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INVESTIGATION ON THE HEALTH STATUS OF JUVENILE INDIAN MAJOR CARP (*Cirrhinus cirrhosus*) FROM VARIOUS FARMS OF MYMENSINGH AREA

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ABSTRACT

Ahmed GU, Akter MN, Rahman KMM (2016) Investigation on the health status of juvenile Indian major carp (*Cirrhinus cirrhosus*) from various farms of Mymensingh area. *J. Innov. Dev. Strategy.* 10(1), 6-11.

An experiment was carried out to evaluate the health status of juvenile Indian major carp (*Cirrhinus cirrhosus*) from a Government fish farm and a NGO fish farm in the Mymensingh region through clinical and histopathological observations for a period of 9 months from April 2005 to December 2005. Water quality parameters (temperature, dissolved oxygen, pH and total hardness) were recorded on a monthly basis. Samples of skin, muscle, gill, liver and kidney were examined through histoalogical technique. Clinical signs such as weak body, red spots, scale loss, gill discoloration and rough skin in caudal and ventral region were observed, particularly in the month of November and December. The examined fishes were more or less normal in appearance in the summer season (April-May). A moderate pathological changes were observed in all the examined organs of fishes in the months of June to August, while the severity of pathological changes were increased in the months of September and October. However, marked pathological changes were observed in the months of November and December. Among all the affected organs, gill was the severely affected, followed by skin and muscle, liver and the kidney. Clinical and histopathological studies revealed that juvenile carps (*C. cirrhosus*) of the both fish farms were more affected in the colder months of the year, and the severity of the infection was more pronounced in the Government fish farm.

Key words: *Cirrhinus cirrhosus, health status, clinical, histopathology*

INTRODUCTION

Economically, carps (cyprinids) appear as the most significant teleost family, contributing to over 20 million metric tons of fish produced worldwide, approximately 40% of the world aquaculture production or 77% of the global freshwater aquaculture production (Xu *et al*. 2014). Inland water resources of Bangladesh are considered to be one of the richest in the world and potential for fisheries development (Islam 1999). The Indian major carp *C. cirrhosus* has a great economic significance in the South Asia region, including Bangladesh. This species is flourishing as a significant new source of fish aquaculture products on the global fish market with several desirable characteristics, including its adaptability for intensive culture, acceptance of low input sustainable feeds, adaptability to impaired water quality, and widespread consumer acceptance.

The disease is being considered one of the most significant constraint for the sustainable development of Indian major carp production in both the culture system and wild condition in Bangladesh (Rahman and Chowdhury, 1996). In an intensive fish culture, fish diseases are a common phenomena. Any imbalance among the three important factors such as the existence of the pathogen in fish body and the quality of the environment and the general health status of the fish, are the possible reasons of the outbreak of disease (Francis-Floyd, 1997). Unfavourable or extreme environmental changes may be fatal or cause stress to fish leading to secondary infections. Fish remains in such an environment which is loaded with innumerable agents like chemical pollutants, bacteria, virus, parasites and fungus etc., either individually or in combination of the aforementioned agents may responsible for occurrences of various kinds of diseases (Post 1987). Common diseases of freshwater fishes of Bangladesh are ulcer type disease, including epizootic ulcerative syndrome (EUS), septicemia disease, tail and fin rot, bacterial gill rot, dropsy, various types of fungal disease, protozoan diseases, parasitic diseases, nutritional diseases, tumors etc. (Chowdhury 1993, 1997). In most cases haemorrhages, septicemia, different kinds of lesions, gill damage etc. are common symptoms of the affected fish.

Clinical investigation provides information on the nature of diseases of fish and histopathological technique has got immense importance of diagnosing the disease of aquatic organisms throughout the world. But in Bangladesh, this technique has been used for fish disease diagnosis to a limited extent due to lack of technical knowledge and laboratory facilities (Moniruzzaman 2000). The present work was undertaken to identify the occurrence of pathology and diseases in *C. cirrhosus* from a Government fish farm and compared with a NGO's fish farm in Mymensingh district of Bangladesh.

