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A Comparison of External Parasites Pathogenic to Fish in Two Fish Ponds Located in Kirkuk Governorate

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Abstract: Water is indeed the essence of life and an essential element for all living organisms. Determining the physical and chemical characteristics of water is crucial for assessing its suitability for various purposes such as drinking, irrigation, and fish farming. Water is the essential support needed by people to carry out their vital functions, including nutrition, swimming, digestion, reproduction, and excretion. During the study period, a total of 288 samples of carp fish (Cyprinus carpio) were collected from two fish farming stations in Daqoq and Lailan, in Kirkuk city, from January to July 2023.

Keywords: Pathogenic External Parasites, Oxygen Requirements, Electrical Conductivity, Chemical Elements.

1. INTRODUCTION

Fish farming in fish ponds is considered a crucial agricultural and economic activity that plays a vital role in meeting food demands and achieving sustainable development. With the increasing importance of this sector, understanding the challenges it faces becomes essential, particularly concerning external parasites that impact the health and success of fish. This report aims to conduct an extensive comparison of pathogenic external parasites in two different fish pond environments, specifically in the regions of Daquq and Laylan [1]. This report aims to analyze and compare pathogenic external parasites of fish in two fish ponds located in the regions of Daquq and Laylan. It will shed light on various species of harmful parasites, their impacts on fish health, as well as the measures taken to control and mitigate the effects of this phenomenon [2].

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2. MATERIALS AND METHODS

Pathogenic External Parasites

Parasites are considered pathogenic agents that affect all living beings, including humans in general and fish in particular. The severity of these parasites is not less than that of other disease-causing agents such as bacteria and fungi. These parasites can lead to significant losses in fish populations. Parasitic infections have substantial economic importance in fish farming as they result in fish weakness, decreased weight, and consumer rejection. Moreover, they can cause mortality in young fish. Parasites also play a significant role in transmitting bacterial and viral diseases among fish, in addition to weakening fish immunity and making them susceptible to various diseases. The type and prevalence of parasitic infections vary based on the type of parasites, temperature levels, farming conditions, the presence of intermediate hosts, and transmission vectors [3]. Some researchers have indicated that understanding variations in the host's diet aids in comprehending the parasite's life cycle. The life cycle of a parasite is determined by the host's dietary relationships. Studying the host's diet is fundamental to understanding the source of parasite infection. Fish are susceptible to various disease-causing agents, and parasites are one of those agents. Fish lose their resistance and become vulnerable to diseases and parasites despite their inherent ability to resist diseases, provided they are in favorable environmental conditions [4]. Parasites affect fish living in natural water bodies as well as those in fish farms. Parasitic infections are influenced by environmental factors such as temperature, pH levels, salinity, dissolved oxygen levels in the water, the geographical location of fish presence, pollution levels, and more. For example, in Iraq, rough fish compete with carp fish in fish farms for environmental space and food resources. Furthermore, rough fish may host certain types of parasites, serving as carriers for those parasites [5]. Water quality refers to various attributes of water depending on the purpose of its usage. Drinking water requires high standards, irrigation water demands lower standards than drinking water, and water intended for livestock (cattle, sheep, poultry, and fish) cultivation necessitates standards closer to those of drinking water. The chemical and physical specifications of Iraqi water suitable for fish farming are provided by the Ministry of Agriculture (2014), measured in mg/L.

Table1 Shows The optimal proportions of the physical and chemical characteristics of the water in which the fish live

Attributes	Optimal Ratio	Allowable Ratio
Hydrogen Ion Concentration	7	6-9
(CL) – Chlorides	10-5	Not more than 10
(SO4) – Sulfates	15	250
(N) – Nitrogen	1.5-0.5	2
(P) – Phosphorus	0.4-1.0	0.5
(Salts)	Less than 1 gram per liter	5 – 1 gram per liter
(Alkalinity)	1.8-2 milligrams per liter	2.5 milligrams per liter
(Acidity)	1.5 milligrams per liter	5 milligrams per liter
(Fe) – Iron	2-1	4.5

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(H2S) - Hydrogen Sulfide	0.00	0.1
(BrO3) – Bromate	20-5	40
(Transparency)	15-10 cm	Not less than 10 cm

Evaluating the water quality for irrigation relies on several criteria, with one of the most important being the total content and ionic composition of salts. This leads to variability in water quality, depending on the type and quantity of dissolved salts resulting from the dissolution or weathering of rocks, such as the dissolution of gypsum and limestone. These dissolved salts can then be transported with irrigation water [6].

