

RESEARCH ON SOME ASPECTS OF POULTRY MEAT QUALITY DEPENDING ON STORAGE

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Abstract

The study of current research is of interest regarding the assessment of the quality of poultry meat depending on the storage conditions. The scientific researches were performed using the following research methods: microscopic visualization, bacterioscopic and bacteriological methods qualitative and quantitative analysis, induction, deduction, the graphics method, the chronological series method. The results of the researches on the quality of poultry meat assortments demonstrated aspects of the quality of poultry meat assortments after 24 hours of refrigeration with a higher weight in the sample of poultry meat of the assortment purchased from the market - 3 isolated bacterial colonies, followed by the poultry meat of domestic origin-2 colonies and 1 bacterial colony determined in store-bought poultry meat depending on various storage conditions. In the scientific research are analyzed the consumption of meat by different categories, the origin of poultry meat sold on markets from Moldova, the analysis of quality based on storage and proposed recommendations related the improving the quality of the poultry meat.

Key words: poultry, meat quality, bacteriology, bacterioscopy, refrigeration, freezing, storage

INTRODUCTION

In the last decade in the Republic of Moldova, there is a significant increase in the volume of poultry breeding in peasant households and in the industrial way with the use of intensive technologies. The Statistical Yearbook of the Republic of Moldova notes a significant increase in the production of poultry meat. This advancement in the production of poultry meat is conditioned by the short period of growth of birds (broiler chickens reaching the mass required for slaughter at 40 days of growth) [2; 6; 8].

Poultry meat is part of the white meat category, it has dietary properties, being very welcome in the diet of children of all ages, adults and the elderly. The population all over the world prefers to eat poultry meat in its natural state, which represents about 80-85% of the weight of the bird's carcass and only 10-12% is directed to the manufacture of minced poultry meat products. Poultry meat processing represents a complex set of processes closely related to biology, meat

chemistry, processing technique and technology, marketing and trade [1; 3; 7; 11].

In the last 20-30 years, poultry processing technology has been developing in the direction of increasing productivity, the main problem of poultry meat processing technologies being the relatively short storage time of finished products both in refrigerated and frozen states. From these considerations, it was found that different bacterial species from the genera *Pseudomonas*, *Clostridium*, *Bacillus*, *Listeria monocytogenes*, *Streptococcus*, *Lactobacillus*, *Enterobacter* usually persist on the surface of refrigerated poultry meat [4, 6, 9; 10; 11]. Also, working on rabbit meat, we found a large diversity of bacterial species [5].

Food poisoning often has possible causes transmitted through meat, given the fact that live birds are carriers of *Salmonella* and *Campylobacter* type microorganisms opposite of which there are currently no effective means to reduce their spread [10; 12, 13].

For these reasons, the main objectives of these researches are to investigate the quality of poultry meat in various storage conditions.

MATERIALS AND METHODS

Practical laboratory research on the quality of poultry meat of different categories from home conditions, market and store after 24 hours of refrigeration and 24 hours of freezing was carried out according to laboratory bacteriological methods by making microbial preparations and cultivation from samples on culture media intended for the identification of microorganisms, regarding its quality.

For the investigations, samples of poultry meat were collected and investigated by the basic methods used: bacterioscopic and bacteriological. Through these basic methods of investigation, quality indices were determined regarding the aspects of determining the number of colonies and cells of the developed microbial species.

RESULTS AND DISCUSSIONS

Analysing the production of meat for the period 2018-2022, we can reveal that the total meat production is approximately 120 thousand tons. In 2022, was produced 45 tons of poultry meat, registering an increase compared to 2021 by 5 tons, but analysing the dynamics of meat production for the period 2018-2022, was registered that the production of poultry meat constitutes approximately 45 thousand tons per year (Fig. 1).

According to the Fig.2 the consumption of poultry meat in Republic of Moldova per inhabitant registered an increase in the period 2020-2022, from 25 kg/pers in 2020 to 27 kg/pers in 2022.

