THE IMPACT OF MONO- AND POLYINVASIONS ON MEAT QUALITY IN COMMON CARP (*CYPRINUS CARPIO* LINNAEUS 1758)

IMPACTUL MONO- ȘI POLINVAZIILOR ASUPRA CALITĂȚII CĂRNII LA CRAPUL COMUN (*CYPRINUS CARPIO* LINNAEUS 1758)

CZU: 576.8:597.551.2 **https://doi.org/10.59295/spd2024n.38**

Ion GOLOGAN,
ORCID: 0000-0002-8463-2093
e-mail: gologanionel@gmail.com
Institute of Zoology, Moldova State University
Ștefan RUSU,
ORCID: 0000-0002-3204-5436
e-mail: rusus1974@yahoo.com
Institute of Zoology, Moldova State University
Dumitru ERHAN,
ORCID: 0000-0001-9722-4382
e-mail: dumitruerhan@yahoo.com
Institute of Zoology, Moldova State University
Viorelia RUSU,
ORCID: 0009-0006-2400-7030
e-mail: viorelia1@yahoo.com
Institute of Zoology, Moldova State University

Summary. *The research on common carp specimens revealed a varying impact of parasite infestation on meat quality. Group II, infested with D. extensus, exhibited an insignificant change in protein content compared to the non-infested group. Group III, infested with K. sinensis, experienced a 14.68% decrease in protein, while group IV showed the highest reduction (16.6%). Lipid content decreased, with group II showing a 7.26% decrease, group III 22.25%, and group IV the most significant reduction (42.86%). Moisture content and pH levels increased in infested specimens, reaching their peak in group IV. These findings emphasize the complex effects of parasitic infestation on carp meat quality.*

Keywords: *common carp, protein, fat, moisture content, pH.*

INTRODUCTION

The fishing industry is one of the leading sectors of the modern agro-industrial complex. The majority of fish are harvested from oceans and seas, but fish farming and aquaculture in inland water bodies also play a significant role today.

Fish represents a very important trophic source because fish meat and fat have a

very high digestibility coefficient. Its proteins and lipids provide essential amino acids and essential polyunsaturated fatty acids important for human nutrition. Given the economic importance of fish, great attention is given to invasive diseases caused by parasites and their influence on the morphofunctional and biochemical status of the fish [1, 2, 8].

Parasites can affect the body surface, fins, gills, nasal cavities, organs of the digestive, excretory, circulatory, and reproductive systems, as well as the muscle tissue of fish. The aggressive action of parasites manifests through both mechanical lesions and toxic influence, affeting the fish's body condition. Additionally, parasites can facilitate the transfer of other parasites and reduce the overall population of certain fish species.

High infestation with certain parasites can make fish unsuitable for consumption in some cases. At the same time, there are instances of unjustified rejection of fish raw materials based on the discovery of parasites or pathological abnormalities in the fish [4, 7, 10].

Therefore, the aim of the research was to study the impact of mono- and polyinvasions on the meat quality of the species *Cyprinus carpio* (Linnaeus, 1758) - common carp, specifically: protein content, lipid content, moisture content, and pH.

MATERIAL AND METHOD

Helminthological investigations were conducted on 40 common carp specimens. The parasitological examination was performed according to the following methods: the complete helminthological dissection method for animals and humans developed by K. I. Skryabin and the parasitological examination method developed by Doghel and modified by Bykhovskaya-Pavlovskaya [5, 9]. The parenchymatous organs of fish specimens were examined using a compressor, and the content of the digestive tract was examined after several successive washes.

The scientific works of the authors Bykhovsky and Bauyer provided methodological support for determining helminth species [3, 6]. To quantify helminth contamination, the extensivity of invasion (EI, % - the percentage of host contamination by a species of parasites) and intensity of invasion (II, specimens - minimum and maximum number of parasites of a species) were calculated. For the statistical processing of data, the STATISTICA 12 program was used. To evaluate the impact of mono- and polyinvasions on some quality indices of the muscle tissue, the following methods were used: the Kjeldahl method for determining the protein content and the Soxhlet method for detecting the fat content. The determination of moisture content in muscle tissue was carried out using a method based on the principle of water evaporation as a result of thermal treatment until a constant mass of the dry substance is achieved (at a temperature of 100-105 °C) and determining the change in mass by weighing. The determination of hydrogen ion concentration (pH) was carried out using the portable millivoltmeter.