First Station in Daquq District
Fish Ponds

- Location: Situated in an agricultural area in Daquq District.
- Number and Area: The farm consists of 5 fish ponds, each with an area of 6 dunums.
- Cultivated Species: Common carp is cultivated in the ponds.
- Dimensions: Pond length is 150 meters, width is 100 meters, and depth is 1.5 meters.
- Surrounding Environment: The area around the ponds is characterized by abundant trees.

Well Water

- Location: Mechanically drilled well with a depth of 155 meters.
- Uses: Well water is used for supplying the fish ponds, irrigation of crops, daily use, and animal watering.
- Pipe Diameter: Casing pipe diameter is 8 inches, and draw pipe diameter is 4 inches.
- Not Used for Drinking: The well water is not used for human consumption.

Comparison

- Fish ponds rely on water extracted from the same farm, which is also used for irrigating crops.
- Well water is used to supply fish ponds, crops, animals, and general daily uses.
- The farm is characterized by its agricultural environment and trees around the ponds.
- Well water serves multiple purposes, including irrigation, supplying the ponds, and watering animals. It's important to note that available water sources play a crucial role in shaping the aquatic environment, agricultural sustainability, and farming practices. Studying the impact of well water usage on water quality in the fish ponds, as well as on the surrounding plants and animals, could provide valuable insights.

Second Station in Laylan District
Fish Ponds

- Location: Located in an agricultural area in Laylan District.
- Number and Area: The farm consists of 6 fish ponds, each with an area of 16 dunums for the six ponds.
- Cultivated Species: Common carp is cultivated in the ponds.
- Dimensions: Pond length is 150 meters, width is 100 meters, and depth is 1.5 meters.

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- Surrounding Environment: The area is characterized by abundant plants, trees, and birds that feed on fish.

Outflow from Pond Water

- Uses: Water exiting from the ponds is used for irrigating nearby crops and various plants.
- 3-3. Well Water:
- Location: Mechanically drilled well with a depth of 140 meters.
- Uses: Well water is used to supply the fish ponds, irrigate crops, trees, and for animal drinking.
- Pipe Diameter: Casing pipe diameter is 8 inches, and draw pipe diameter is 4 inches.
- Not Used for Drinking: Well water is not used for human consumption.

Comparison

- There is a significant similarity between the fish ponds and the well water source in the second station and the first station. The same type of fish is cultivated, and the water is used for multiple purposes, such as irrigating crops and supplying the ponds.
- There appears to be an emphasis on planting plants and trees in the second station and utilizing the outflow water from the pond for this purpose.
- There is also similarity in pipe diameter and well water depth between the two stations. Based on this comparison, it seems that there is a significant similarity between the fish ponds and the use of well water in both stations. This similarity could be a result of similar agricultural and water conditions in the two areas [7].

Nutritional Materials Used

Nutritional materials play a crucial role in the success of fish farming and ensuring their growth and health. This study aims to analyze and compare the nutritional components of the feed used in feeding common carp in the ponds between the stations in Daquq and Laylan. A table will be provided that contains the components of the feed and their percentages in the ponds, comparing the chemical composition and materials used [8].

Analysis of Nutritional Components

- Protein (26%): Protein is an important part of fish feed, contributing to body growth and tissue formation. Ingredients such as fish meal and soybean meal are good sources of protein.
- Carbohydrates (53%): Providing sufficient carbohydrates is important to supply fish with energy. While specific carbohydrate components are not mentioned, they play a crucial role in meeting the energy needs of fish.
- Moisture (8%): This component determines the moisture content in the feed and represents the percentage of water in the feed.
- Ash (6%): Ash refers to the minerals and mineral substances remaining after burning the sample, and this part of the feed can provide essential minerals for fish growth.
- Fiber (4%): Dietary fiber is important for improving fish digestion and digestive system health.

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- Fat (5%): Fat represents an important source of energy and plays a role in the development of the nervous system and other vital functions.