During the period Jan-Nov. 2023, in the Republic of Moldova was imported 25,556 tons of poultry meat (Fig. 3). Analysing the imports of poultry meat, was identified that prevails Ukraine with 49% imports or 12,641. A significant share in imported poultry meat in Moldova owns Poland – 19% and Hungary – 14%.

Investigations of poultry meat samples of different varieties confirm our data regarding

superficial quantitative indices on the culture media of poultry meat varieties of different categories after 24 hours of refrigeration, Figure 4.

These varieties of poultry meat evaluated for the number of colonies developed demonstrate to us the characteristics of the study of the bacterial bacteriological microflora.

During the analysis of the study, it was found with regard to the bacteriological behaviors regarding the number of colonies after 24 hours of refrigeration in different types of meat, that on the gel medium depending on the nature of the analyzed samples, it can be observed that the sample had the largest share of poultry meat of the variety purchased from the market – 3 bacterial colonies isolated, followed by poultry meat of domestic origin – 2 colonies and 1 bacterial colony determined in poultry meat purchased in the store.

The research focused on the quality and quantity of the food product pollution, the bacterioscopic and bacteriological behavior, which allowed the specific characteristics of the bacteria. As a result of the research, simple, classic methods were used to determine the characteristic colonies of bacterial cultures, obtained on selective isolation media, which, in a first stage, were highlighted on nutrient agar, and later on Endo selective media, Levine and Saburov for highlighting the pathogenic characteristics. Within the work methodology, the identification of enterobacteriaceae in general, and species belonging to the Salmonella genus in particular, by microbiological tests were not confirmed.

In the conducted experiments, we used standardized examination methods, first of all, classic bacteriological examinations (bacterioscopic, cultural examinations, isolation and identification of germs) from raw poultry meat refrigerated after 24 hours.

The results obtained using the classical bacteriological methods ensure, in addition to the isolation of the bacteria, the identification of different morphological and cultural characters, on the basis of which the strains can be classified into species. In addition, the bacteriological examination also provides

clues about the source of the infection, thus making it possible to eliminate it. Figure 5 represents the behavior of testing the bacteriological quantitative indices from the depth on the culture media of the poultry meat assortments of different categories after 24 hours of freezing, where it is found that the number of colonies constituted in the frozen meat denotes lower values compared to the

values obtained from following investigations of refrigerated meat samples. Thus, the values obtained regarding the number of colonies in the samples from the chicken meat sold on the market constituted 2 microbial colonies, compared to the values of the samples of the poultry meat from the domestic and store-bought varieties, where the number of colonies was 1 colony from both types of meat of investigated bird.

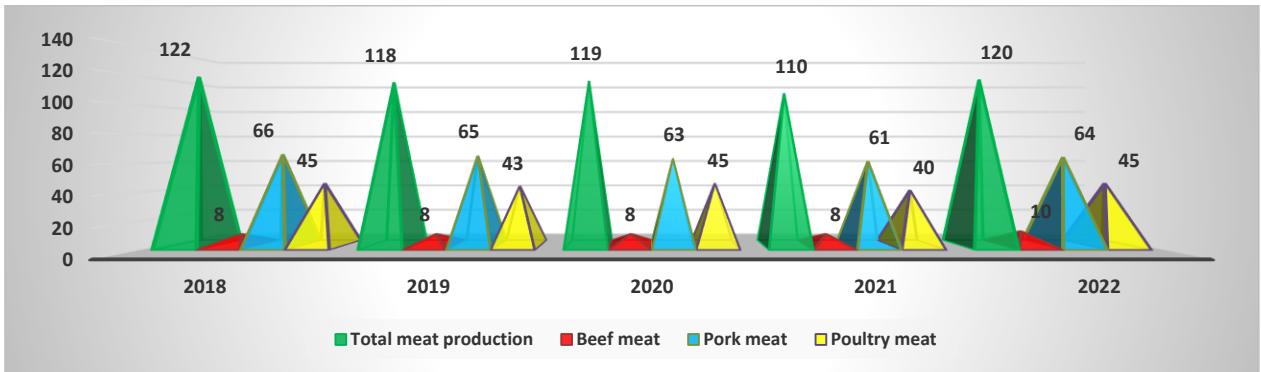


Fig.1. Meat production in the Republic of Moldova for 2018-2022, thousand tons
 Source: elaborated by the author

