ISSN: 0976-7126
Kumar *et al.*, 14(8-9):36-42, 2023

International Journal of Pharmacy & Life Sciences
Open Access to Researcher

Fresh Water Fish Diseases in India and its Diagnosis: A Review

Ankit Kumar*, Vipin Kumar Saini, Vikas Kumar Tyagi, Ashu, Saba Rana and Disha Sharma

Department of Bioscience, Shri Ram College, Muzaffarnagar, India

Article info

Received: 11/07/23

Revised: 15/08/2023

Accepted: 20/09/2023

www.ijplsjournal.com

Abstract

India is one of the largest producers of aquaculture, providing significant economic support to many people in the country. However, the emergence of diseases has become a major obstacle to aquaculture production and marketing. Many stress factors such as poor physicochemical and microbial quality of aquaculture, poor food quality and high density can lead to diseases due to infectious diseases. The presence of different types of diseases and parasites poses a serious threatand causes serious damage to fisheries, including increased morbidityand mortality, reduced growth and increased costs of vaccination and control measures. Therefore, this review highlights thediseases of freshwater fish in India and their management with the aim of promoting sustainable aquaculture.

Key-words: Aquaculture, Biofloc System, Disease-Resistant, Treatment, Control Measures

Introduction

Aquaculture is a rapidly growing food industry with a total global production of122.5 million tonnes in2020 (SOFIA, 2022). This is estimated to be 8.64tonnes of India's aquaculture production in2020 (SOFIA, 2022). The demand for fish, coupled with the depletion of ocean catches, has put immense pressure onthe aquaculture sector, increasing the need for intensive labour. Many organisms suitable for culture are grown in different cultures. There are three main types of culture: open culture, semi- closed culture and closed culture. Open culture includes box culture, fence culture, shelf culture, and raft culture. Semi-closed cultures include ponds and water cultures, and closed cultures include biofloc systems and reticulating aquaculture systems (RAS). Fish are susceptible to many diseases, especially when raised in controlled conditions [1] . Causes of disease include poor farming practices, stress, immune suppression, high livestock rates, poor management, and pathogen aggressiveness.

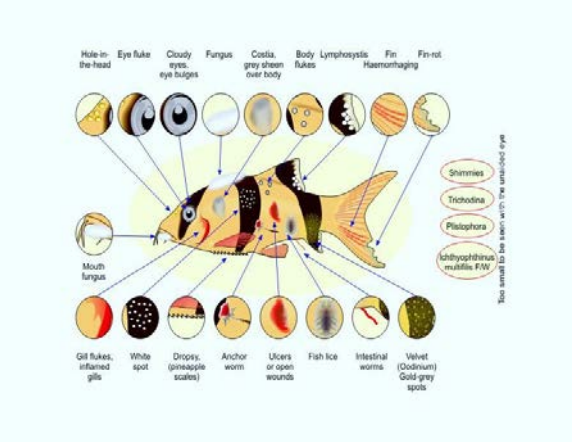
Well-managed ponds are generally disease-free, but serious problems can occur due to lack of maintenance, husbandry and management. As they say, prevention is always better than cure, so steps should be taken to prevent diseases from entering the breeding pond. Although there are many treatment options, these can be difficult and often impractical for ponds with large fish populations. The best way to prevent infection is to remove and discard infected fish from the pond. Whenever possible, choose disease-resistant fish for breeding.

***Corresponding Author**

ISSN: 0976-7126
Kumar *et al.*, 14(8-9):36-42, 2023

Kinds of diseases in aquaculture

The emergence of aquaculture diseases is due to the interaction between the host, the organism, and the environment. There are three types of diseases: infection, including bacterial, viral, fungal, and parasitic.



The World Health Organization (WOAH) or the International Office of Animal Diseases (OIE) lists the main diseases (OIE, 2021), which are infectious diseases in fish farming, carp edema virus, hematopoietic necrosis virus, Lame virus, and latent Paralytic virus noda virus. virus, salmon anemia virus, tilapia lake virus, hematopoietic muscle necrosis virus virus,herpes line disease, sea bream irido virus, salmon alpha virus, carp spring viremia, and viral hemorrhagic sepsis cause great economic losses worldwide [2].

