

MONITORING OF SEPARATED QUALITY INDICATORS OF HERRING IN THE COMMERCIAL NETWORK OF ODESSA

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The article presents the results of a study of individual indicators of the quality of salted herring sold in the agro-food markets of Odessa. The importance of a comprehensive approach to establishing quality parameters of salted herring has been proven. The degree of freshness of the product samples was analyzed based on organoleptic, bacterioscopic and biochemical indicators. The organoleptic study is complemented by a luminescent study of salted herrings.

Also the data of the features of identifying salted herrings of questionable freshness are presented with using an integrated approach. 25% of samples of questionable freshness were found during the study.

Key words: *salted herring, quality, organoleptic examination, bacterioscopy, questionable freshness.*

Formulation of the problem. Today, fish and fish products are in high demand due to their dietary properties.

Fish and seafood, in terms of their nutritional value, are not inferior to meat products. They are easily digested and are a valuable source of trace elements for the human body. However, fish and fish products can accumulate heavy metals [5].

Fish is a perishable product. The duration of fish storage is primarily influenced by temperature. However, freezing is a temporary way of storing fish, which allows to reduce microbial and enzymatic spoilage, but does not prevent the process of oxidative spoilage itself [3].

One of the oldest ways of preserving fish is its salting. The preservation mechanism consists in the effect of table salt on blocking the activity of many enzymes responsible for the metabolism of bacteria. As a result, the function of cell membranes is disturbed and plasmolysis of bacteria occurs [8].

Salted herrings are produced mainly at small enterprises in our country. The raw material for their production is frozen fish from Norway [7]. Herrings are very valuable food product. They contain vitamins A, D, B12, polyunsaturated fatty acids. Literary sources are reported that eating herring leads to a decrease in the likelihood of cardiovascular diseases. Herring fat helps to reduce the size of adipocytes, leading to a decrease in the risk of type 2 diabetes. Also, herrings are rich in antioxidants.

The production of salted herring at small capacities makes it difficult to control the hygienic conditions of obtaining the final product. Thus, it has been proven that the quality of salted herring is directly related to the quality of the raw materials from which they are made.

The main defects of salted fish, which arise as a result of disruption of technological processes and the influence of other factors in the process of storage and sale, include dampness, mustiness, tanning, tightening, saponification, fuchsin, salt burn, rust [6].

As noted by V. A. Gromova and A. V. Smagina (2013), in the process of storing salted herring, lipid indicators and the fatty acid composition of the raw material are very important [4]. And research by L. I. Ambartsumyan and co-authors (2019) shows that a large proportion of fish preserves do not meet the requirements of current standards in terms of physico-chemical and microbiological parameters [1]. At the same time, other literary sources assure that the organoleptic and physicochemical parameters of salted fish samples from domestic producers meets the requirements of the standards, as well as safety indicators [2].

The most effective method of ensuring the safety of salted fish is the system of introducing the HACCP system at fish processing facilities [10].

Parasitic diseases, especially anisakidosis, significantly reduce the quality of salted herring. Thus, T. V. Shevchuk and co-authors (2012) point out that individuals affected by anizakids can be found in herring carcasses that are sold in the agro-food markets of Ukraine. The sanitary assessment of such fish consists in recognizing it as conditionally suitable and the need to disinfect the product [9].

So, salted herring is a valuable food product, but at the same time it is also a perishable product, which imposes a number of strict requirements on the conditions of its production, storage, and sale. The most important importance in preserving the health of the population due to the use of a safe and high-quality product belongs to the conduct of a qualified veterinary and sanitary examination, which consists in the determination of organoleptic, physico-chemical, bacteriological indicators.

The available literature data indicate the relevance of the issue of determining individual quality indicators of herrings entering the trade network.

The goal of the work. The purpose of the work was to determine individual indicators of the quality of salted herring sold in the retail network Odessa.

Materials and methods. It was selected 12 samples of salted herring at the agricultural markets of Odessa for the purpose of research. Samples were taken in different places on a regular basis.

The selected samples were examined organoleptically, bacterioscopically, and biochemically.

During the organoleptic examination, the condition of the surface, color, smell, taste, consistency, integrity of the carcasses, the condition of the gill petals and internal organs were evaluated. In addition, the samples were subjected to a luminescence study.

In the course of bacterioscopic research, the degree of freshness was determined (by making smears-imprints from the surface and deep layers of salted herring carcasses).

Biochemical research was carried out using the FoodScan device and ISISCAN software.

