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Technological Solution for Increasing Efficiency of Using and Shelf-Life Extension of Food Products.

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ABSTRACT

Fowl meat - is useful and easily digestible food product, indispensable for human beings. In this research were investigated the basic theoretical and practical issues related to the methods and possibilities of application of electrochemically activated agents that can be used to prolong the terms of freshness and to improve microbiological, organoleptic and physico-chemical features of quality of food products, particularly poultry. In order to reduce microbial contamination, to improve the quality features and to extend the shelf - life of poultry was proposed technique of processing with electrochemically activated agent that would reduce the level of contamination significantly [8]. A number of experiments was performed. The result was reducing of microbiological contamination of poultry to 1×10^3 CFU /g (allowable value). Shelf - life of poultry was extended from 3 to 6 days.

Keywords: food processing, poultry, electrochemically activated solutions, sodium bicarbonate.

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INTRODUCTION

Many scientists related with food industry are searching for the methods to improve the quality of foodstuffs. Necessity to make them better, safer, with an extended shelf - life is very important today.

The purpose of this investigation was to develop technical and technological methods of increasing the efficiency of animal product (for example, poultry). The object of research were activities for the shelf-life extension, improving quality and safety of poultry. The subject was electrochemically activated agent of green chemistry «Anolyte PEROX» (Delfin Aqua, Russia [6]), prepared on the basis of an aqueous solution of baking soda, by chlorine-free technology. The relevance stems from the need to improve the quality and safety of food services.

Chicken meat was selected as the object of research due to the fact that microbiological requirements for chicken meat are at high level. It is believed that poultry is one of the most polluted raw materials and requires a more careful processing [9].

On the basis of the examination, during which were investigated poultry samples of five producers, it was found that all samples have microbial contamination that exceeds acceptable values [1].

It is important to note that the decrees of the Chief State Sanitary Doctor of Russia №33 of June, 02, 2008 «About the production and circulation of poultry» and №66 of December, 04, 2008 «About using solutions containing chlorine for poultry treatment" forbid using for poultry treatment solutions containing chlorine above requirements set in SanPiN 2.1.4.1074-01 «Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems. Quality Control» (0.3-0.5 mg / liter) [2].

This is due to the fact that the use of chlorine in the water for cooling the poultry leads to accumulation on the surface and in the thickness of the meat by-products of oxidative activity of free chlorine, especially organochlorines (chlorophenols, chloramines, THM and others) that are hazardous for human health. Therefore, in this research all the experiments were carried out using chlorine-free technology.

At the present time, the extension of fresh poultry is possible by [7]:

- cooling and freezing;
- food additives (growth hormones, antibiotics);
- packaging technology (vacuum shrink bags).

The most important step in the development of ecological technologies used to preserve the freshness of meat, is the use in aviculture the modern and universal process of reception - electrochemical activation of water and special aqueous solutions.

It was found that applying of activated water in aviculture allows [3]:

- to increase the weight of meat on 6,7-13,7% by watering chickens;
- to ensure the effectiveness of chicken coops and equipment disinfection without the use of chemical disinfectants;
- to improve the quality of meat;
- to reduce microbial contamination of meat;
- they are effective, ecological, safe, and most importantly: did not contain chlorine.

MATERIALS AND METHODS

In this research work was used Anolyte PEROX - solution made in STEL PEROX installation, based on solution of baking soda in fresh water with concentration in range 100-150 g / l, the final products - Anolyte PEROX and Catholyte.

Anolyte - disinfectant effective against microorganisms. Anolyte PEROX is nontoxic (relates to IV toxicity class), does not affect on environment, can be used in the presence of people with any method of

application. The Catholyte is a non-toxic agent having cleaning properties, is used for cleaning and pre-treatment [3, 4].

In this research was carried out a number of experiments to test the effect of electrochemically activated chlorine-free solution (Anolyte PEROX) for terms of freshness and quality parameters of poultry.

The experiment №1 was considered as trial and consisted of poultry processing with test solution in one step, experiment №2 - in three steps.

For the experiment was chosen broiler chicken which was fresh at the time of purchase. For testing has been selected the average sample of poultry in an amount of 30 grams, and placed in sterilized glass containers (1-2 pieces in each) [figure 1].