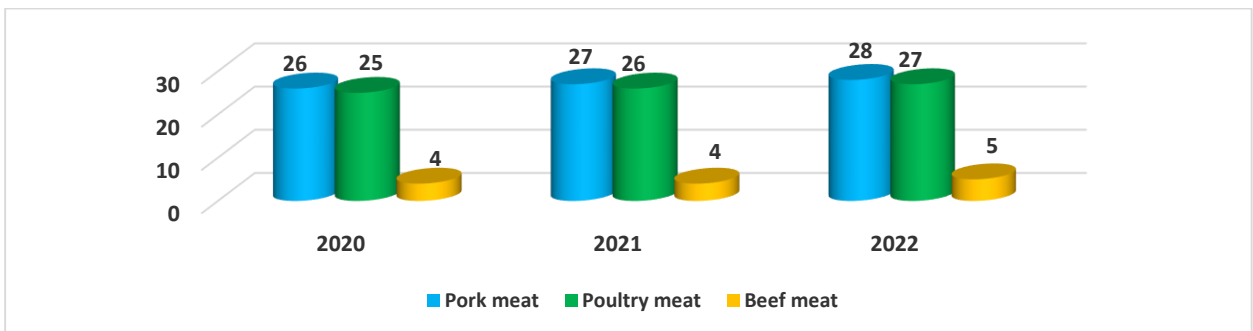


Fig. 2. Meat consumption per inhabitant for 2020-2022, kg/pers
 Source: elaborated by the author

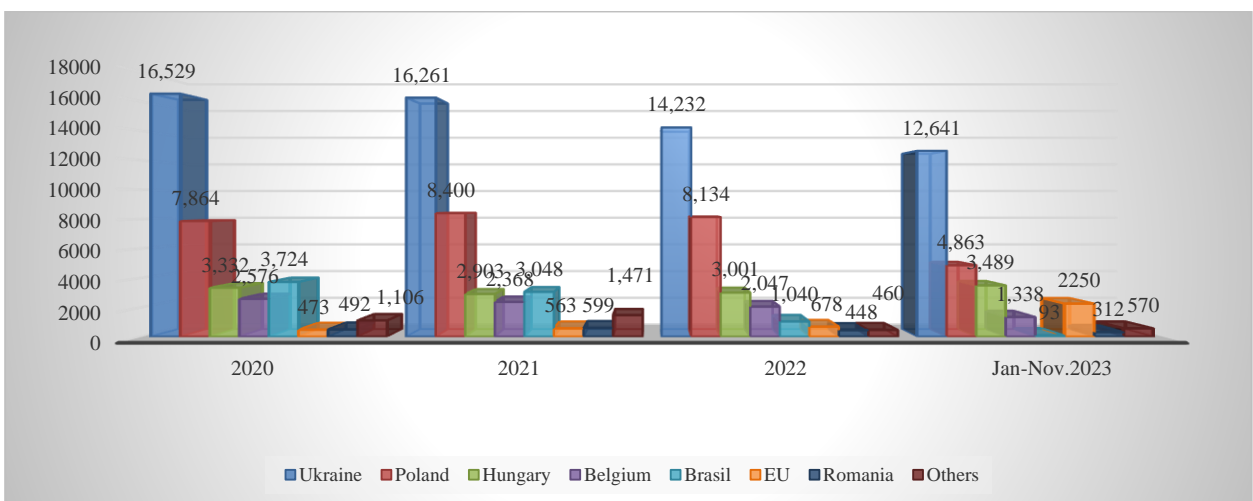


Fig. 3. The origin of poultry meat (and of edible meat) imported in the Republic of Moldova for 2020-Jan/Nov 2023, tons
 Source: elaborated by the author.

