qualitative (including microstructural) indices of meat from broiler chickens and laying hens at early stages of maturation processes depending on the conditions of technological preparation of meat raw materials for manufacture of finished products.

Materials and Methods
M. pectoralis mayor and m. quadriceps femoris from broiler chickens and laying hens in 4 days after slaughter without forecooling, in the process of curing with mechanical effect under vacuum, and finished products obtained from the raw materials manufactured using the intensive technology (experiment) served as materials of investigation. The same muscles from broiler chickens and laying hens processed according to the traditional technology served as control. Sampling for histological, microbiological and physicochemical investigations was carried out at the same stages of carcass and poultry meat technological processing.
For histological investigation the samples were fixed in 15 % aqueous solution of neutral formalin, dehydrated in alcohols of increasing strength and enclosed in celloidin according to the generally accepted procedure. Sections were colored with Ehrlich hematoxilin, with the subsequent final coloring with eosin and were studied using the luminous microscope "Yenoval" (Germany). In addition to microstructural analysis, pH value and the temperature of muscular tissue were determined by "Zamer" pH-meter, moisture-retaining capacity – by the Grau method in modification of Volovinskaya, moisture content – according to universally adopted procedures, microbiological characteristics of meat – in accordance with the State Standard for research methods.

Results and Discussion
Investigations carried out by us have shown that intensification of the technological processing of raw materials can be achieved by substantial reduction of the cycle of forced water cooling of carcasses and usage of vacuum mechanical treatment of raw material during the subsequent curing.
It has been established, that reduction of the technological cycle due to exclusion of the forced cooling process doesn't have a negative effect on the raw material quality and the character of autolysis. Microstructure of the muscular tissue of poultry thoracic and femoral muscles both in the experimental and control groups is characterized by destructive changes similar by the depth and degree of development to autolytic ones. The found out peculiarities of the muscular tissue structure testify to the fact, that the muscles of both the experimental and control groups of poultry are at the early stage of maturation (Figs 1, 2). It is necessary to note that in femoral muscles the maturation process proceeded less actively as compared to that in thoracic muscles.
Rather high temperature of carcasses amounting to 20 °C in 4 hours after the slaughter of birds to a large extent promotes acceleration of proteolysis in the experimental raw materials. In this connection microbiological welfare of raw materials is an important factor in usage of poultry meat without forced cooling. However, according to the data of microbiological investigations, microbiological contamination of muscular tissue in the experiment was lower than that in the control by a factor of 10^1 and amounted to 1.2×10^5 and 3.2×10^4 CFU/g, respectively.
Neither were found significant differences in moisture-retaining capacity of the muscular tissue of thoracic and femoral muscles of broiler chickens and laying hens when using both experimental and traditional technologies of raw material processing.
Mechanical action, improving penetrability of muscular tissue structures for the curing mixture, on the muscular tissue of experimental samples in the process of meat raw material curing allows to accelerate it. Microstructure investigations of the samples of muscular tissue of thoracic and femoral muscles from experimental hens showed, that muscular fibers were characterized by a high degree of swelling and homogenization of structural elements. At the same time sharp weakening of their cross striation and forming of destruction products – fine-grained protein mass underneath sarcolemma and between the bundles of muscular fibers - were observed. By the degree of manifestation of microstructural changes it was seen that in the experiment changes in the process of muscular tissue curing were analogous to those observed in the control raw material at longer periods of its maturing (24 hours) and curing (Figs 3,4).

It was determined that the character of changes of muscular tissue microstructural properties during the accelerated procedure of meat raw material maturation and its curing didn't significantly change. Moreover, local destruction of the muscular fiber myofibrillas in the process of mechanical treatment of meat improved tenderness of the manufactured finished product.

The revealed structural changes of muscular tissue correlate with the results of physicochemical investigations and technological parameters characterizing finished products.

The structure of finished products of experimental samples by composition of ground meat ingredients, its consistency and homogeneity was analogous to that of the control samples. During organoleptic evaluation of the samples of finished products fabricated according to the traditional and offered by the authors technologies it was noted that the taste, aroma, and tenderness of the experimental products were higher.

Also it is necessary to note that the output of finished products when using the accelerated production technology was 10 % higher than that in case of the traditional one.

Conclusion

Exclusion of the forced water cooling of poultry after slaughter allows to reduce the technological cycle of manufacture of finished products and increase their output. In this case meat of these kinds of poultry can be used in 4-5 hours after slaughter. Losses of raw material resources are reduced and specific power consumption of the poultry processing without deterioration of the quality of fabricated finished products is decreased as well.

References

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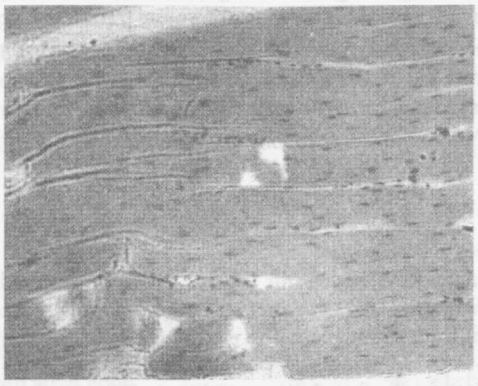

Fig. 1 . Microstructure of m. pectoralis mayor, control, broiler chickens, 24 hours after slaughter

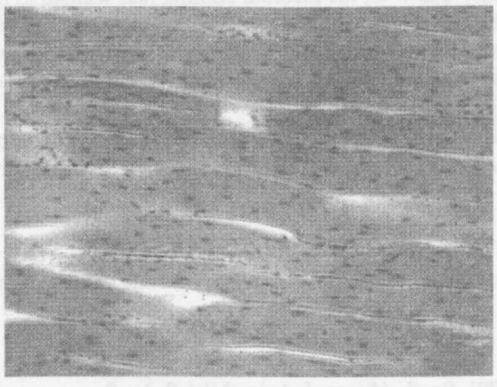

Fig. 2. Microstructure of m. pectoralis mayor, test, broiler chickens, 4 hours after slaughter

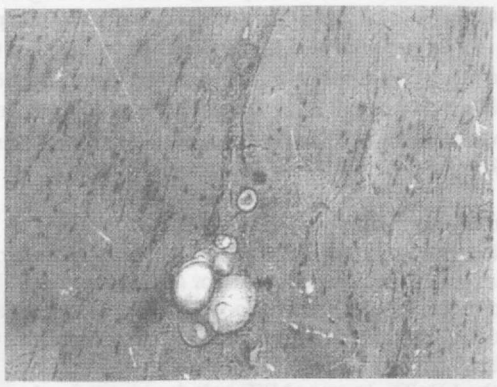

Fig. 3 . Microstructure of m. pectoralis mayor, control, broiler chickens, after curing

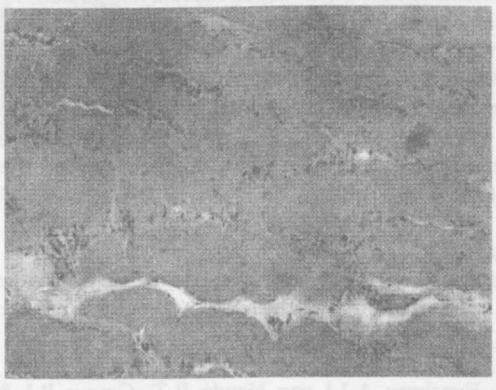

Fig. 4. Microstructure of m. pectoralis mayor, test, broiler chickens, after curing