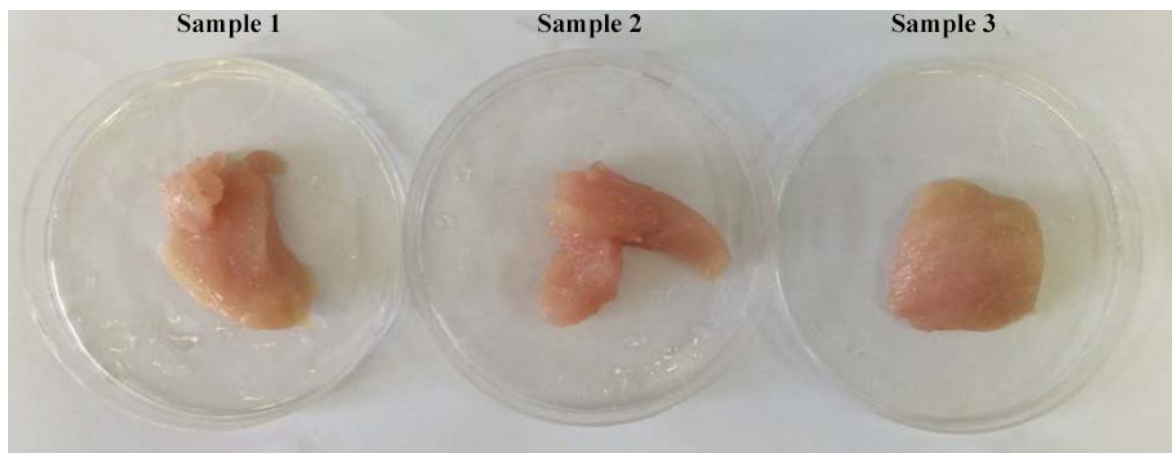


Figure 1: Samples of meat prepared for the experiment.

To prepare for culturing sample №1 (10 grams) was placed in a saline without pretreatment, sample №2 was pretreated with tap water, the sample №3 was treated with solution of «Anolyte PEROX». It was placed in a container with anolyte for 30 minutes and then in saline. After processing the meat was analyzed for total bacterial count (TBC) and terms of freshness.

After obtaining the results of the first experiment, was decided to perform another series of experiments, and to identify the method of ECA-solution processing, which would be the best way to increase the quality of food services, shelf - life and to improve microbiological characteristics of meat.

For the experiment, as well as in the first case was used broiler chicken. It was prepared 3 samples of fresh meat. The samples were placed in saline: №1 without pretreatment, №2 pre-treated with tap water, №3 was treated with a solution of «Anolyte PEROX» by new technology in three steps: firstly it was carefully washed with a solution of the catholyte, then placed in anolyte for 60 minutes, after what the solution was renewed and the meat has been placed in a fresh anolyte solution for another 30 minutes.

RESULTS AND DISCUSSION

After 72 hours of the first experiment were found following results of microbiological analysis: massive microbial growth was observed in all samples [Figure 2], indicating on contamination of meat and that treatment with Anolyte PEROX failed to reduce microbial contamination.

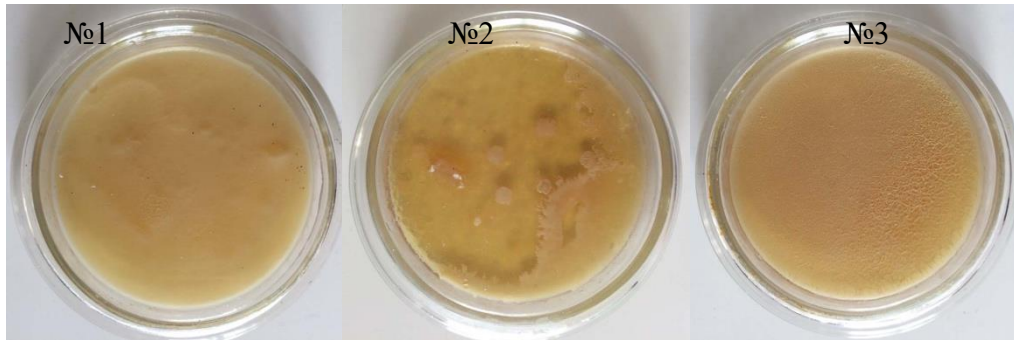


Figure 2: Microbiological analysis. Experiment 1 (after 72 hours).