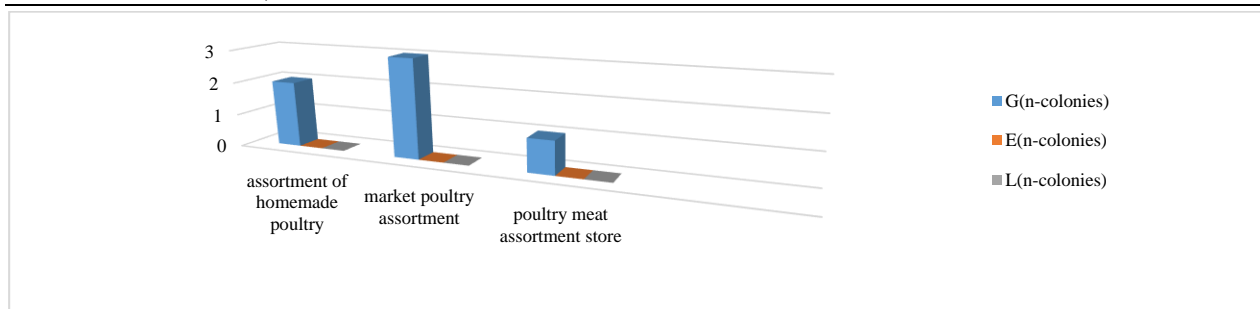


Fig. 4. Quantitative superficial bacteriological indices on the culture media of poultry meat assortments of different categories after 24 hours of refrigeration
 Source: elaborated by the author.

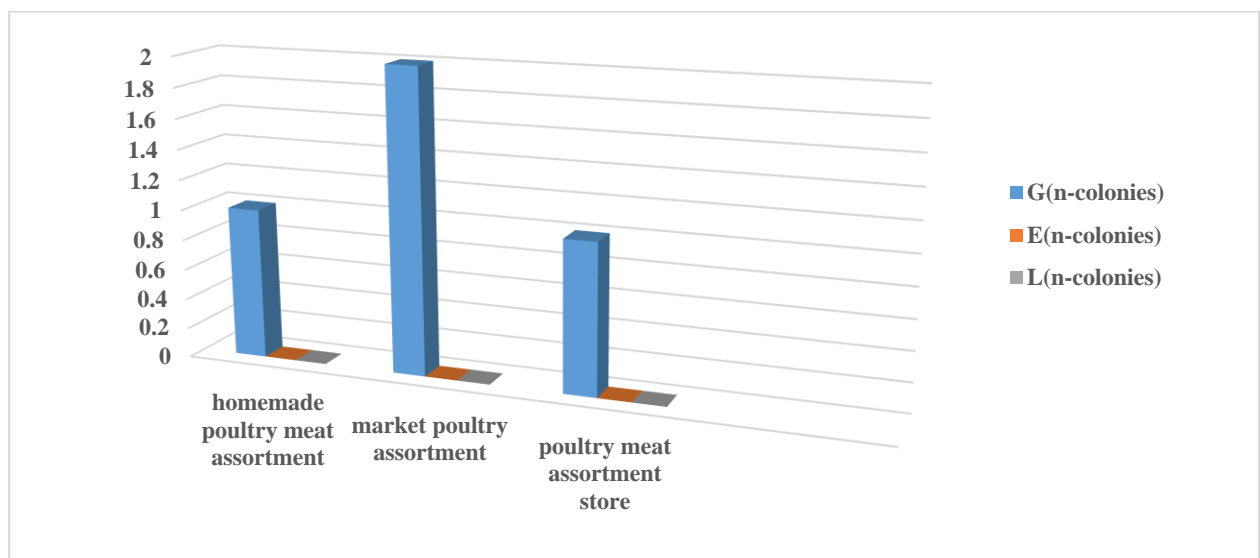


Fig. 5. Quantitative bacteriological indices from depth on the culture media of poultry meat assortments of different categories after 24 hours of freezing
 Source: elaborated by the author.

The data presented are important in the context in which, as a result of the investigations, these colonies were detected, which under microscopy showed saprophytic cocci, confirming a normal bacterial microflora.

Considering these aspects, we conclude that food poisoning through these types of meat is excluded.

