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Fungal Infection in Freshwater Fishes of Jabalpur

A Study on Prevalence and Pathogenicity

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Abstract: Freshwater fish are an important source of protein for many countries and provide valuable economic and nutritional benefits to human populations. Among the pathogens affecting fish, Oomycetes are recognized as the second most damaging group to freshwater species. The presence of toxic aquatic fungi in water often leads to infections in major carp fishes, which are also consumed by humans. In the present study, an effort was made to assess the prevalence of fungal infections in major carps from the Jabalpur region (M.P.) and to promote better fishery management within the local population. The study also aimed to isolate and identify the fungal mycoflora associated with infected fish. Out of 51 fish samples examined, 35 (68.65%) were found positive for fungal infection. The isolated fungi included *Aspergillus flavus, Aspergillus fumigatus, Aspergillus niger, Penicillium sp., Rhizopus sp.*, and *Candida sp.* These fungi were obtained from four species of freshwater fishes: *Labeo rohita, Catla catla, Cirrhinus mrigala,* and *Mystus tengara*. Fish diseases can cause severe economic losses in aquaculture by reducing fish growth, productivity, and survival rates. Effective fish health management plays a critical role in disease prevention, control, and the promotion of sustainable aquaculture practices. Over the last decade, fish farming has expanded rapidly worldwide, making fish culture an increasingly important commercial industry. The study of fungal infections in freshwater fishes is therefore of great significance, as it provides valuable insights into the diversity, life cycle, and ecological impact of fish mycoflora.

Keywords: *Major Carps, Pathogen, Fungal infection, Oomycetes.*

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I. INTRODUCTION

Freshwater fishes are an important source of protein for people of many countries and represent one of the most significant groups of vertebrates, providing valuable ecological and economic services to humans in several ways (Hussain et al. 2011, Rubbani et al., 2011). Freshwater resources possess a rich diversity of fish species, including Tor tor, *Catla catla, Cirrihinus mrigala, Cyprinus carpio,Labio rohita, Puntius chola, Mystus seeghala, and Chanda nama* (D. Saini and K.K. Dube,2017). Oomycetes (fungi) are saprophytic opportunists that multiply on fish which are physically injured, stressed, or previously infected. Members of this group are generally regarded as agent of secondary infection arising from conditions such as bacterial invasion, poor husbandry practices, parasitic infestation, and other stress factors. Among freshwater pathogens, oomycetes are considered the second most damaging group after bacteria. One of the most destructive oomycete pathogens of fish is *Aspergillus,* which is endemic to all freshwater and responsible for the decline in natural fish populations. Within the aquatic fungi, species of oomycetes have special importance because of their import on fish health in addition many workers (Sati 1991; Chauhan 1994;) have abo reported that fungi belonging to some of the most virulent parasites).

The primary causes for fungal infection include fluctuations in water temperature, poor water quality, and injuries due to trauma or excessive handling (Chauhan et al.,2014) fungi typically invade through damaged skin or open wounds, leading to secondary infections. Several factors contribute to the development of fungal infections in fish, affecting either the fish or the pathogen itself. It is generally a combination of factors, rather than a single

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condition, that ultimately leads to infection. Fungal diseases such as saprolegniasis are often secondary, appearing after handling stress, traumatic skin damage, overcrowding, pollution, or concurrent bacterial, parasitic, or viral infections.

Aquatic fungi present in surface water infect animals, causing diseases such as lobomycosis, acute ulceration (ulcerative dermal necrosis), and gill rot in fish. Water molds and other aquatic fungi from freshwater sources are known to infect a variety of aquatic species. The presence of toxic aquatic fungi can also threaten human health through the consumption of infected aquatic organisms such as fish, prawns, and spriulina (Magwaza et al., 2017)

Many fungal infections are opportunistic, occurring when fish are under stress due to unfavorable environmental conditions or concurrent infections. Fungi attack fish eggs, fry, fingerlings and adult fish, causing significant losses in both natural and commercial aquaculture system (Bangyeekhum and Sylvie,2001).