Fungal diseases

Onlya few species offungiare considered fishdiseases. These animals are commonlyfound inwater and like to exploit unfavorable conditions to kill fish, causing skin damage. Most of the fungal diseases recorded in carp culture are caused by Oomycetes fungi, Saprolegnia, Achlya and Hyphomycetes genera. Diseases caused by these fungi are called “Saprolegnia. Oomycete fungi are widelyfound inthe aquaticenvironment and areconsidered important pathogens. Thesearegenerally considered to be saprophytic organisms, secondary infectious organisms that readily colonize tissues damaged by bacteria or viruses (Mukherjee, 2002). Fungal infections of the skin or fins appear as white to off-white bloom-like growths. These structures are usually composed of numerous fungal hyphae and are evident on microscopic examination [3]. Saprolegnia is particularly beneficial in overwintering ponds with high stocking levels, such as cage culture or intensive aquaculture areas. Although reports of Saprolegnia are numerous, it is more common in culture and is usually low in incidence in pond culture, where control is poor unless control is present. Diseases in aquaculture ponds can be caused by Brachyspora and Hypospora bacteria as well as saprolegnia. Another important fungal disease affecting the economy of fish farming is fungal infection (EUS).

Parasitic diseases

The productivity of aquaculture systems is hampered by the presence of many fish parasites. Among many diseases, parasitic diseases have become a major and alarming problem and have led to a decline in the fresh seafood industry of India. Fish parasites multiply in good conditions, affect the health of the fish and often lead to increased mortality. These organisms disrupt the host's nutrition, disrupt metabolic processes, affect the functioning of the digestive system and cause damage to the nervoussystem[4].MostoftheprotozoalikeIchthyostigmasp.andmonogenictrematodeslike Trichodina sp. and Dactylogyrus spp. and large crustacean ectoparasites including Gyrodactylus sp.as well as Lernae spp., Argulus spp. and Ergasilus cause serious damage to fish farms in India.Details of infectious diseases reported in India and their treatments are shown in Table 2 [5].

Bacterial Diseases

Diseases caused by bacteria are quite common and cause serious problems in terms of health management. These bacteria are usuallysaprophytic and will become pathogenic onlywhenthe body balance of the fish is disturbed, food is notavailable or various stresses such as poor water qualityand overstocking create a disease outbreak. These diseases are usually found in fish eggs, fry and fingerlings and cause high mortality rate [6]. These diseases mostly act as infectious diseases; many important diseases such as motile Aeromonas septicaemia, Edwardsiosis, Pseudomonas septicaemia, flexobacteriosis, vibriosis, gill disease, branching bacillus disease and intestinal sepsis have been reportedinIndiancarpculture.

DetailsofinfectiousdiseasesreportedinIndia andtheir treatmentsare shown in Table 2.

Viral diseases

More than 125 different viruses have been found in fish worldwide and new discoveries are being made continuously. However, there are reports of some diseases affecting Indian fin fish. Virusessuch as carp herpesvirus-2 (CyHV-2), KOI virus (KIRV), carp edema virus (CEV), cytomegalovirus andgoldfishhematopoieticvirus necrotic herpeshave beenreportedinornamentalfarming. Thereare reports of the emergence of tilapia lake virus (TILV) in the Indian subcontinent [7].

Diseases diagnosis

Thelatestdiseasediagnosisguidelinescanbecategorizedintothreelevelsofinfection identification:

Level I: Thisincludesfarm/productioninspection, storage,andhealthmanagement.This background information is very useful in confirming the diagnosis of infection from Level II and III diagnoses.

LevelII: Thisinvolvesspecializedtechniquessuchas histopathology,whicharetypicallynot feasible to perform directly at the farm site.

LevelIII: Encompasses advanced techniques that demand a high levelof infrastructure investment, trained personnel, and substantial expenditure for conducting the tests [8].