It is important to include complex measures for this purpose, aimed both at educating those who handle food to maintain proper hygiene in slaughtering, preparation and marketing units, but also at the proper preparation of food, its correct refrigeration and the prevention of cross-contamination, measures of personal hygiene and reducing the contamination of carcasses in slaughterhouses, sales conditions in the store or at the market.

From this point of view, the aspects regarding the conditions for obtaining and marketing food, especially poultry meat, which is frequently used in human nutrition, are very important. In the framework of our study carried out in samples of poultry meat of different categories, the bacterioscopic quantitative indices shown in Figure 6 confirm some important values obtained.

According to the bibliographic sources, the bacterioscopic microbiological study of meat investigation involves the division of marketed meat into three categories: fresh meat-10 cocci/microscopy; less fresh-30 cocci/microscopy; relatively fresh-more than 30 cocci/microscopy.

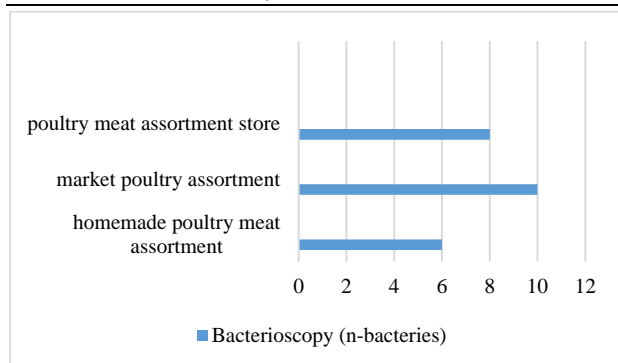


Fig. 6. Quantitative bacterioscopic indices from the depth of poultry meat of different categories after 24 hours of freezing

Source: elaborated by the author.

The bacterioscopic study was the stage after which cocci microorganisms were isolated from the depth of the poultry meat carcass, which confirmed important characteristic values observed in the result of microscopic research.

According to the data in Figure 6, it can be observed that in the samples of meat sold at the frozen market, the number of buns was 10 cocci microscopy cocci in the samples from the depth of the meat compared to the samples of chicken meat sold in store conditions where the number of buns in bacterioscopy was 8 cocci bacterioscopy and the peels homemade meat, where under microscopy the number of lumps constituted 6 cocci under microscopy. Therefore, a preponderance of the number of chickens sold at the market is observed, possibly this preponderance is explained by some less hygienic marketing conditions compared to the poultry meat sold in the store and that of domestic origin.

The importance of these reports from a practical point of view is of interest in that these characteristics were detected, which upon viewing confirmed a normal bacterial microflora characteristic of saprophytic cocci. These reports guide us towards complex measures, which aim towards a correct commercialization of poultry carcasses, refrigeration, freezing and prevention of contamination with various species of microorganisms.

The study revealed in Figure 7 shows quantitative superficial bacterioscopic values of poultry meat of different categories after 24 hours of refrigeration, where it is observed

that the bacterioscopic microflora is more abundant in the samples of meat sold on the market - 14 cocci cells under microscopy, compared to the samples sold in the store with 10 cocci under microscopy of chilled meat and 8 cocci of bacterial cells characteristic of home-grown meat.

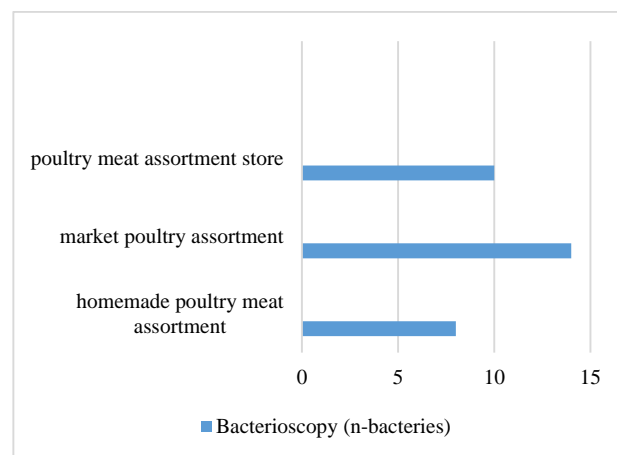


Fig. 7. Quantitative superficial bacterioscopic indices of poultry meat of different categories after 24 hours of refrigeration

Source: elaborated by the author.