This analysis reflects the chemical composition of the feed used in the nutrition of common carp in the ponds at both stations. The feed provides the necessary proteins, carbohydrates, minerals, and fats for the growth and health of the fish. This analysis will help determine the balance of the feed and its impact on the health of the fish at both stations, as well as identify future steps to improve fish farming in these areas [9].

3. RESULTS AND DISCUSSIONS

Comparison between the Stations of Daqoq and Lailan

Number of Examined Fish

- Daqoq: 105 fish.
- Lailan: 85 fish.

Monthly Average Air Temperature Changes

- Daqoq: Ranging from 12.8 degrees Celsius in February to 44 degrees Celsius in July.
- Lailan: Ranging from 13 degrees Celsius in January to 30 degrees Celsius in June**.**

Monthly Average Water Temperature Changes

- Daqoq: Ranging from 13 degrees Celsius in January to 30 degrees Celsius in July.
- Lailan: Ranging from 13 degrees Celsius in January to 28 degrees Celsius in July.

Monthly Average Water Electrical Conductivity Changes

- Daqoq: Ranging from 409 microsiemens per centimeter in January to 660 microsiemens per centimeter in July.
- Lailan: Ranging from 408 microsiemens per centimeter in January to 666 microsiemens per centimeter in July.

Monthly Turbidity Changes

- Daqoq: Ranging between 209 and 449 nephelometric turbidity units (N.T.U) in different months.
- Lailan: Ranging between 204 and 263 nephelometric turbidity units (N.T.U) in different months**.**

Monthly Total Dissolved Solids Changes:

- Daqoq: Ranging between 295 and 449 milligrams per liter in different months.
- Lailan: Ranging between 214 and 299 milligrams per liter in different months.

Through this comparison, it is evident that there are monthly and site-specific differences in air and water temperatures, electrical conductivity, turbidity, and total dissolved solids between the Daqoq and Lailan stations. These differences may reflect variations in

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environmental conditions and water sources between the locations, which can impact the aquatic environment and water quality in each area[10].

Infection with Head Kidney Worm

By analyzing the infection rate of head kidney worm over the listed months, it became evident that the infection rate at the Daqoq station was generally higher than at the Lailan station. The average infection rate in Daqoq was approximately 14%, whereas the average infection rate in Lailan was around 8%. Lailan can be considered safer for fish health, given the lower infection rate with head kidney worms [11].

Environment and Electrical Conductivity

Several environmental variables were measured at both stations, including air and water temperatures, electrical conductivity, and pH levels. It was observed that there were differences in water and air temperatures between the two stations. Electrical conductivity readings also showed a slight decrease in Lailan compared to Daqoq, indicating the possibility of lower water purity levels in Daqoq [12].

Oxygen Requirements

Dissolved oxygen concentration and oxygen requirements were measured at both stations. According to the Maitland classification (2013), Daqoq can be considered to have oxygen requirements between "questionable" and "deficient cleanliness," while Lailan falls between "moderate cleanliness" and "clean." This suggests that the dissolved oxygen levels at Lailan are closer to the environmental requirements for fish compared to Daqoq [5]**.**

Chemical Elements

Potassium and sodium ion concentrations were measured at both stations. It was found that there were slight differences in potassium ion concentrations between the stations, with the average concentration of potassium ions in Daqoq slightly higher than in Lailan. As for sodium ion concentrations, concentrations were generally similar between the two stations [2].

4. CONCLUSIONS

Based on the provided data, it can be concluded that Lailan exhibits relative improvement in environmental requirements for fish compared to Daqoq. This is reflected in lower rates of head kidney worm infection, higher dissolved oxygen percentages, and oxygen requirements, as well as chemical elements compared to the known environmental classification. This suggests that Lailan provides a healthier environment for fish growth and development compared to Daqoq. Further studies are needed for verification and improvement in both stations .Through a detailed comparative analysis of external parasitic infections in fishponds in the Daqoq district and Lailan subdistrict, this report aims to provide a better understanding of the challenges and opportunities related to fish farming in the region. It will also contribute to identifying effective measures for controlling parasitic infections and achieving the sustainability and success of fish farming in these two locations.

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