Wherein everyday were conducted organoleptic analysis of the samples, both in raw state and after heat treatment. The results showed that the meat treated with «AnolytePEROX» became unusable on day 5 of the experiment, despite the fact that no processed meats spoiled on day 3.

Also, we can say that the broth of processed meat had a more saturated odour and was more transparent, what indicate on positive result in an effort to improve the quality of food services. Experiments with copper sulfate also showed that the processed meat keep its freshness longer.

After 72 hours of the second experiment, it was found in the original sample and in the sample treated with tap water a massive growth of colonies, indicating that the test product was contaminated. In the threefold dilution of the sample treated with tap water also was observed confluent growth. However, in the sample treated with «Anolyte PEROX» in threefold dilution was found only 1 colony, which, according to valid regulations on SanPin [1] indicates that the solution coped with his task and destroyed pathogens [figure 3].

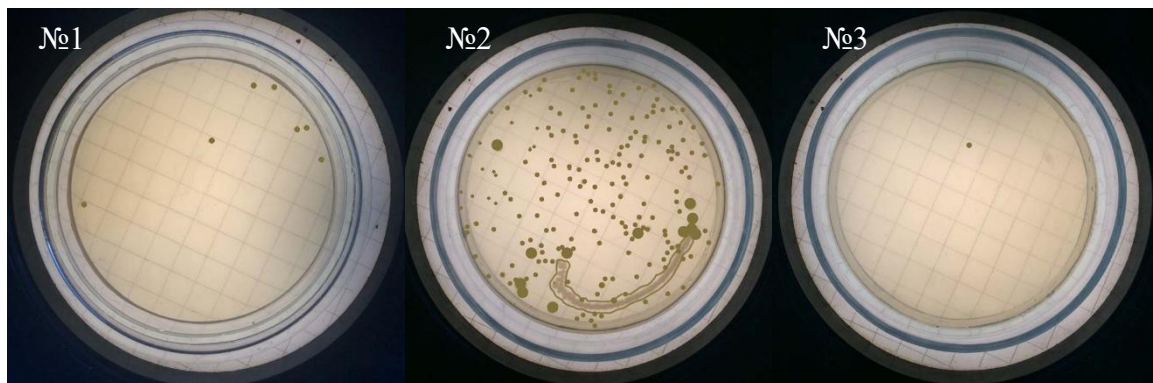


Figure 3: Microbiological analysis. Experiment 2 (after 72 hours).

Based on these data was made a conclusion that developed technology in three stages is effective against microbial insemination of poultry and the intention to improve the safety of food services was reached.

Organoleptic analysis of meat showed that no processed sample spoiled, as in the first case, on day 3 of the experiment: there was a strong stickiness, musty smell of spoiled meat. Meat processed with «AnolytePEROX» kept properties of fresh meat longer than untreated meat, signs of spoilage appeared only on the sixth day.

It was found that «Anolyte PEROX» positively affects on shelf - life, color and condition of the surface of meat. As in the previous experiment, was proceed organoleptic evaluation of broth. The results demonstrated that the broth cooked of meat treated with «Anolyte PEROX» surpassed the broth of unhandled by all criteria.

In this experiment were carried out five analyses of fresh nessusing copper sulphate. On the third day, broth had a large number of flakes, was muddy, its color became greenish after addition of copper sulfate. Meat treated with Anolyte PEROX spoiled on day 6 with the same features of broth.

Based on these data we can conclude that:

- meat treated with Anolyte PEROX had best organoleptic characteristics, both fresh and after heat treatment;
- invention of a new method of processing can extend the freshness of meat from 3 to 6 days;
- designed treatment reduced the indicators of total bacterial count;
- tasks to improve the quality and safety of food services can be considered as fulfilled.

Due to the fact that the Anolyte PEROX - is a new tool in the field of poultry processing, its properties must be subjected to a more detailed study.

THANKS

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