Table 1:External signs observed during level I diseases diagnosis

Clinical signs	Typesofdiseases
Gillswithexcessmucus	Bacterial, parasitic,environmentalor nutritional
Gillsnecrotic	Bacterial,parasitic, fungal
Gillspale	Viral, bacteria,nutritional
Skinwithexcessmucus	Parasitic,environmental
Re-pigmentedareasinskin	Bacterialorparasitic
Exophthalmia, haemorrhagedopaque eyes	Viral,bacterial,parasitic,gassupersaturation
Ulceration,necrotisation	Bacterial,parasitic
Dropsy	Bacterial,viral,metazoanparasite
Enlargedabdomen(fluid accumulation)	Viral,bacterial,parasitic
Growth,nodules,raisedspotonskin	Viral,parasitic,neoplasmic, fungal.

Table 2: Common fish diseases in India their symptoms and treatment

Fungal Diseases				
Nameof Disease	**CausativeAgent Name**	**Symptoms**	**Treatment**	**References**
Saproligniasis	*aprolegnia parasitica*	Appearanceoffluffytufts of cotton- like material, haemorrhage,exposureof jaw bones, blindness	1-3ppmmalachitegreenforon e hour 1:500 formalin for 15 minutes 3to5mg/1 methylene blueasa Preventativemeasureafter the eggs are laid NaCl 5-10 ppt H2O2500ppmfor15 minutes	Lipton,2006;Ravi andjithender,2007 [10, 15]

ɔmycosi s	*ınchiomyces sanguinis*	Fungusdevelopsonorin gill tissue,	0.3ppmMalachitegreen for 24h Dipin 3-5%NaCl for5to10 min.	oduhalilova*et al.*, 2023; Ravi and jithender,2007[1 ,15]
Epizooticulcerative syndrome	*Aphanomycesinvadans*	Redspot,blackishburnlike markor deeper ulcer with redcentresandwhiterims	Calcium hydroxide at 375kg/Ha NaClisappliedat1250-1875kg/haCIFAXat1 liter/ha Bleachingpowderat5- 10kg/ha Oxytetracyclineat60-100mg/kgwithfeedfor7 days	*Mannaatal.,2023; Raviand jithender,2007 [11,15]*

Bacterial Diseases				
Furunculosis	*Aeromonas salmonicida*	Appearance of boillike lesions, stomach filled with mucus, blood and sloughedepithelialcells,	Oxytetra cycline 50-75 mg/kgfishweight/dayfor 10 days	Raviand Jithender, 2007[15]
Dropsy	*Pseudomonas punctata*	Bloating of the body, accumulation of yellow colouredfluidinsidethe body cavity	5ppm potassium permanganatefor2 minutesdipbath 250mg oxytetracyclinin20lwater for2to3days	Vajargah,2022;Ravi andjithender,200 7 [20, 15]
Finandtailrot	*A. hydrophila,*	Erosions,discoloration	Tetracycline3-4gm/100lfor2-3 days 1minute diptreatment in500ppmcoppersulphate solution	Mishra*etal.*,2017; Ravi and jithender,2007 [12,15]

[[Eye disease	*Aeromonas liquifaciens*	Cataractofeyes,affect cornea,	Chloromycetin8-10mg/literbath	Mishra*et al.*,2017 [12]
Vibriosis	*Vibrio parahemolyticus, Vibriosalmonicida andVibrio harveyi*	Redspotsontheventral and lateral area of fish, swollen and dark skin lesions that ulcerate	Sulfamethazine2gm/100pounds of fish/ day Terramycin3-4gm/100poundsof fish/dayfor10 days	Mishraetal., 2017; Raviandjithender [12,15]
Parasitic diseases				

Whitespot disease	*Ichthyophthirius multifilis*	characterized by the presence of small whit espotsontheskinorgills	1.5to2.5%ofSodiumchlori defor 10 to 30 minutes/ 7 days Potassiumpermanganate at2to5 ppm Malachitegreenat0.1ppmf or3to 4days	Lipton,2006;Ravi andjithender,2007; Mishra*etal*.,2017[10, 15,12]

