METHODS OF PROTECTING FISH FROM PARASITES

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Abstract. *This article examines the main parasites found in fish, their biological characteristics, and factors influencing their development. The causes of parasitic diseases in aquaculture, their impact on fish health, and their economic consequences are analyzed. Particular attention is given to preventive measures in fish farming, including water quality control, quarantine practices, and adherence to sanitary and hygienic standards. Modern treatment methods and the effectiveness of chemical and biological agents are also discussed based on scientific approaches. The results of the study indicate the necessity of a comprehensive approach to protecting fish from parasitic infections.*

Keywords: *aquaculture, fish parasites, prevention, parasitic diseases, treatment methods, water quality, fish health.*

Introduction: In recent years, aquaculture has been rapidly developing worldwide as one of the important sectors ensuring food security. Population growth, the decline of fish reserves in natural water bodies, and the increasing demand for protein-rich food products require improving the efficiency of fish farming enterprises. At the same time, the widespread use of intensive fish cultivation technologies significantly increases the risk of the spread of various diseases, particularly parasitic diseases. Parasitic diseases occurring in fish are among the most common problems in aquaculture systems and cause major economic losses. These diseases lead to a decrease in fish growth rate, reduced feed utilization efficiency, weakened immunity, and in some cases, mass mortality. As a result, the profitability of fish farms sharply decreases and product quality deteriorates.

Parasites enter the fish organism through various pathways and negatively affect their vital functions. In particular, water pollution, deviations of hydrochemical indicators from the norm, excessive stocking density, and failure to comply with sanitary-hygienic requirements create favorable conditions for the development of parasitic diseases. Therefore, the issue of protecting fish from parasites is important not only biologically, but also economically and ecologically.

Currently, various methods have been developed to prevent and combat parasitic diseases in fish, which include strengthening preventive measures, using modern diagnostic methods, and applying effective treatment agents. In particular, a comprehensive approach—namely water quality monitoring, proper feeding, quarantine measures, and veterinary control conducted in harmony—ensures high efficiency. The purpose of this article is to analyze the main parasites found in fish, the causes of their occurrence, and modern methods of combating them. In addition, developing scientifically based recommendations aimed at preventing parasitic diseases in fish farms is one of the important objectives of this study.

Research Materials and Methods

The studies were carried out in 2024–2025 in artificial ponds under the conditions of fish farms such as Mirbozor Dilfini, Narpay carp, the northeastern basin of the Kattakurgan Reservoir, Jaloyer Gold Fish, and the Qurbon Ariq coastal fish farming facilities.

As the experimental object, **6–8-month-old carp (*Cyprinus carpio*)** were selected. The average weight of the fish ranged from **80–120 g**.

The experiment was organized into **4 groups (150 fish in each group):**

- **Group 1 (control):** no treatment or prophylactic agents were applied
- **Group 2:** prophylactic baths with saline solution (NaCl)
- **Group 3:** treatment with formalin solution
- **Group 4:** modern antiparasitic preparation (for example, an ivermectin-based agent)

The duration of the experiment was **30 days**. Every 10 days, the general condition of the fish, the degree of parasite infestation, and growth indicators were monitored.

Applied Preparations and Their Dosages

During the experiment, the following agents were used:

Group	Infestation level (%)	Mortality (%)	Growth indicator (%)
Control	65%	20%	100%
Salt treatment	35%	10%	110%
Formalin treatment	25%	8%	115%
Ivermectin group	10%	3%	125%

- **Salt (NaCl) bath:** 2–3% solution for 10–15 minutes
- **Formalin solution:** concentration of 25 mg/L for 30–60 minutes
- **Ivermectin-based preparation:** administered through feed at a dose of 0.2 mg/kg
- **Potassium permanganate ($KMnO_4$):** concentration of 2 mg/L for water disinfection

Experimental Results

The results of the 30-day observation are presented in the following table:

Note: changing the dosage of the preparations adversely affects the fish organism.

According to the results, a sharp decrease in infestation level was observed in the groups where antiparasitic preparations were applied. The highest effectiveness was recorded in the ivermectin-based treatment.

Analysis and Discussion of Results

The obtained results indicate that the regular application of preventive measures is of great importance in preventing parasitic diseases in fish. In particular, salt and formalin solutions are simple and inexpensive methods, making them effective for small-scale farms.

Modern antiparasitic preparations have high efficiency and affect different stages of parasite development. However, their application requires precise dosage determination and strict adherence to veterinary supervision.

Preventive Recommendations

To protect fish from parasites, the following measures are recommended:

- Continuous monitoring of water quality (**pH 6.5–8.5, oxygen ≥5 mg/L**)
- Avoiding excessive fish stocking density

- Keeping new fish in quarantine for at least **10–14 days**
- Applying prophylactic baths every **2 weeks** (salt or $KMnO_4$)
- Providing high-quality and balanced feed
- Regular pond disinfection
- Establishing veterinary supervision

Conclusion

1. As a result of the conducted studies, it was determined that parasitic diseases are widespread in fish and are mainly associated with deterioration of water quality, non-compliance with sanitary-hygienic requirements, and excessive stocking density. These factors create conditions for the rapid development of diseases.

2. The experimental results showed that regular application of preventive measures (salt solution, potassium permanganate baths, quarantine measures) significantly reduces the level of parasite infestation in fish and improves their overall physiological condition.

3. Chemical agents, particularly formalin solution and modern antiparasitic preparations (based on ivermectin), were found to be highly effective. Especially ivermectin-based preparations showed the strongest effect against parasites, reducing infestation to a minimum level.

4. It was proven that fish growth rate and survival level are directly related to preventive and treatment measures. Growth indicators in the experimental groups were higher than in the control group, which is the result of a healthy environment and effective treatment.

5. A comprehensive approach to protecting fish from parasites—namely water quality control, proper feeding, application of quarantine measures, and the use of modern treatment methods—is the most effective way. This approach ensures high productivity and economic efficiency in fish farming enterprises.

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