MATERIALS AND METHODS

The current investigation was conducted considering two fish farms in Mymensingh district, Bangladesh for a period of 9 months from April 2005 to December 2005. Among the two fish farms one was Government Fish Seed Multiplication Farm at Kajiakandi village, under Fulpur Upazila (25 km to east side from Mymensingh town) and the other was a private fish farm operated by a Non-Government Organization, Society for Social Service (SSS) at Sherpur under Phulpur Upazila (about 2 km to west side from Phulpur Upazila Office). Water quality parameters such as p^H, dissolve oxygen, temperature, total hardness, conductivity and total dissolve

solids were recorded on a monthly basis during the experimental period between 0800 to 0900 hours using HACH'S Spectrophotometer (Hach-dret/5 speed, Hach company). Sampling was carried out monthly. During each sampling, 6 fishes of *C. cirrhosus* were randomly selected from each fish farm using the seine net. The sampled fishes were transported to the Fish Disease Laboratory of the Faculty of Fisheries, Bangladesh Aricultural University, Mymensingh with oxygenated plastic bags filled with freshwater. The sampled fishes were examined using magnifying glass to find out external injuries, infections or any other abnormal condition of fish body and recorded. Skin and muscle, gill, liver and kidney samples were collected with sharp scalpel and forceps and preserved in 10% neutral buffered formalin for histopathological study. An automatic tissue processor (SHANDON, CITADEL 1000) was used for dehydration, clearing and infiltration. The samples were embedded with malted wax, perforated plastic holder and steel mold. During embedding period proper care was taken for the orientation of skin and muscle samples in the steel molds. Sectioning was done at a thickness of 5 micrometer using a microtome machine. The sections were stained with haematoxylin and eosin stains and mounted with Canada balsam and covered with a cover slip. To fix the cover slips, the prepared slides were placed over a clean platform for 24 hours and examined under a compound microscope. Photomicrographs were then taken by using a photomicroscope (OLYMPUS, Model CHS, Japan). Pathological changes were observed from the slides and photographs. Clinical and pathological comparison made from the slides and photographs and compared among the months and between the farms.

RESULT AND DISCUSSION

Among all the water quality parameters evaluated only water temperature becomes unfavourable for fish culture in the month of December (Table 1). Water temperature of Government and NGO fish farm were more or less similar. The highest water temperature of Government fish farm was recorded in July as 31^{o}C and lowest in December 2005 as 18^{o}C. On the other hand, the highest water temperature of the NGO fish farm was recorded in June and July as 30^{o}C and lowest in December 2005 as 19^{o}C. Hossain and Paul (1993) reported that the outbreak of disease was the highest when water temperature was the lowest and mentioned at low temperature fish immune system could not work properly and eventually the fish would become more susceptible to disease. According to Tangtrongpiros (1985), a sudden drop of temperature in water was supposed to be an important predisposing cause of disease outbreaks. A separate study by Akter *et al.* (2006), reported that fishes such as *Monopterus cuchia* and *Macrognathus aculeatus* collected from the Ailee beel in Mymensingh areas were more affected both clinically and histopathologically in the months of December and January when the water temperature was less than the optimum level.

Table 1. Monthly variations of water quality parameters in Government fish farm and Non Government fish farm

	Government fish farm				**Non Government fish farm**			
Parameter / **Months**	**Temperature (^{o}c)**	**Dissolved oxygen (mgl^{-1})**	**pH**	**Hardness (mgl^{-1})**	**Temperature (^{o}C)**	**Dissolved oxygen (mgl^{-1})**	**pH**	**Hardness (mgl^{-1})**
April	29	5.5	7.0	77.0	28.5	6.2	7.1	88.0
May	28	4.8	7.5	80.0	27.0	6.7	7.0	65.0
June	30	6.0	6.3	67.0	30.0	5.5	6.0	80.4
July	31	5.0	7.0	93.0	30.0	6.0	6.8	95.0
August	28	6.0	7.6	86.0	29.0	6.0	7.5	65.3
September	25	6.2	7.5	68.5	26.0	5.8	7.0	78.0
October	25.5	5.8	7.2	90.4	25.0	8.0	7.2	82.0
November	22	7.0	8.0	88.5	21.0	6.5	7.8	94.5
December	18	6.0	8.5	63.0	19.0	7.0	8.3	92.0
Mean±SE	26.28±4.16	5.81±0.66	7.40±0.63	79.27±11.07	26.17±3.92	6.41±0.75	7.19±0.65	82.24±11.44

Clinically, *C. cirrhosus* of both farms were healthy in appearance in the months of April to July and almost normal in appearance in September and October (Table 2). The fishes from both farms were found severely affected during the winter season particularly in the months of November and December with the clinical pathologies such as gill discoloration, red spots in caudal and ventral region, rough skin, scale loss and weak

body. Fish from the both fish farms showed a clinical pathology such as gill discoloration, red spots in caudal and ventral region, rough skin, scale loss and weak body in November and December. Chakma (2002), Salim (2002) and Monowara (2003) also reported that fishes were more affected clinically and histopathologically during the colder months (December and January). Ahmed and Hoque (1999) also observed clinical symptom such as grey white necrotic areas in various carp species in the months of December, January and February.