India is the third- largest fish- producing country in the world, contributing approximately 7.96% to its GDP. The fisheries sector supports the Livelihood of over 28 million people, particularly among marginalized and vulnerable communities. The central Indian state of Madhya Pradesh produced over 200 thousand metric tons of fish in the year 2020. Over the past decade, Fish farming has expanded rapidly across the world, making aquaculture a commercially important global industry. However, diseases in fresh water fish remain a major threat to achieving optimum production, and economic sustainability in aquaculture.

As Major carps from the Narmada River are a vital source of protein for people in the Jabalpur region, the study of fish mycosis holds great importance for fishery management and for preventing the spread of fish and zoonotic diseases. Mycotic diseases of fish are a genuine risk to the sustainability of the aquaculture industry. (Kwanprasat et al., 2007). The aim of the present study is to investigate fungal infection in major carp fishes of Jabalpur, to compile information regarding fungal diseases in fish, and to contribute to the growing body of literature in this field.

II. MATERIALS & METHODS

- *Collection of Infected Fish Samples*

Infected fish samples were collected from different sites along the Narmada River, including private and government fish farms, local fish shops, and from various fish vendors and hawkers. The collected fishes were immediately transported to the laboratory in sterile polythene bags and then transferred into a well-aerated aquarium containing clean freshwater maintained at room temperature (25–30°C).The total length (TL) and body weight (BW) of each fish were recorded, and their health status was carefully observed. To prevent secondary contamination, each fish was surface-disinfected by dipping in 1% formaldehyde for 1–5 minutes, followed by immersion in 70% ethanol, and finally rinsed several times with sterilized distilled water.

- *Preparation of Culture Media*

Fungal culture media were prepared using Sabouraud Dextrose Agar (SDA), Malt Extract Agar (MEA), and Potato Dextrose Agar (PDA). The pH of each medium was adjusted to neutral (7.0). Approximately 5 mL of medium was poured into sterile petri plates and autoclaved at 121°C for 30 minutes under 15 lbs/in² pressure for sterilization. After sterilization, antibacterial agents were added aseptically to inhibit bacterial growth.

- *Isolation and Identification of Fungi*

Fungal inoculations were made by transferring small portions from the infected fish body parts (skin, scales, gills, and intestine) onto the prepared agar plates. The inoculated plates were incubated at 28–30°C, and fungal growth was observed for 7–15 days. For microscopic examination, direct smears from infected tissues were prepared and stained with Lactophenol Cotton Blue (LPCB) solution. Slide cultures were also prepared from each fungal colony and stained similarly for detailed observation. Yeast isolates were identified using the yeast identification program (Kwanchung and Bennett, 1992) and by performing chlamydospore formation, germ tube tests, and biochemical analyses on actively growing yeast strains. Mold isolates were identified based on their cultural characteristics, and micro- and macromorphological features.

III. RESULTS

This study was conducted to investigate fungal infections in cultured freshwater major carps of the Jabalpur region. A total of 51 fish samples belonging to four species — *Labeo rohita, Catla catla, Cirrhinus mrigala*, and *Mystus tengara* — were examined to identify fungal pathogens based on clinical signs and symptoms.Among the examined fishes, 35 (68.62%) were found positive for fungal infection, while 16 (31.37%) were negative. Infected fishes exhibited visible clinical symptoms such as ruptured skin, eroded scales, damaged fins, and lesions on the skin and gills. The total length (TL) and body weight (BW) of the infected fishes ranged from 25–30 cm and 118–140 g, respectively.

Fungal isolates recovered from infected tissues included four genera and several species: *Aspergillus fumigatus, Aspergillus niger, Aspergillus terreus, Aspergillus flavus, Rhizopus sp., Penicillium sp., and Candida spp*. These fungi were isolated from the scales, gills, and intestines of the infected fish.