RESULTS AND DISCUSSION

In order to evaluate the impact of mono- and polyinvasions on the variation of the chemical composition of muscle tissue, a parasitological examination of common carp

was conducted. Based on the level of infestation with one or more species of helminths, the examined common carp specimens were divided into four groups:

- Group I – uninfested;
- Group II – specimens infested with the monogenetic trematode *Dactylogyrus extensus*;
- Group III – specimens infested with the cestode *Khawia sinensis* (II – 10 specimens or more/fish);
- Group IV – specimens infested with both *Dactylogyrus extensus* and *Khawia sinensis*.

Considering the above, in order to evaluate the impact of mono- and polyinvasions on the quality of meat, we determined the protein content, lipid content, moisture content, and pH depending on the parasitic species and the degree of infestation in terms of mono- and polyinvasions (tab.1).

Table 1. The influence of mono- and poliinvasions the biochemical composition of muscle tissue in common carp

Group	Number of the examined fish	Proteins (%)	Fat (%)	Moisture content (%)	pH
I (non-infested)	10	14,58±0,39	4,27±0,21	81,39±0,60	6,46±0,045
II (infested with *D. extensus*)	10	14,59±0,97	3,96±0,75	81,81±0,50	6,50±0,015
III (infested with *K. sinensis*)	10	12,44±0,59	3,32±0,49	82,52±0,52	6,56±0,048
IV (polyinfested)	10	12,16±3,73	2,44±0,17	82,95±0,57	6,62±0,060
Reference: *-P<0,05; **-P<0,01; ***-P<0,001					

It was found that infestation with the mentioned parasites lead to changes in the organoleptic indicators, physico-chemical properties, and biological value of the meat, depending on the intensity of invasion in terms of mono- and polyinvasion.

Thus, in the case of a minor infestation, the organoleptic indicators of the meat change insignificantly. The muscles adhere tightly to the bones, the color and smell are characteristic of fresh fish, the muscle consistency is elastic, and the muscle fiber pattern is preserved. At a moderate intensity of invasion (from 5 to 10 parasites), the muscles break down into separate fibers, the muscle consistency becomes less elastic, and the muscle fiber pattern is blurred. In the case of a significant infestation (more than 10 parasites), the muscles easily separate from the bones, are hydremic, and the consistency is flabby.

As a result of the research conducted on the common carp specimens from group II, infested with *D. extensus*, an insignificant change in the protein content of the muscle tissue was observed compared to the common carp specimens from group I. In the

specimens from group III, infested with *K. sinensis*, the protein content decreased by 14.68% compared to group I. In group IV, polyinfested, the greatest decrease in protein was observed, with a reduction of 16.6% compared to group I, and group II, infested with *D. extensus*.

A decrease in lipid content was also observed in the parasitized carp specimens. In the specimens from group II, infested with *D. extensus*, the lipid content decreased by 7.26% compared to the specimens from group I. In the specimens from group III, infested with *K. sinensis*, the lipid content decreased by 22.25% compared to group I, and by 16.17% compared to group II, infested with *D. extensus*. The lowest lipid content in the muscle tissue was observed in the specimens from group IV. In the specimens from group IV, polyinfested, the lipid content was reduced by 42.86% compared to group I, by 38.39% compared to group II, and by 26.51% compared to group III.

In contrast to the protein and lipid content, which decrease in helminthiases, increased values of moisture content and pH were recorded in the infested carp specimens.

Thus, the moisture content in the specimens from group II, infested with *D. extensus*, increased by 0.52% compared to group I. In group III, infested with *K. sinensis*, the moisture increased by 1.37% compared to group I, non-infested, and by 0.87% compared to group II. The highest moisture content in the muscle tissue was recorded in group IV. In the specimens from group IV the moisture was 1.89% higher than in group I, 1.38% higher than in group II, infested with *D. extensus*, and 0.52% higher than in group III, infested with *K. sinensis*.