Histologically, all the fish were normal in April and May. Less pathological changes were observed in June, July and August, while a marked pathological changes were reported in September and October and the severity of infection were gradually increased during November and December. Among all the organs, gills were more affected than others. In the both fish farm, the structure of gills were almost normal in fashion in the months of April to May, the pathological changes were only started to show in the month of June, while the severity of infection of both fish farm were increased in the months of November and December by showing hypertrophy, hyperplasia, necrosis, haemorrhage, loss of pillar cell in the primary gill lamellae and loss of secondary gill lamellae (Table 2 and Fig. A, B). Generally, the primary and secondary gill lamellae of fish from NGO fish farm were considerably less affected in comparison with the gills of species obtained from the Government fish farm. Similar to the present study, hypertrophy, hyperplasia, necrosis, clubbing, haemorrhage and pillar cells disruption around the primary and secondary gill lamellae were also observed in juvenile exotic carp particularly in November and December months (Gosh 2006); hypertrophy and missing of gill lamellae in *C. punctatus* (Akter 2006).

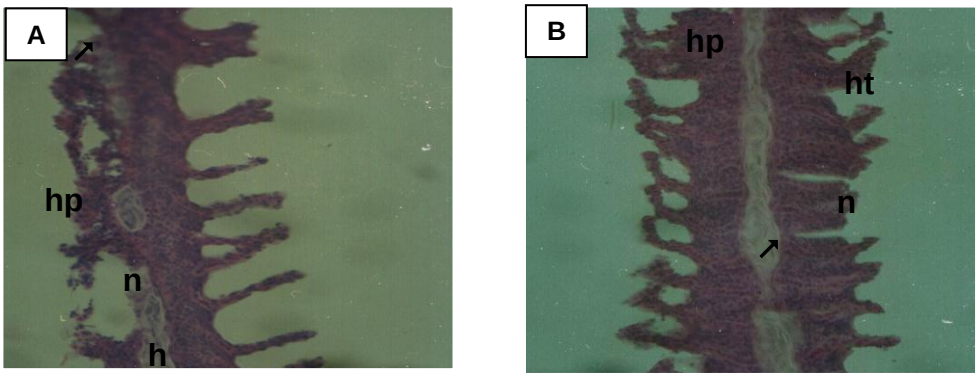


Fig. A. Section of gill of *C. cirrhosus* collected from Government fish farm in November & December. Indicate necrosis (n), haemorrhage (h), hyperplasia (hp) and loss of secondary gill lamellae (↗) were seen. H & E × 532.

Fig. B. Section of gill of *C. cirrhosus* collected from NGO fish farm in November & December. Both the gill lamellae were affected denoted by hypertrophy (ht), hyperplasia (hp), necrosis (n) and loss of pillar cells (↗) were seen. H & E × 532.

The skin and muscle of *C. cirrhosus* in both fish farms were moderately affected in which epidermis and dermis totally or partly lost, ruptured myotomes, vacuole, and melanomacrophage were observed (Table 2 and Figures C, D). Similar pathological symptoms were also reported in the juvenile of Indian major carps (Ahmed and Hoque, 1999).