Table 01 shows four major carp species examined in the study: *Mystus tengara* (22 samples), *Labeo rohita* (12 samples), *Catla catla* (10 samples), and *Cirrhinus mrigala* (7 samples). Among these, *Mystus tengara*

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showed 16 positive cases, *Labeo rohita* showed 10 positive cases, *Catla catla* showed 5 positive cases, and *Cirrhinus mrigala* showed 4 positive cases of fungal infection. Overall, out of 51 fish examined, 35 (68.62%) were positive and 16 (31.37%) were negative for fungal infection.

Figure 03 presents the fungal genera and species isolated from infected fish samples. A total of three fungal genera were identified, including one species of *Aspergillus*, two species of *Rhizopus*, two species of *Penicillium*, and two species of *Candida.*

Table 1 Positive & Negative Species

S.No	Name	Positive	Negative	Total
1	*Mystus tengara*	16	06	22
2	*Labeo rohita*	10	02	12
3	*Catla- catla*	05	05	10
4	*Ccrrhinus mrigala*	04	03	07
	Total	35(68.62%)	16(31.37%)	51

Fig 1 Infected Fishes - *Mystus tengrara, Catla catla, Labio rohita*

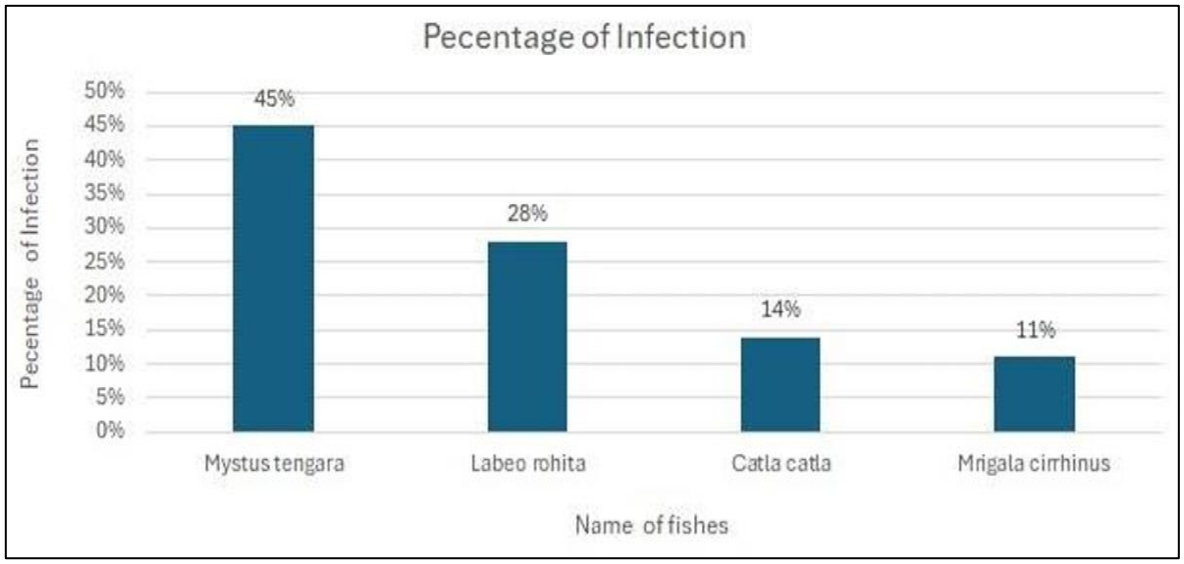

Fig 2 Histogram Showing Percentage of Infection in Different Fish Species

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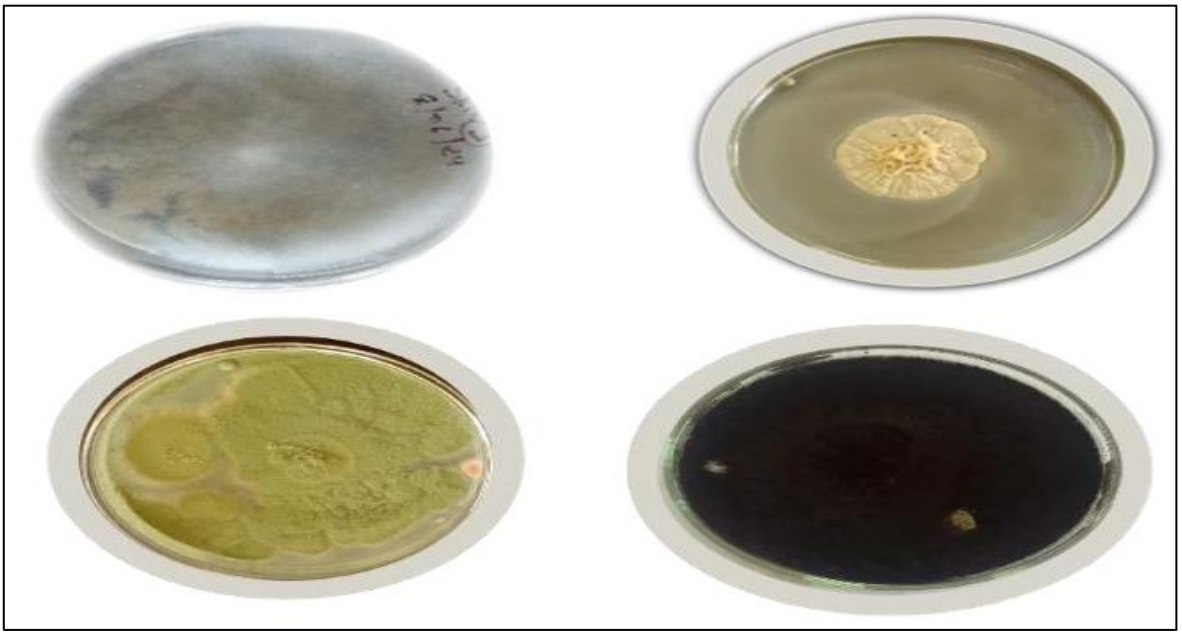

Fig 3 Different Isolated Fungal Species- *Rhizopus, Aspergillus* lentulus, Aspergillus flavus, Aspergillus Niger

Table 2 Total Number of Species Identified

S. No	Name Of Species	Number of Species
1	*Aspergillus flavus*	15
2	*Aspergillus terreus*	12
3	*Aspergillus fumigatus*	11
4	*Aspergillus niger*	11
5	*Aspergillus species*	02
6	*Penicillium species*	05
7	*Candida species*	02
8	*Rhizopus species*	02
	Total	60