Dactylogyrosis	*Dactylogyrussp*	Mostly affects gills, destroying the gill filaments, gills with clumps of whitemasses.Parasitescan be observed under microscope in sample from gills	10ppm potassium per manganate bath for 1-2 hour sodiumchloride2.5%for1h ourby bath Mebendazole1mg/literfor 24hour by bath method	Buchmann, 2022; Ravi and jithender, 2007;Mishra*et al*., 2017 [4, 15,12]
Gyrodactylosis	*Gyrodoactylus sp.*	These parasite which grow on and destroy the skin, gills with clumps of White masses frequently associatedwithsecondary infections.	10ppmpotassiumpermanganate bath for 1-2 hour sodiumchloride2.5%for1h ourby bath Mebendazole1mg/literfor 24hour by bath method	Buchmann, 2022; Ravi and jithender, 2007;Mishra*et al*., 2017 [4, 15,12]

Viral diseases				
Springviraemia of carp	Springviraemiaof carp virus	Exophthalmia,palegills, Haemorrhagesontheskin, base of Thefinsandtheevent,and abdominal distension or dropsy	Notreatmentisavailable	Mishra*et al*.,2017; Ravi and jithender, 2007;Lipton,2006[12, 15,10]
Infectious haematopoietic necrosis	Infectious haematopoieticnecrosis virus	Darkening of the skin, palegills,ascites,distended abdomen, exophthalmia, and petechial Haemorrhages in ternally andexternally	Notreatmentisavailable	Mishra et al., 2017;Raviand jithender, 2007;Lipton,2006[12, 15,10]
Carpedemavirus disease	Carpedemavirus	Swollen gills or gill necrosis, enophthalmos, skinlesionsatthebaseof the fins or around the mouth Andinflammationofthe anus	Notreatmentisavailable	Mishra et al., 2017;Raviand jithender, 2007;Lipton,2006[12, 15,10]

ISSN: 0976-7126
Kumar *et al.*, 14(8-9):36-42, 2023

DiseasemanagementpracticesPreventivem easures:

Thefollowingaspectsareusefultopreventdisea sesatfishfarm

- Prevent theentryofwild aquaticlifeintotheponds.
- Constructreservoirsfor storing water without directlytakingfromthenaturalwater bodies.
- Treatreservoirwaterbeforeuse intopond
- Waterexchangeshouldbeminimumpresen t
- Useofclosedorsemi-closedrecycle system
- Incaseofadiseaseoutbreak,disinfectconta minatedwaterbeforedischarge.
- Maintaingoodpond preparationbydryingpondbottomand removing toplayerofthe sediment.
- Avoidoverstocking
- Maintaingoodwaterquality,idealwaterqu alityparametersarementionedinthe table.
- Feednutritionallybalanceddietattherequir edquantityavoidingexcess feed.
- Earlyandeffectivedetectionof pathogensusingimproveddiagnosticmeth odstoscreenand quarantine infected fishes to prevent the spread of the pathogens.
- Alwaysusespecificpathogenfree(SPF)ors pecificpathogenresistant(SPR)fishlarvae
- Avoidimporting of larvae.This couldincrease accidental introduction of potential pathogens across the borders.
- Avoidfeedingtrashfishtofish[9][10].

Chemotherapy

Currently, successful aquaculture relies on the use of chemicals. Most countries involved in aquaculture have developed agreements on the use of veterinary drugs in aquaculture. Some chemicals approved by the FDA for use in aquaculture include chloramine-T, formalin, hydrogen peroxide, oxytetracycline hydrochloride, tricaine mesylate, chorionic gonadotropin, florfenicol, oxytetracycline dihydrate, sulfadimethoxine, and omepraline. However, antibiotics and disinfectants should be used with caution in aquaculture. For example, the Marine Products Export Development Authority (MPEDA) of India published a list of banned antibiotics and antibiotics in 2001. This list includes drugs such as Chloramphenicol, Dimetridazole, Nitrofurans, Metronidazole, Neomycin, Onidazole, Nalidixic Acid, Ipronidazole, Sulfamethoxazole, Nitroimidazoles, Aristolochia, Clenbuterol,Chlorpromazine,Diethylstilbestro l,SulfofolioneandGlycopeptides.surrounding culture and friendly Beautiful This ensures that aquatic ecosystems remain healthy and aquaculture products are safe for consumption and export [11] [12].