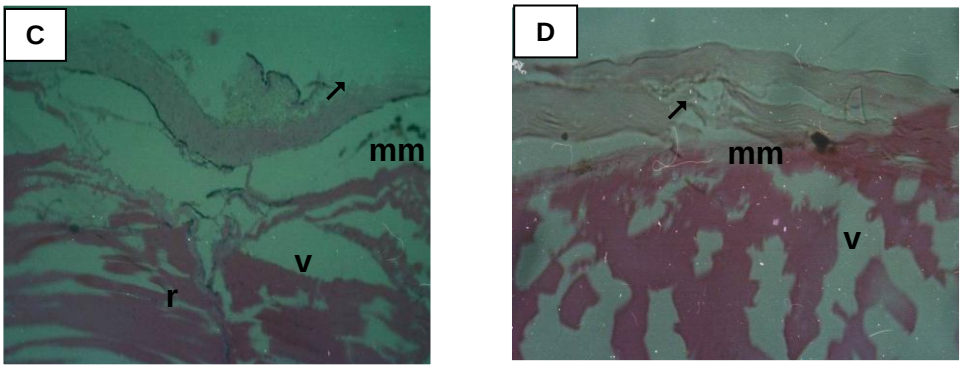
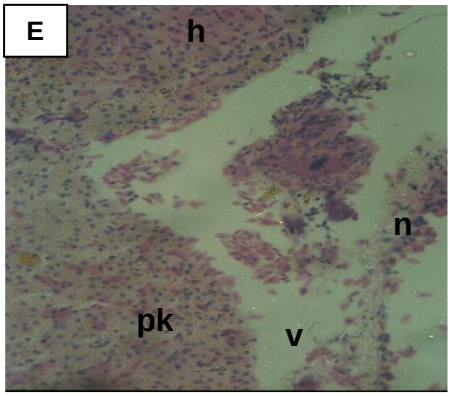


Fig. C. Section of skin & muscle of *C. cirrhosus* collected from Government fish farm in November & December. Epidermis was totally lost & the dermis (↗) was separated from the muscle. Melanomacrophages (mm), vacuole (v), & ruptured myotomes (r) of muscle were seen. H & E ×133.

Fig. D. Section of skin & muscle of *C. cirrhosus* collected from NGO fish farm in September & October. Epidermis was slough off from dermis (↗), melanomacrophase (mm), & vacuole (v) were also seen. H & E ×532.

Marked histopathological changes including necrotic hepatocytes, pyknotic nuclei, haemorrhage and vacuole were observed in the liver of *C. cirrhosus* in both fish farms (Table 2 and Figures E, F). Similar findings also previously reported by Ram and Singh (1988) where liver of the teleost fish, *Channa punctatus* exhibited varying degrees of pathological changes including cytoplasmolysis, nuclear pyknosis and necrosis leading to complete degeneration of hepatocytes. Afifi-SH (1996) also reported that the vascular changes in the liver might be due to the damage of the endothelial lining of the blood vessels and prevascular cuffing. In the present study comparatively less pathological changes were observed in the liver of fishes of NGO fish farm.



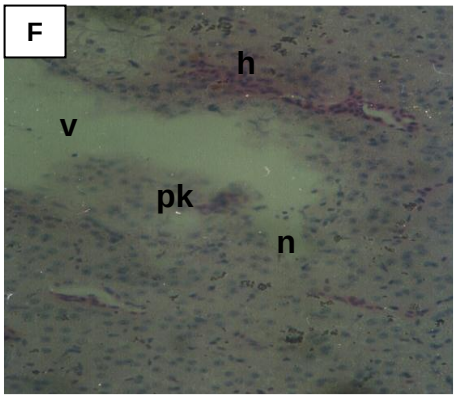
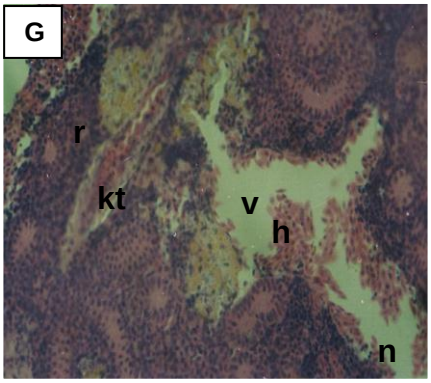


Fig. E. Section of liver of *C. cirrhosus* collected from Government fish farm in November & December. Necrotic hepatocytes (n), pyknotic nuclei (pk), vacuole (v) & haemorrhage (h) were seen. H & E × 532.

Fig. F. Section of liver of *C. cirrhosus* collected from NGO fish farm in November & December. Necrotic hepatocytes (n), vacuole (v), haemorrhage (h) & pyknotic nuclei (pk) were seen. H & E × 532.