Results and discussion. During an organoleptic examination of samples of salted Norwegian herring, attention was paid to the appearance, color, integrity of carcasses, abdomen, smell, condition of gills, consistency of internal organs. Conclusions were drawn regarding the freshness of the samples based on these indicators.

In the course of organoleptic research, out of 12 samples, 3 samples were found, the freshness of which was recognized as doubtful, which is 25%. Thus, in samples of questionable freshness, a rusty stain, vaguely defined and melted internal organs, an intense specific unpleasant smell and taste, softening of muscle tissue, violation of the integrity of the skin were found.

Luminescent research confirmed the questionable freshness of 3 samples of salted herring.

The results of the bacterioscopic examination are shown in Table 1.

Table 1. Results of bacterioscopic examination of salted herring (n=12, M±m).

Sample No	Number of microorganisms		Conclusion
	surface layers	deep layers	
1	41,5±3,5	17,3±1,2	doubtful freshness
2	4,5±0,3	0	fresh
3	2,2±0,1	0	fresh
4	0	0	fresh
5	5,5±0,5	0	fresh
6	33,8±1,6	16,3±1,5	doubtful freshness
7	3,7±0,2	0	fresh
8	8,2±0,5	0	fresh
9	0	0	fresh
10	4,6±0,3	0	fresh
11	86,2±5,5	38,5±2,1	stale
12	35,3±1,5	12,1±0,8	doubtful freshness

It can be seen from the table that in sample 1, 41.5±3.5 microorganisms were found in smears from the surface layers of the carcass, and 17.3±1.2 microorganisms from the deep ones, which indicates the questionable freshness of the sample. In the 2nd sample, 4.5±0.3 microorganisms were found in smears from the surface layers, and no microorganisms were found from the deep layers, which is characteristic of a fresh product. The 3rd sample also turned out to be fresh: 2.2±0.1 microorganisms were found in smears from the surface layers, and no microorganisms were visualized from the deep layers.

In sample No. 4, no microorganisms were detected in smears-imprints from the surface layers of the carcass, as well as from deep ones. Therefore, the sample is recognized as a fresh. In the 5th sample, microorganisms were found only in a smear from the surface layers - 5.5±0.5 microorganisms. This sample is considered as a fresh. The number of microorganisms in the smears from the surface and deep layers

of the 6th sample indicated its dubious freshness: 33.8 ± 1.6 microorganisms were found in the surface smears-prints, and 16.3 ± 1.5 microorganisms in the deep ones.

As for the 7th-9th samples, they were all recognized as a fresh. Thus, no microorganisms were detected in the swabs-imprints from all three samples. In swabs from the surface layers of the 7th sample, 3.7 ± 0.2 microorganisms were detected, in the 8th sample - 8.2 ± 0.5 microorganisms, and in the 9th sample, no microorganisms were detected.

Microscopic examination of smears-imprints of the 10-12th samples indicated that the 10th sample was fresh: surface smears-imprints revealed 4.6 ± 0.3 microorganisms, no microorganisms were detected in deep ones. 86.2 ± 5.5 microorganisms were found in the smears-imprints from the surface of sample 11, and 38.5 ± 2.1 microorganisms from the deep layers, which indicates the staleness of the product. As for the last 12th sample, it is recognized as doubtfully fresh, because 35.3 ± 1.5 microorganisms were found in the smears-imprints from the surface layers, and 12.1 ± 0.8 microorganisms from the deep ones.

It should be noted that microscopic examination of smears-imprints from samples of salted Norwegian herring confirmed the results of the organoleptic examination. With its help, it was possible to detect a sample of doubtful freshness (sample No. 12), which was recognized as fresh during the previous organoleptic examination, and a stale sample (sample No. 11), which was recognized as doubtfully fresh during the organoleptic examination.

Thus, the bacterioscopic examination made it possible to detect questionable freshness in three samples, which is 25% of the total number of studies, and non-freshness of one sample, which is 8% of the total number of studies. The results of organoleptic studies were confirmed and supplemented with its help.

Biochemical research of samples of salted Norwegian herring was carried out by determining the percentage content of protein, ash, fat, salt, collagen and moisture in it. The obtained results are shown in Table 2.

Table 2. Biochemical composition of salted herring samples (n=12).