Table 3: *Ideal water quality parameter for fish farming*

Waterqualityparam eter	Optimumrange
Depth	1-3meter
Turbidity	31-62cm
Temperature	28.7-33.5°C
Dissolvedoxygen	>4.8ppm
pH	7-8.3
Alkalinity	80-208ppm
Hardness	85-140ppm
Salinity	0ppt
Ammonia	0.02ppm
nitrite	0.01ppm
Nitrate	0-210ppm
Phosphorus	0.02-0.03ppm

Conclusion

Prevention and reduction of diseases in aquaculture is important to reduce production and economic losses by preserving the health of water bodies. Many strategies such as biosecurity, stress management, quality management (GMP), antibiotic use, antibiotics, drugs, rapeseed oil, anti- inflammatory, prebiotics/postbioticsareusedto prevent and controlinfectiousdiseases inaquaculture [13].In this review, various preventive measures for ideal culture and water quality are presented as well as treatment of insect infections as well as bacterial, fungal and parasitic diseases in freshwater fish. Therefore, it is necessary to develop treatments for disease prevention [14]

References

1. Buchmann K. Control of parasitic diseases in aquaculture. Parasitology. 2022 Dec;149(14):1985-97.
2. ChirilăF, FiţN, NadăşG, Negrea O, Ranga R. Isolation and characterization of an *Aeromonas hydrophila* strain in a carp (*Cyprinus carpio*) toxemia focus. Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Veterinary Medicine. 2008;65(1):244-247.
3. Davis HS. A new bacterial disease of fresh-waterfishes. Washington, DC: US Government Printing Office; c1922.
4. Abduhalilova GI, Makha madaliyeva MU, Khojakhanov SI. Fish branchiomycosis prevention measures. InternationalBulletinofApplied Science and Technology. 2023 Apr 7;3(4):247-252.
5. Adanir D, Turutoglu H. Isolation and antibiotic susceptibility of *Aeromonas hydrophila* in acarp (*Cyprinus carpio*) hatchery farm.2017 51:361-364.
6. Āhameda K, Sisira Kumara WA. Hand book on fish and crustacean diseases in the SAARC region; c2005.
7. FAO. The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation. Rome, FAO; c2022. https://doi.org/10.4060/cc0461en.
8. Lipton AP. Diseasesofornamentalfishesandtheircontrol;c2006.
9. Manna SK, Bera AK, Baitha R, Das N. Fish diseases and their management in inland open waters; c2003.
10. Mishra SS, RakeshD, DhimanM, ChoudharyP, Debbarma J, Sahoo SN, *etal*. Present statusof fish disease management in freshwater aquaculture in India: state-of-the-art-review. Journal of Aquaculture & Fisheries. 2017;1(003):14.
11. MohantyBR,SahooPK.Edwardsiellosisin fish:abrief review. Journal of biosciences. 2007 Dec;32:1331- 1344.
12. Mukherjee SC. Fish diseases in India, their causes and control measures-Winter school onrecent advances indiagnosisand management ofdiseases in mariculture, 7thto 27thNovember 2002, Course Manual.
13. Ravi Shankar Piska and Jithender Kumar Naik S. Fresh wateraquacultureFisheries,IIyearPaperI(Ed.Ravi Shankar Piska) Intermediate Vocational Course,StateInstituteofVocationalEducationand BoardofIntermediateEducation;c2007.
14. Sahoo PK, MohantyJ, GarnayakSK, MohantyBR, Banya K, HemaP, *etal*.Estimationofloss due to argulosis incarp culture ponds inIndia. IndianJournalofFisheries. 2013;60(2):99-102.

Cite this article as:
Kumar A., Saini V.P., Tyagi V.K., Ashu, Rana S. and Sharma D. (2023). Fresh Water Fish Diseases in India and its Diagnosis: A Review. *Int. J. of Pharm. & Life Sci.,* 14(8-9): 36-42.
Source of Support: Nil
Conflict of Interest: Not declared
For reprints contact: ijplsjournal@gmail.com