Histopathologically, the kidney of *C. cirrhosus* of government fish farm showed various pathological changes such as ruptured haemapoeitic cell, necrotic and swollen kidney tubules having wide vacuole and haemorrage (Tables 2 and Figure G), while mild pathological changes were seen in the kidney of fishes collected from NGO fish farm by showing swollen kidney tubules, blood cell, necrosis, vacuole and fat deposition (Tables 2 and Figure H). Similar pathological symptoms of kidney were also observed in major carp (Ahmed and Hoque, 1999; Islam 1999; Moniruzzaman 2000). Ahmed and Hoque (1999) reported that histologically the internal organs like kidney and liver were more affected and disease like EUS occurred during the months of December and January.



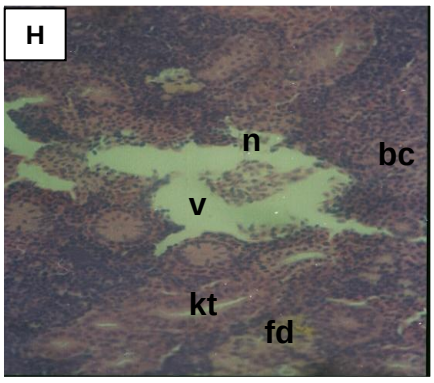


Fig. G. Section of kidney of *C. cirrhosus* collected from Government fish farm in November & December. Ruptured haemapoeitic cell (r), necrosis (n), haemorrhage (h), vacuole (v) & swollen kidney tubules (kt) were seen. H & E × 532.

Fig. H. Section of kidney of *C. cirrhosus* collected from NGO fish farm in September & October. Swollen kidney tubules (kt), blood cell (bc), necrosis (n), vacuole (v) and fat deposition (fd) were seen. H & E × 532.

Table 2. Histopathology of different organs of fishes from Government and Non Government fish farm

Cirrhinus cirrhosus	**Months** / **Organs**	**April-May**	**June-July-August**	**September-October**	**November-December**
Government Fish Farm	Gill	More or less normal	'ht', 'n', 'h' in 'sgl' & loss of pillar cell	'ht', 'hp', 't', 'n' & loss of pillar cell in 'pgl'	'n', 'h', 'hp' & loss of secondary gill lamellae were seen
	Skin & muscle	More or less normal	'v', 'c' & 'r' myotome present	'e' sloughed off, 'r' myotome, 'mm' & 'v' present	'e' lost, 'd' separated, 'mm', 'v' & r' myotome were seen
	Liver	Normal	'n', 'fd' & 'h' present	'n', 'fd' & 'v' present	'n', 'hpt', 'pk' nuclei, 'v' & 'h' were seen
	Kidney	Normal	necrotic 'kt' were seen	'n', & 'fd' were seen	ruptured 'hat', 'n', 'h', 'v' & swollen 'kt' were seen in the liver cell
Non-Government Fish Farm	Gill	Recover slowly	'n', 'cb', 'ht', in 'sgl' & loss of pillar cell were seen	'ht', & loss of pillar cell	'ht', 'hp', 'n' & loss of pillar cell were seen
	Skin & muscle	Normal	'e', 'd' separated, 'mm', 'v' &' r' myotome were seen	'e' sloughed off, 'mm' & 'v 'present	'e' & 'd' separated, 'v', &' r' myotome and 'mm' present
	Liver	Normal	'il', necrotic 'hpt', 'pk' nuclei & 'bc' were seen	'il', 'v', & 'n' were seen	necrotic 'hpt', 'v', 'h' & 'pk' nuclei were seen
	Kidney	Normal	swollen 'kt', 'h' & 'n' seen	swollen 'kt', 'bc', 'n,' 'v' & 'pk' nuclei present	'n', 'v', 'pk' nuclei & 'g' were seen

*All abbreviations in this table are explained as follows

bc=blood cell; c=chromatophore; cl=clubbing; d=dermis; e=epidermis; fd=fat deposition; g= glomerulus; gl= gill lamellae; h=haemorrhage; hat=haemotopoitic tissue; hp=hyperplasia; hpt=hepatocytes; ht=hypertrophy; il= ilets of langerhans; kt=kidney tubule; mm=melanomacrophage; n=necrosis; pgl=primary gill lamella; pk=pyknotic; r=ruptured; sgl=secondary gill lamellae; t=talengiactesis; v=vacuole.

