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Gill pathology of juvenile carps in nursery ponds

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Abstract

Gill pathology of juveniles of two Indian major carps *Labeo rohita* and *Cirrhinus mrigala* were studied for a culture period of three months in a private and a government fish farm ponds. Under histopathological observations, only protozoan parasite, *Myxobolus* sp., was recorded as cyst. These myxosporidian cysts were high in the gills of *L. rohita* of the government farm pond followed by *C. mrigala* of the private farm pond. Hypertrophical gill lamellae (primary and secondary) with loss of secondary lamellae were evidenced in *C. mrigala* of privately operated pond.

Key words : Histopathology, *Myxobolus* sp., Carp, Nursery ponds

Introduction

The outbreak of various types of disease is one of the important reasons of reduction in fish production. Maintaining good water quality, nutrition, broodstock, species composition, stocking density etc., i.e., proper management, can control or at least reduce the outbreak of disease. Some fish farmers, fish traders and related people are in the opinion that most of the private fish farms are better managed than the government fish farms, and the fish seeds in the private farms are of good quality for further stocking.

Gills of fish are important sites for prevalence of disease. In Indian major carps, gill diseases are very common. Infestation in the gills of *L. rohita* and *C. mrigala* differ due to difference in feeding habits of the fishes (Sanaullah and Ahmed 1980). The Myxosporidia are cosmopolitan parasites and infect a wide range of both marine and freshwater fishes. Infestations of *Myxobolus*, *Henneguya* and *Thelohanellus* on the gills of freshwater fish are very common. There have been several recent studies on the pathology of gill infections by Myxosporidia (Aisa 1972). Dykova and Lom (1978) found inflammatory tissue reactions in the gill sphaerosporosis of carps due to invasions by *Henneguya* sp. Sanaullah and Ahmed (1980) found *Myxobolus* sp. infection in adult *C. catla*, *L. rohita* and *C. mrigala* and described the histopathology of the disease.

The present research has been aimed to investigate the gill diseases through histopathological study of juvenile *L. rohita* and *C. mrigala* from two nursery ponds in different locations and of different management systems.

Materials and methods

The experimental fish samples were collected from two nursery ponds: one pond of a private farm and the other, from a government one. The private one, at the "Jhalak Fish and Shrimp Farm", Gouripur, Mymensingh, was designated as pond-I (area 30 decimals), and the government owned one, at "Fish Seed Multiplication Farm", Trishal, Mymensingh, was designated as pond-II (66 decimals).

To kill the insects and all other animals of the ponds, phostoxin (5 tabs/40 m^2) and rotenone (20 gms/40 m^2) were applied to pond-I and pond-II, respectively. After 7 days of toxin application the ponds were fertilized by urea (100 gms/40 m^2 in pond-I and 200 gms/40 m^2 in pond-II), TSP (90 gms/40 m^2 in pond-I and 100 gms/40 m^2 in pond-II) and cowdung (4.5 kg/40 m^2).

In pond-I, *Labeo rohita*, *Cirrhinus mrigala*, *Puntius gonionotus* and *Cyprinus carpio* (each species in equal number) were stocked at a total density of 70 fingerlings/40 m^2, and in pond-II, only *L. rohita* and *C. mrigala* (1:1) were stocked at a density of 45 fingerlings/40 m^2. Supplemental feed composed of rice-bran and mustard-oilcake (4:1) was given twice a day (around 08.30 h and 15.00 h) at the rate of 5% of the body weight of the stocked fishes in each time in each pond. Overnight soaked oil-cake was mixed with rice-bran and applied to the ponds in dough form.

L. rohita and *C. mrigala* fingerling samples were collected from the ponds fortnightly for three months. In each sampling, 12 fish of each species from each pond were taken for detailed observations of which 4 fish of each species were used for histological study. The gill samples were fixed in 10% formalin and processed in an automatic tissue processor. Four gill-sections were taken for each sampled specimen and were examined under microscope to observe whether they were infected by *Myxobolus* sp. cysts or not. The number of infected fishes was recorded and their percentage among the sampled fishes was calculated. A squash preparation of gill was taken over glass slides and was covered with coverslip before microscopic examination. An average of 30 spores from gill of each fish were measured using dimensions recommened by Lom and Arthur (1989).

Results

The cysts containing spores of *Myxobolus* were mainly located with single secondary lamellae and mostly at their tips (Fig. 1A).

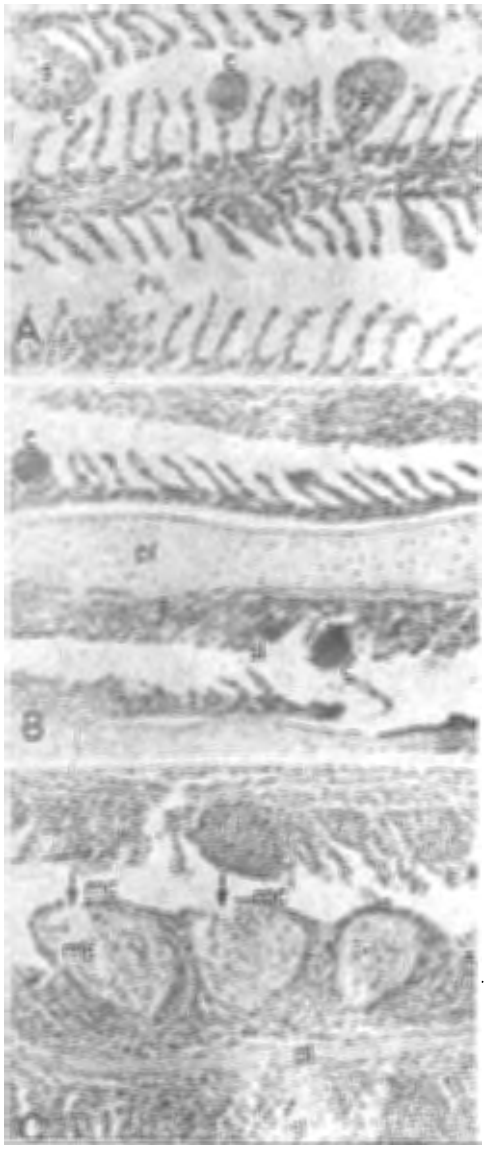

Fig. 1. Cross section of gills of juvenile carps.