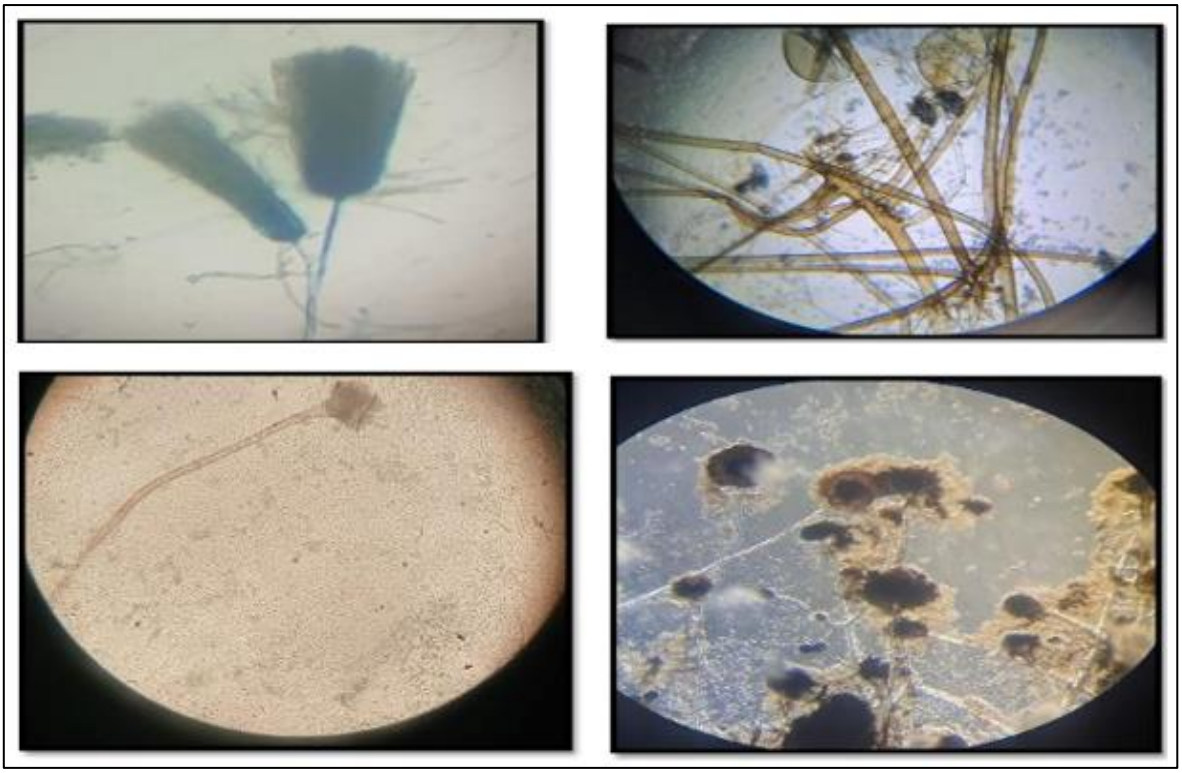

Fig 4 Microscopic Slides Showing Different Fungal Species

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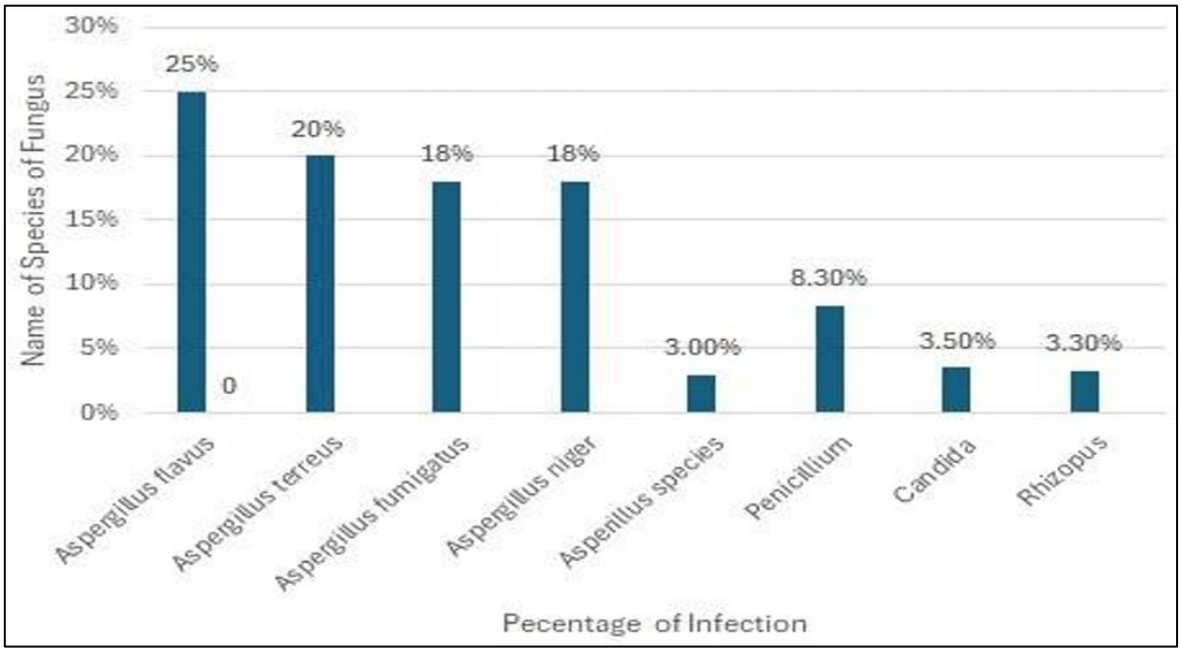