Although most of the examined juvenile carps from different farms of Mymensingh area seemed to be healthy, a great percentage of fish were found affected by different infectious agents under histological observation. Various pathological changes of investigated organs were observed in the present investigation during October, November and December. From the management point of view, NGO fish farm seemed to be better than the Government fish farm, which was the major reason of lower level of infection recorded in NGO fish farm. Similar to the present study, Gosh (2006) also reported severity of infection in *Hypophthalmichthys molitrix* collected from Government fish farm was more pronounced compared to those fish collected from BAU fish farm. Thus it could be suggested that more precautionary measures would necessary to be carried out in the Government fish farm to prevent and control disease in order to obtain healthy fish. Introduction of pathogens as well as infected fish to the water body pollution from other sources should be prevented as far as possible. Steps should be taken to prevent the pollution and habitat destruction. However, further research works are necessary to draw a final conclusion on the disease outbreak in juvenile (*C. cirrhosus*) of nursery ponds in Bangladesh through histological techniques.

CONCLUSION

In conclusion, it is evident from the results that most of the examined juvenile fishes were normal and healthy from external observations, but pathologically a great number of fishes were affected by various diseases. The severity of clinical and histopathological changes were increased in the colder period specially in the months of November and December.

REFERENCES

Afifi-SH (1996) Histopathology of catfish, mud barbel *Clarias mossambicus* infected with *Trypanosoma markewitschi* under laboratory conditions, *Assiut. Vet. Medi. J.* 35(70), 72-83.

Ahmed GU, Hoque MA (1999) Mycotic involvement in epizootic ulcerative syndrome of freshwater fishes of Bangladesh. A histopathological study**.** *Asian Fish. Sci. Philippines*. 12**,** 381-390.

Akter N (2006) Study on health condition of freshwater eels from Ailee beel, Mymensingh. M.S. Thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 63.

Akter S, Ahmed GU, Roy MK, Akter N (2006) Investigation of some small indigenous fish species from Ailee beel, Mymensingh. *Progress. Agric*. 17(1), 219-225.

Chakma AP (2002) Histopathological observation on the effect of potassium permanganate in curing diseased small indigenous fishes. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 60.

Chowdhury MBR (1993) Research priorities for microbial fish disease and its control in Bangladesh. In: Proceeding of the Workshop on Research Priorities of Bangladesh for fish health, disease prevention and pathology. May 17, edited by Alan Tollervey**,** p. 8-11.

Chowdhury MBR (1997) Bacterial involvement in fish disease in Bangladesh. Presented at the international symposium on Disease in Marine Aquaculture, October 3-6, 1997. Hiroshima, Jaapan. Abstract (iii): 2-24.

Francis-Floyd R (1997) Introduction to Fish Health Management. Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Circular 921.

Gosh K (2006) Investigation of health status of juvenile exotic carps from various farming conditions. M.S. Thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, pp. 94.

Hossain MS, Paul SK (1993) Study of fish disease into the floodplains. In research progress report (June-September 1993). Fisheries Research Institute, Third Fisheries Project, Santahar, Bogra, October 1993. p. 46-52.

Islam MJ (1999) Investigation into Carp diseases through histopathological observations. M.S. Thesis. Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 79.

Moniruzzaman M (2000) Investigation on disease of some small indigenous freshwater fishes of Bangladesh. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 80.

Monowara M (2003) Monogenean infestation on certain small indigenous fishes of Mymensingh. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp.144.

Post DG (1987) Text book of fish health. T. F. H. Publications, Inc. Ltd. 221 West Sylvania Avenue, Neptune City, NJ. 00753, USA. p. 6-10.

Rahman MM, Chowdhury MBR (1996) Isolation of bacterial pathogen causing on ulcer disease in farmed carp fishes of Mymensingh. *Bangladesh. J. Fish.* 19, 103-110.

Ram RN, Singh SK (1988) Carbofuran induced histopathological and biochemical changes in liver of the teleost fish, *Channa punctatus* (Bloch). *Ecotox. Environ. Safety*, 16(3), 194-201.

Salim A (2002) Studies on fish diseases of carp poly culture systems through histopathological technique. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. pp. 70.

Tangtrongpiros J (1985) The Situation of freshwater fish disease epidemic and sanitary in Thailand. Paper presented at the 14th Conference of the 0. 1. E. Regional Commission for Asia, the Far East and Oceania. Colombo, 29 July - 2 August 1985.

Xu P, Xu J, Li J, Wang X, Liu G, Jiang Y, Yu J, Sun X (2014) Development and exploitation of genome resources and tools for common carp *Cyprinus carpio* genetic selection. World Aquaculture 2014 - Meeting Abstract.