On Endo, Levine and Saburov microbial pathogenic species detection media, no pathogenic colonies characteristic of pathogenic species were detected by culture and microscopic visualization after Gram staining. Salmonella and Escherichia species after bibliographic studies remain the main cause of foodborne bacterial diseases reported in China, USA and other countries of the world. Meat products are recognized as one of the major sources of human salmonellosis; however, there is a lack of comprehensive and quantitative data on Salmonella contamination of these foods. Therefore, the objectives of this study were also focused on investigating the prevalence, bacterial load of different varieties of poultry meat for sale. The analysis of the most likely number of microbial colonies and cocci microorganisms detected showed us that the contamination was quite low.

CONCLUSIONS

-The indicators of the study found aspects of the bacteriological behaviors regarding the quality of the poultry meat assortments after

24 hours of refrigeration with a greater weight in the poultry meat sample of the assortment purchased from the market - 3 isolated bacterial colonies, followed by the poultry meat of origin housewife-2 colonies and 1 bacterial colony determined in store-bought poultry meat.

-The behavior of testing the bacteriological quantitative indices regarding the quality aspects from the depth on the culture media of the poultry meat assortments of different categories after 24 hours of freezing showed a number of colonies constituted in the frozen meat lower values compared to the values obtained from the investigations refrigerated meat samples.

-The samples of meat sold at the frozen market confirmed a number of cocci consisting of 10 microscopic cocci in the samples from the depth of the meat compared to the samples of chicken meat sold in store conditions where the number of cocci at bacterioscopy was 8 cocci bacterioscopy and the home meat samples, where on microscopy the number of cocci constituted 6 cocci on microscopy.

-A more obvious preponderance of the number of chickens sold at the market confirms a possible less hygienic sales condition compared to the poultry meat sold in the store and that of domestic origin.

REFERENCES

- [1]Apostu, S., 2006, Microbiology of food products. Vol. I., Risoprint Publishing House, Cluj-Napoca.
[2]Carp-Cărare, C., 2014, General microbiology. Iași: Ion Ionescu de la Brad Publishing House, 245 p.
[3]Fiț, N., 2015, General microbiology. Cluj-Napoca: Academic Pres Publishing House, 248 p.
[4]Golban, R., Golban, A. 2021, The importance of agricultural production and variation of bacterial microflower on the quality of poultry meat in various marketing conditions. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 21(2), 295-302.
[5]Golban, R., Golban, A., 2023, microbial quality of rabbit meat carcasses sold on the local and foreign market . Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 23(2), 273-280.
[6]Neculiță,N.E., 2016, Research on the microbiology of fresh, chilled and frozen poultry meat,

- https://iuls.ro/wp-content/uploads/2021/12/2010_iul_Sandu_Narcisa_Elena_en.pdf, Accessed on April 10, 2024.
[7]Niculiță, P., 2002, Conservation techniques of agro-food produ. Ceres, Publishing House, București.
[8]Oțel, I., 2012, Technology of meat products. Tehnica Publishing House. STAS Collection for Food Industry. Tehnică Publishing House, București.
[9]Pop, C., 2006, Foodstuffs merchandising. Edict Production Publishing House, Iași.
[10]Rotaru, O., Mihaiu, M., 2002, Veterinary hygiene of food products. Pathology through food. Todesk Publishing House, Cluj-Napoca.225 p.
[11]Stănescu, V., 2006, Food hygiene and control. Veterinary sanitary practicum. Fundația România de mâine.
[12]Tașbac, B., 2016, Special veterinary bacteriology. Larisa Publishing House, Câmpulung. 284 p.
[13]Tasbac, B., Țogoe, I., 2018, Microbiologia alimentelor. Larisa Publishing House, Câmpulung Muscel, 101 p.