Fig 5 Histogram Showing Percentage of Infection and Fungal Species Identified in Fish

Table 3 Organ wise Distribution of Positive/ Negative Sample and Isolated Fungal Species in Fish

S. no	Fish organ	No of sample	Positive	Negative	Isolated Fungus species	Isolated no. of species
01	Skin	51	21	29	Asp*ergillus fumigatus*	06
					Aspergillus flavus	05
					Aspergillus niger	04
					Aspergillus terreus *Penicillium*	03 02
02	Gill	51	20	31	*Aspergillus terreus* *Aspergillus niger*	05 04
					Aspergillus flavus	04
					Aspergillus fumigatus *Aspergillus species* *Penicillum*	02 02 03
					Candida	02
03	intestine	51	18	33	*Aspergillus flavus* *Aspergillus terres*	06 04
					Aspergillus niger	03
					Aspergillus fumigatus *Rhizopus*	03 02

From 51 infected fish, samples of gill, skin, and intestine were collected. Out of these, 20 samples of fish gills and skin were processed. From the processed samples, seven different fungi were isolated: *Aspergillus flavus, Aspergillus niger, Aspergillus fumigatus, Aspergillus terreus, Penicillium species, Candida species, and Rhizopus species.*

The highest rate of infection was observed in the skin (41% of the fish), while the lowest was recorded in the intestine (35%). The maximum infection occurred during the spring season, particularly in the month of August, whereas the lowest infection was found in March.

The percentage occurrence of isolated fungi was as follows:

Aspergillus flavus– 25%, *Aspergillus terreus* – 20%, *Aspergillus fumigatus* – 18%, *Aspergillus niger* – 18%, *Penicillium species* – 8.3%, *Candida species* – 3.3%, *Rhizopus species* – 3.3%.

IV. DISCUSSION AND CONCLUSION

The present study was conducted to assess the prevalence of fungal infections in freshwater fishes collected from various sites in the Jabalpur region (M.P.). A total of 51 fish samples belonging to four species — *Mystus tengara, Labeo rohita, Catla catla,* and *Cirrhinus mrigala* — were examined. Among these, 35 fishes (68.62%) were found to be infected with fungal species, indicating a relatively high rate of fungal prevalence in the region's aquatic ecosystem.

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The dominance of *Aspergillus* species in the infected fishes suggests that this genus plays a major role in fish mycoses in the Jabalpur region. The most frequently isolated fungi were *Aspergillus flavus* (25%), *A. terreus* (20%), A. fumigatus (18%), and A. niger (18%). Other genera, including Penicillium, Candida, and Rhizopus, were also recorded in lower percentages. These findings are consistent with previous reports by Chauhan et al. (2014) and Kwanprasat et al. (2007), who documented Aspergillus as one of the major pathogenic fungi responsible for fish infections in freshwater habitats.

In the present investigation, the highest rate of infection was recorded in the skin (41%), followed by the gills and intestine. This can be attributed to the direct exposure of the skin to environmental contaminants and pathogenic spores in water. Injuries caused by handling, overcrowding, or poor water quality provide suitable entry points for fungal spores to invade the tissues.

Seasonal variation was also evident in the results. The highest incidence of fungal infection was observed during the spring season, particularly in August, while the lowest infection rate occurred in March. Seasonal fluctuations in temperature and water quality are known to influence fungal growth and spore dispersal, which may explain the observed pattern.

The isolation of opportunistic fungal genera such as Candida and Rhizopus indicates that stress factors, including pollution and reduced immunity, may predispose fishes to fungal infections. The high infection rate observed in this study highlights the importance of maintaining optimal environmental conditions and good aquaculture management practices to prevent fungal diseases in freshwater fish populations.

Overall, the present findings emphasize that fungal infections pose a significant threat to fish health and aquaculture productivity in the Jabalpur region. Effective monitoring, regular screening, and improved water quality management are essential to minimize economic losses and ensure sustainable fish culture practices.