A. Cirrhinus mrigala of pond-I. ***c****, cysts at the tip of secondary lamellae;* ***s****, spores within the cysts. Haematoxyln and Eosin (x 118).*

B. Labeo rohita of pond-II. ***pl****, hypertrophied primary lamella;* ***sl****, clubbed secondary lamellae;* ***c****, cysts at the tip of secondary lamellae. Haematoxyln and Eosin (x 115).*

C. L. rohita of pond-II. ***pl*** *and* ***sl****, hypertrophy and hyperplasia in primary (****pl****) and secondary gill lamellae (****sl****);* ***mc****, mature cysts;* ***ms****, myxosporidian spores; arrows indicate ruptured cyst walls. Haematoxyln and Eosin (x 440).*

In respect of gill pathology, more histopathological changes were evidenced in *C. mrigala* when compared with *L. rohita*. In the gills of *C. mrigala*, large *Myxobolus* cysts were recorded at the terminal ends of secondary lamellae where portions of the lamellae were hypertrophied, missing or some were

deformed with inflammatory cells, consisting of thrombocyte, monocyte and other leucocytes (Fig. 1A). Numerous cysts of various sizes of the said protozoan parasite were also noticed with those secondary lamellae. On the other hand, hypertrophied primary lamellae with clubbing secondary lamellae were noticed and a few protozoan cysts were attached with the secondary lamellae of the gills of *L. rohita* (Fig. 1B).

In the gills of juvenile *L. rohita* of pond-I myxosporidian cysts were also found at the tip of the secondary gill lamellae but their number was few in comparison to *C. mrigala*. On the other hand, in pond-II the gills of *L. rohita* were more affected by the protozoan parasites than those of the *C. mrigala* (Fig. 1B-C). The peripheral wall of some cysts were found to be ruptured to release spores of *Myxobolus* species (Fig. 1C). The secondary lamellae lost their normal structure and they were clubbed together (Fig. 1B-C).

The prevalence of cysts in *L. rohita* were 39% (pond-I) and 89% (pond-II) and in *C. mrigala* were 72% (pond-I) and 22% (pond-II).

Discussion

The gills of the juvenile *L. rohita* and *C. mrigala* obtained from both the private and government farm ponds were found to be affected under histopathological observations. The causative agent of carp gill disease in the present experiment was a protozoan parasite, *Myxobolus* sp. which appeared in the gills of both the carp species in the form of cysts. Occurrence of *Myxobolus* sp. in the gills of adult major carps of Bangladesh was first reported by Sanaullah and Ahmed (1980).

The highest prevalence was recorded from the *L. rohita* of government farm which was followed by the *C. mrigala* of private farm. Sanaullah and Ahmed (1980) also observed higher prevalence from *L. rohita* than *C. mrigala.*

Many cysts with swollen secondary lamellae and appearance of inflammatory cells, consisting of thrombocyte, monocyte and other leucocytes, were observed in the gills of *C. mrigala* of the private farm-pond. In the present investigation hypertrophied primary lamellae in the gills of *L. rohita* with clubbing secondary lamellae and considerable number of myxosporiodian cysts were observed. Gerundo *et al.* (1991) while studying the effect of chemotherapy by repeated doses of malachite green found clubbing of the apical end of secondary gill lamellae of rainbow trout, *Salmo trutta*. However, the histopathology caused by *Myxobolus* sp. in both the carps (of both farm) in the present study is generally similar to those described by Sanaullah and Ahmed (1980) and Dykova and Lom (1978).

In the present investigation, the cysts of *Myxobolus* sp. appeared only at the tips of primary and secondary gill lamellae in *L. rohita* and at the tips and/or base of secondary gill lamellae in *C. mrigala* of both ponds. Sanaullah and Ahmed (1980) found parasitic cysts in the distal tips of the primary lamellae to a point

about half way along their length. Crespo *et al.* (1990) found cysts in the gills of amberjack, *Seriola dumerili* Rasso, in the trailing edge of the gill filament and in the interlamellar spaces.

Although the majority of the sampled young carps of the nursery ponds seemed to be healthy by external examination but histological observations showed a good percentage of the fish affected by the gill parasites. Infestation of *Myxobolus* sp. in *L. rohita* were higher in the government fish-farm pond and in *C. mrigala* in the private farm pond. This might be due to the quality of broodstock of the respective species and/or the water quality of the farms. Since fishes of the both ponds were infested by *Myxobolus* sp., though with a difference in intensity of infestation and in fish species, it is difficult to say, on the basis of present study, which pond was better managed. However, farmers should take precautions in maintaining broodstock and water quality to get healthy and disease free spawn and juveniles. No chemotherapeutic measures were taken in the present experiment and would be carried out in successive experiments.

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