In the specimens from group II, infested with *D. extensus*, the pH increased by 0.62% compared to group I. In group III, infested with *K. sinensis*, the pH increased by 1.53% compared to group I, and by 0.92% compared to group II, infested with *D. extensus*. Compared to group IV the pH in group III decreased by 0.91%. The highest pH value was recorded in group IV. Thus, in the muscle tissue of the carp specimens from group IV, polyinfested, the pH was 2.42% higher than in group I, non-infested, 1.82% higher than in group II, infested with *D. extensus*, and 0.91% higher than in group III, infested with *K. sinensis*.

CONCLUSIONS

1. It was observed that parasitic infestation leads to a decrease in protein content in common carp, with the greatest reduction found in polyinfested specimens. Group II, infested with *D. extensus*, showed an insignificant change in protein content compared to the non-infested group, while group III, infested with *K. sinensis*, experienced a 14.68% decrease, and group IV, polyinfested, had the highest reduction (16.6%).

2. The lipid content of common carp muscle tissue decreased significantly due to parasitic infestation. Group II, infested with *D. extensus*, showed a 7.26% decrease, group III, infested with *K. sinensis*, showed a 22.25% decrease, and group IV, polyinfested, had the most significant reduction (42.86%).

3. In contrast to the reduction in protein and lipid content, moisture content and pH levels increased in parasitized common carp groups. Group IV, polyinfested, presented

the highest moisture content and pH, with moisture content 1.89% higher and pH 2.42% higher than the non-infested group. Group II and III also showed increases in moisture and pH levels compared to the non-infested group.

REFERENCES

1. ABDUKHAKIMOVICH K.K. the effect on the morpho-physiological characteristics of the body of carp fish infected with cestodoses. In International Congress on Models and methods in Modern Investigations. 2023 Oct 20, Vol. 3, p. 1-4.
2. ARBUZOVA A.A. Ligulez ryb: Veterinarno-sanitarnaya ekspertiza. In Molodezh' i innovatsii. 2019, pp. 141-144
3. BAUYER, O.N. Opredelitel' parazitov presnovodnykh ryb fauny SSSR. Tom 3. Izdatel'stvo Nauka. Leningrad. 1985. 583 p.
4. BELONOGOVA A.N, KONONOV D.V, KOSTERIN D.Y. Nekotoryye pokazateli kachestva rechnoy ryby Verkhnevolzhskogo basseyna pri zarazhenii ikh lichinkami gel'mintov. In Aktual'nyye voprosy importozameshcheniya v sel'skom khozyaystve i veterinarnoy meditsine. 2016, pp. 20-28.
5. BYKHOVSKAYA-PAVLOVSKAYA, I.E. Parazity ryb. Rukovodstvo po izucheniyu. Izdatel'stvo Nauka. Leningrad. 1985, pp. 90-111.
6. BYKHOVSKIY, B.E. Opredelitel' parazitov presnovodnykh ryb SSSR. Zoologicheskiy institut Akademii nauk SSSR, Tom. 80, 1962. 776 p.
7. KOSYAYEV N.I, IVANOV N.G, ARBUZOVA A.A. Ligulez ryb: veterinarno-sanitarnaya otsenka. In Sovremennyye dostizheniya veterinarnoy i zootekhnicheskoy nauki: perspektivy razvitiya. 2019, pp. 263-267.
8. KUZNETSOVA L.F. Veterinarno-sanitarnaya ekspertiza ryby pri liguleze. In Aktual'nyye problemy infektsionnoy patologii i biotekhnologii. 2018, pp. 172-174.
9. SKRYABIN, K.I. Metod polnykh gel'mintologicheskikh vskrytiy pozvonochnykh, vklyuchaya cheloveka. M.: Izd-vo MGU. 1928, 45 p
10. TAYGUZIN R.S, YEVGRAFOVA Z.S, KUCHAPINA L.A. Veterinarno-sanitarnaya ekspertiza presnovodnoy ryby v norme i pri liguloze. In Izvestiya Orenburgskogo gosudarstvennogo agrarnogo universiteta. 2015, 208-209.