Sample No	Indicators, %					
	ash	proteins	fats	salt	collagen	moisture
1	2	3	4	5	6	7
1	$1,67 \pm 0,01$	$16,52 \pm 1,10$	$15,81 \pm 1,21$	$1,24 \pm 0,01$	$1,55 \pm 0,01$	$63,21 \pm 2,61$
2	$1,94 \pm 0,11$	$16,11 \pm 1,21$	$15,65 \pm 1,15$	$1,68 \pm 0,01$	$1,58 \pm 0,01$	$63,04 \pm 3,25$
3	$2,34 \pm 0,16$	$16,20 \pm 1,12$	$15,25 \pm 1,86$	$1,87 \pm 0,02$	$1,50 \pm 0,05$	$62,84 \pm 2,75$
4	$3,39 \pm 0,01$	$15,42 \pm 1,15$	$15,78 \pm 0,67$	$2,02 \pm 0,01$	$1,88 \pm 0,01$	$61,51 \pm 3,50$
5	$2,15 \pm 0,02$	$15,88 \pm 1,32$	$15,75 \pm 1,10$	$1,25 \pm 0,01$	$1,46 \pm 0,01$	$63,51 \pm 1,96$
6	$1,93 \pm 0,01$	$15,95 \pm 1,34$	$15,44 \pm 1,36$	$1,77 \pm 0,01$	$1,51 \pm 0,01$	$63,40 \pm 4,23$

7	1,85± 0,01	15,76± 1,23	15,63± 1,33	2,12± 0,01	1,56± 0,01	63,08± 3,55
8	2,03± 0,01	15,63± 1,23	15,77± 1,34	1,54± 0,01	1,51± 0,01	63,52± 3,77
9	2,86± 0,01	16,43± 1,24	15,55± 1,12	2,02± 0,01	1,88± 0,01	61,26± 2,72
10	3,25± 0,02	15,86± 1,22	15,68± 0,95	1,51± 0,01	1,37± 0,01	62,33± 2,81
11	2,63± 0,02	15,43± 1,11	15,39± 1,01	1,44± 0,01	1,61± 0,01	63,50± 5,21
12	3,19± 0,01	16,12± 0,85	15,25± 1,15	1,77± 0,01	1,83± 0,01	61,84± 2,17
Average value	2,88± 0,03	15,92± 1,18	15,58± 1,19	1,69± 0,01	1,60± 0,01	62,75± 3,2

The results of the table indicate that the average ash content in salted herring samples was $2.88 \pm 0.03\%$, protein – $15.92 \pm 1.18\%$, fat – $15.58 \pm 1.19\%$, salt – $1.69 \pm 0.01\%$, collagen – $1.60 \pm 0.01\%$ and moisture – $62.75 \pm 3.2\%$. The data show that none of the samples were sufficiently salted, because DSTU GOST 815:2008 regulates the content of sodium chloride in low-salt herrings within 4-6%. Such a product can pose a threat to the health of consumers, becoming a source of food infections and food poisoning.

Conclusion. Special attention should be paid to the quality of salted herring, because this product is perishable. During the veterinary-sanitary examination of salted herring, it is advisable to use several research methods in order to more accurately determine the low-quality product. Thus, the organoleptic research established that the total percentage of doubtfully fresh samples was 25% relative to the total amount of the examined material. Microscopic examination of smear-prints from the surface and deep layers of the samples also confirmed the questionable freshness of three samples, representing 25% of the total number of studies, and the staleness of one sample, representing 8% of the total number of studies. Experimental samples of salted Norwegian herring were characterized by biochemical composition with an average ash content of $2.88 \pm 0.03\%$, protein – $15.92 \pm 1.18\%$, fat – $15.58 \pm 1.19\%$, salt – $1.69 \pm 0.01\%$, collagen – $1.60 \pm 0.01\%$ and moisture – $62.75 \pm 3.2\%$.

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МОНІТОРИНГ ОКРЕМИХ ПОКАЗНИКІВ ЯКОСТІ ОСЕЛЕДЦІВ У ТОРГІВЕЛЬНІЙ МЕРЕЖІ М. ОДЕСИ

О.Півень

У статті наведено результати дослідження окремих показників якості солених оселедців, що реалізуються на агропродовольчих ринках м. Одеси. Доведено важливість комплексного підходу до встановлення параметрів якості солених оселедців. Проаналізовано ступінь свіжості зразків продукту на основі органолептичних, бактеріоскопічних та біохімічних показників. Органолептичне дослідження доповнено люмінесцентним дослідженням солених оселедців.

Також представлено дані, щодо особливостей виявлення солених оселедців сумнівної свіжості із застосуванням комплексного підходу. У ході дослідження виявлено 25 % зразків сумнівної свіжості.

Ключові слова: *оселедці солені, якість, органолептичне дослідження, бактеріоскопія, сумнівна свіжість.*