BACTERIAL INFECTION ON MAJOR CARP CATLA FISH FROM LANJUD RESERVOIR OF DISTRICT BULDHANA (M. S.) INDIA

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Abstract
Fishes are the main element of aquatic communities, and they can directly affect the exploitation of all its communities as a protein source for human consumption. Pathogenic infection can strongly affect the rate of reproduction and survival capacity of fish. Therefore, knowledge of fish diseases has a great relevance through both from a scientific as well as an applied point of view. In this literature we attempt to determine the species of bacteria pathogenic to Catla fish collected from Lanjud reservoir. During this attempt two pathogenic strains of bacteria are examined from 30 defective samples of catla fish. Isolated bacterial species are Aeromonas hydrophila and Vibro cholerae.
Keywords: *Major carp- Catla, bacterial infection, Lanjud reservoir, Buldhana.*

Introduction

Fishes are the main element of aquatic communities, and they can directly affect the exploitation of all its communities as a protein source for human consumption. Last from three decades, culture fishery strongly developed along with capture fishery and the percentage contribution of inland fish production increased to 71% out of the total fish production. More than Rs. 45000 crores had been credited to national treasury by means of inland fishery every year. The number of culturable fish species is steadily increasing and the search for suitable species for fish-farming is still being on. (Handbook on fisheries Statics, 2019). As fish is daily consuming and luxury food, it gives much importance to the fish community.

For all of this must have credited to scientist, researchers and fish farmers, as they take lots of efforts for this big achievement. Many times, much of the fish stocks available for rearing and fishing are declining due to many reasons. Fish diseases are one of the main abstracts in the success of the fishery industry, since disease-related economic losses can be destructive, where disease outbreaks occur suddenly, spread progressively with much of mortality rate and disappear with equal rate or develops very slowly with less severity, but persist for long time. Diseases are a major threat to all types of fishes.

Much of the factors associated with ecosystem regarding the fish farming supports and promotes the action of pathogens. As a matter of fact, disease outbreaks occur more often in culture environment than free ecosystem. It can be a major factor that influence the abundance and distribution of fish species in distinct geographical areas. Pathogen induced alterations in health and growth of fish community. It can strongly affect the rate of reproduction and survival capacity of fish also. Therefore, knowledge of fish diseases is of great significance through both scientific as well as applied point of view. (Jorge C, 2008). In this literature we attempt to determine the species of bacteria pathogenic to Catla fish collected from Lanjud reservoir.

Materials and Methods

1. Study Area: The Lanjud Dam is medium irrigation project constructed by irrigation department, government of Maharashtra on river Lendi, near Lanjud village, taluka Nandura, district Buldana (M.S.) India. This dam is constructed in the year 1984. The study area is 67 Km away from research canter Buldana (Fishery research lab, Department of Zoology, Jijamata Mahavidyalaya Buldana). Location of the sampling site is on north of district Buldana and situated at latitude 76^0 $36^{'}$ $00^{"}$ N and longitude 20^0 $00^{'}$ $45^{"}$ E. The dam has a total length of 1215m with a height of about 12.55 m. The catchment area of dam is about 66.96 sq km. and gross storage capacity is 1.9892 mcm. The aim to construction of this dam is to supply water to MIDC area of Khamgaon, nearby agriculture, and drinking water to the surrounding villages.

2. Sample collection: About 30 doubtful samples of *Catla catla* fish were collected in sterilized container from the study area Lanjud reservoir, taluka Nandura during study period June 2020 to July 2021. The collected fish samples were brought to the research center Buldhana (Fishery research lab, Department of Zoology, Jijamata Mahavidyalaya Buldana) in an icebox for further analysis.

3. Labortary testing: The infected fish samples were dissected and the infected part of muscles, gills and liver were isolated, smashed with help of sterile swab and then spread over the plate fill with nutrient agar. The plates were incubated at 37°C for 48 hrs. After incubation the total heterotrophic bacterial Population was enumerated and recorded. (Kelly and Jaykus, 2014)

The bacterial colonies were isolated and purified by restreak method. The isolated colonies were separated and again transferred to agar slant tubes,

incubated at 37°C for 12 hrs. The LD50 tests were performed for identification of isolated colonies from the fish samples. LC50 is defined as the concentration of the test pathogen, which kills 50% of the test animals. LC50 value was calculated by variety of methods. In the present study, after 96 hours of the experiment, the LC50 values for five pathogenic strains were calculated as per formula.

The selected strains were administered to the healthy normal juvenile Catla catla for determination of LC 50. The mortality rates of *Catla catla* exposed to different concentration of bacterial strains and mortality rates by LC50 value was calculated and recorded (Sujatha et al., 2013).

Result and Discussion:

The isolation of microorganism is based on the percentage of infected fish, its disease status, its clinical symptoms and biochemical diagnosis. The results of the quantitative estimation of microbial count in different body parts of diseased fish are given in the Table 1.

The highest microbial load was observed in muscle tissue of the dissected fish sample ($5.4 \pm 0.3 \times 10^7$ cfu g -1). The lowest load was found in intestine ($3.4 \pm 0.6 \times 10^4$ cfu g -1). Bacterial species found in high quantity were isolated and identified. In which pathogenic invades of the *A. hydrophila* and *Vibro cholerae* was dominant in the bacterial isolates. Remaining species were found with less invades and not focused.

Isolated bacterial samples were confirmed based on the morphological, physiological and biochemical characteristics by Bergey's Manual of Classification (1998).