Shahbazian et al. (2011) isolated Penicillium expansum, Penicillium citrinum, Aspergillus terruse, Aspergillus clivatus. Fayioye et al.92008) isolated five different species of fungi including Fusarium, Aspergillus, Rhizopus, mucor,and penicillium from & edible smoke-dried fresh water fishes. Junaid et al. (2010) isolated 7 fungal species from stock fish in nigeria and there included Aspergillus flavus, Aspergillus fumigatus, Aspergillus Niger, Trichophyton verrucosum, Rhizopus, mucor and penicillum species. Fungal, are considered Secondary microorganisms in fresh water fish, causing saprolegniosis disease with high mortality rate in fish (Iqbal et al., 2012). Aspergillus flavus spores were found in the mucus of diseased silver carp (Babusu Khanah et al., 2012; Salechhi et al., 2020).

REFERENCES

[1]. Bangyeekhum, S., & Sylvie, M. (2001). Fungal infections in freshwater aquaculture systems: Impacts on fish eggs, fry, and adult fish. *Aquaculture Research*, *32*(5), 345–352.

[2]. Chauhan, R., & Qurashi, T. A. (1994). Studies on oomycete infection in freshwater fishes. *Journal of Inland Fisheries Society of India*, *26*(2), 99–106.

[3]. Chauhan, R., Gupta, R., & Singh, R. (2014). Environmental factors influencing fungal infections in freshwater fishes. *Journal of Aquatic Animal Health*, *26*(3), 178–185.

[4]. Fayioye, O. O., Fagbohun, T. R., & Olubanjo, O. O. (2008). Fungal infection and nutrient quality of traditionally smoked dried freshwater fish. *Turkish Journal of Fisheries and Aquatic Sciences*, *8*, 7–13.

[5]. Food and Agriculture Organization. (2016). *Aquaculture health management and fungal diseases in freshwater systems*. FAO.

[6]. Hussain, S. M., Javed, A., Javid, T., & Hussain, N. (2011). Growth responses of *Catla catla*, *Labeo rohita*, and *Cirrhinus mrigala* during chronic exposure to iron. *Pakistan Journal of Agricultural Sciences*, *48*, 225–230.

[7]. Iqbal, Z., Sheikh, U., & Mugal, R. (2012). Fungal infections in some economically important freshwater fishes. *Pakistan Veterinary Journal*, *32*(3), 422–426.

[8]. Junaid, S. A., Olarubofin, F., & Olabode, A. O. (2010). Mycotic contamination of stock fish sold in Jos, Nigeria. *Journal of Yeast and Fungal Research*, *1*, 136–146.

[9]. Kwanchung, B., & Bennett, J. W. (1992). Yeast identification techniques for aquatic samples. *Mycological Research*, *96*(4), 321–326.

[10]. Kwanprasat, T., Chinabut, S., & Limsuwan, C. (2007). Pathogenicity of *Aspergillus* species in freshwater fish habitats. *Aquaculture International*, *15*(6), 489–498.

[11]. Magwaza, N. M., Nxumalo, E. N., Mamba, B. B., & Msagati, T. A. M. (2017). The Occurrence and Diversity of Waterborne Fungi in African Aquatic Systems: Their Impact on Water Quality and Human Health. *International journal of environmental research and public health*, *14*(5), 546.

[12]. Rubbani, B., Afzal, M., Mubarik, M. S., Salim, M., & Hussain, S. M. (2011). Estimation of apparent digestibility coefficient of soybean meal in major carp diets. *Pakistan Journal of Nutrition*, *10*, 213–218.

[13]. Saini, D., & Dube, K. K. (2017). Diversity of freshwater fishes and their ecological significance. *International Journal of Fisheries and Aquatic Studies*, *5*(2), 12–18.

[14]. Sharaburin, S. V., & Bazderkina, S. A. (1990). Alternata infection in fish. *Veterinariya (Moskva)*, *9*, 42–45.