A. hydrophila was found in the ulcerative tissue as macroscopic lesions in the muscles of the diseased *Catla catla*. The present study showed a high prevalence of motile aeromonad bacteria (46.2 %) followed by *Vibro* species (31.6 %) in all lesions. Motile aeromonads were also recovered from internal organs of ulcerated fish indicating systemic invasion.

Table.1 Quantity of microbial invasion in muscle, gill, liver and intestine of diseased fish (Values are mean ± Standard deviation)

Sr.No.	Fish organs:	Microbial load (CFU g-1)
1	Muscle	$5.4 \pm 0.3 \times 10^7$
2	Gill	$4.9 \pm 0.6 \times 10^6$
3	Liver	$4.2 \pm 0.9 \times 10^5$
4	Intestine	$3.4 \pm 0.6 \times 10^4$

Table 2: The % of bacterial colonies in different body parts

Sr. No	Name of Microbes	Muscle	Gill	Liver	Intestine	Total
1	*Aeromonas hydrophila*	16.2	14.6	12	3.4	46.2
2	*Vibrio cholerae*	12.4	9.3	5.3	4.6	31.6

Table.3 Biochemical characteristics of the pathogenic strain isolated from fish.

Sr.no.	Biochemical test	*Aeromonas hydrophila*	*Vibrio cholerae*
1	Capsule	capsulated	Non-capsulated
2	Shape	rod	rods
3	Motility	+ve	+ve
4	Gelatin hydrolysis	-ve	+ve
5	Methyl Red test	+ve	-ve
6	Gram staining	-ve	-ve
7	Citrate utilization test	+ve	+ve
8	Arginine dehydrolase	+ve	-ve
9	Lysine	+ve	+ve
10	Ornithine	+ve	+ve
11	Urease test	-ve	+ve
12	Indole	+ve	+ve
13	H_2S	+ve	-ve
14	Oxidation fermentation tests	+ve	-ve

In the present study, *Aeromonas hydrophila* and *Vibrio cholerae* were found in collected samples of *Catla catla* fish. The predominance of *Aeromonas hydrophila* in EUS affected fish has also been reported previously by Kumar et al., (1989) in India. Thampuran *et al.*, (1995), have also reported the presence of *Pseudomonas sp.*, *Alcaligenes sp.*, *Micrococcus sp.* and *E. coli*, in infected C. striatus. Sujatha et al., (2013) reported one fungus and nineteen species of bacterial presence with dominance of *A. hydrophila* in *Catla catla* fish.

Baruah et al., (2012) reported that many species of bacteria and fungi were found to be associated with EUS affected snakehead *C. striatus* in which 89% of the total isolates were *Aeromonas hydrophila*. Torres et al., (1990) concluded that *A. hydrophila* strains have been characterized as virulent. While Yadav et al., (1992) marked *A. hydrophila* as a cytotoxic biotic factor. Sabina Yesmin *et al*., (2004) have reported that *Aeromonas hydrophila* is one of the important pathogens of fish in freshwater and brackish water.

References

1. Baruah, A., Saha, R.K., and D. Kamilya, (2012): Inter-species Transmission of the Epizootic Ulcerative Syndrome (EUS) Pathogen, Aphanomyces invades and associated physiological responses.
2. Handbook on fisheries Statics, (2019): Ministry of Fisheries, Animal Husbandry and Dairying, Posted on 19 sept. 2019 by PIB Delhi.
3. Jorge C. Eiras, (2008): Fish Disease, Science Publishers 234 May Street www.scipub.net Post Office Box 699 Enfield, New Hampshire 03748 United States of America ISBN (Set): 978-1-57808-438-8
4. Kelly A. Stevens and Lee-Ann Jaykus (2014): Bacterial Separation and Concentration from Complex Sample Matrices: A Review, *Critical Reviews in Microbiology*, 30(1):7–24, ISSN: 1040-8371, DOI: 10.1080/10408410490266410.
5. Kumar, D., (1989): Epizootic Ulcerative Syndrome out-break in India. Summer Inst. On Fish Dis. And Health Man. In Fresh water Aqua. Sys., 5 24 June CIFA, Bhubaneswar
6. M. Sujatha, P. Dhasarathan, V. Nivetha and T. Kuberan (2013): Pathogenicity of bacterial isolates to Catla catla, *International Journal of current Microbiology and Applied Science;* ISSN: 2319-7706, Volume 2 Number 12 (2013) pp. 575-584.
7. Sabina Yesmin., Rahman M.H., Hussain M.A., Khan A.R., Farzana Pervin, and Hossain, M.A., (2004): Aeromonas hydrophila infection in Bangladesh. Pakistan J. Biol. Sci. 7: 409-411.
8. Thampuran, N., Surendran, P. K., Mukundan, M. K., and Gopakumar, K. (1995): Bacteriological studies on fish affected by epizootic ulcerative syndrome (EUS) in Kerala, India.
9. Torres, J.L., Shariff, M., and A.T. Law, (1990): Identification and virulence screening of Aeromonas sp. Isolated from healthy and epizootic ulcerative syndrome (EUS) infected fish (Ed. By Hirano R. and Hanyu I.). The second Asian Fisheries Forum. Tokyo Asian Fisheries Society Manila, Philippines.
10. William Bergey Whitman (1998): Bergey's Manual of Systemic Bacteriology, volume- 3 The Frimicutes, ISBN: 978-0-387-95041-9, DOI: 10.1007/b92997, Springer Dordrecht Heidelberg London New York.
11. Yadav, M., Indira, G., and A. Ansary, (1992): Cytotoxin elaboration by Aeromonas hydrophila isolated from fish with Epizootic Ulcerative Syndrome, J. Fish dis. 15: 183-189.