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RESEARCH ARTICLE

EFFECT OF HELMINTH PARASITES IN *MASTACEMBALUS armatus* WITH SPECIAL REFERENCE TO HEPATO-SOMATIC INDEX

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ABSTRACT

Present investigation was carried out to reveal the effect of parasitic infection on histology of liver and hepato-somatic index. Maximum 50% prevalence was recorded during winter season while minimum percentage of 25.02% was observed in monsoon season. Hepato-somatic index (HSI) for infected *Mastacembalus armatus* varied from 1.015 to 2.1 gm, as compared to non-infected fishes (1.62 to 5.88 gm). As morphologically, infected liver appeared pale yellow and very thin in size. External surface showed few encysted parasites. Histologically, infected liver showed loosening in hepatic parenchyma, irregular lobular arrangement and necrosis. Most of the hepatocytes are indistinguishable with eccentric and enucleated.

INTRODUCTION

Fish health status depends upon the fish's genetic composition, prior history and the quality of the present environment for both, the fish and the pathogens [1, 2, 3]. Fish health is a broad topic that transcends well beyond the effects of pathogenic organisms. Environmental factor that are stressful to fish may actually provide a more optimal environment for pathogenic organisms and consequently increase their virulence. Parasites appear to be an important stressor affecting fish population in water bodies. Helminth parasites cause pathological changes in the internal organs of host which may lead to death of young fish [4].

Fishes have a great nutritive value and due to this fishes are consumed in abundance not only in India but all over. Fishes provide a balanced diet to all the living organisms. The increasing demand of fish in the market has led an increase in fish disease. This cause stress in fishes which affect the immune system of fishes due to which parasites attack them and causes various diseases which lead to more mortality [5, 6]. Diseases in fishes may be grouped into two broad categories viz, nutritional diseases- diseases caused due to intrinsic causes and diseases caused by parasites and pathogens. Diseases caused by parasite and pathogens result in drastic reduction in the production of fishes. The pathogenicity of parasites varies greatly depending on their number, habitats degree of adaptation that has developed with the host and considerably with the species and size of the host and its health status [7].

The prime goal of the study was to know the metabolic health of the fish for the xenobiotic i.e. the health of the fish population in the aquatic ecosystem. Hence the total organ weight (liver) was taken plays an important role in the process of the production for the hepato-somatic (HSI) of fish system as it greatly depends on quantity and indices. According to [8] liver is the metabolic organ and hepato-somatic index (HSI) is a useful biomarker to detect the effects of the environmental stressors.

MATERIAL AND METHODS

Collection of the host fish

The host fish *Mastacembelus armatus* were collected from different local fish markets of Bhopal region. Fishes were collected ones in a weak for one year (during different seasons i.e. summer, rainy and winter months). The hosts brought to laboratory were subjected to a thorough investigation as per the methods employed by [9], [10]. Standard length and weight were also taken.

Laboratory Technique Techniques Employed

The host Fishes were dissected out and the body cavity and viscera are thoroughly examined for any parasite. Liver was then removed, weighted and kept in separate petri dishes containing normal saline (0.75%). Parasites collected, killed and fixed in Alcohol-Formalin-Acetic acid (AFA) solution for 24 hours. The parasites were dehydrated using different concentrations of alcohol viz. 50%, 70% alcohol, 80% alcohol, 90% alcohol, and 100% alcohol for a period of ten minutes each. After dehydration, the parasites were cleared in xylene and stained with acetocarmine. The parasites then mounted by using DPX. The slides were then observed under a light microscope and identified.

Hepato-Somatic Index (HSI)

The total organ weight (liver) was taken plays an important role in the process of the production for the Hepatosomatic index (HSI) of fish system as it greatly depends on quantity and indices. The indices were calculated according to the quality following formula:

HSI = (Liver weight (g) / Fish weight (g)) × 100

Statistical Analysis

(i) Prevalence = $\frac{\text{Total No. of Hosts Infected} \times 100}{\text{Total No. of Hosts Examined}}$

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(ii) Mean Intensity = Total No. of parasites / Total No. of Infected Hosts Examined

(iii) Relative Abundance = Total No. Parasites / Total No. of Hosts Examined

Histopathological methods

Infected liver were collected from fish and fixed in aqueous Bouin's fixative or 10% formalin for 24 hrs. The tissues were taken out from the Bouin's fluid for 24 hrs and were washed with 70% alcohol till yellow colour of picric acid disapperears. They are then dehydrated through graded series of alcohol (30%, 50%, 70%, 85%, 90% and 100%, cleared in xylene and embedded in paraffin wax (melting point 58^0 to 68^0C). Blocks were prepared and sectioned at a thickness of 5 micron. The ribbons were stretched on clean slides using Mayer's albumin and kept for 24 hrs for drying. Staining was done by the routing techniques of Haematoxylin (Delafields) and Eosin (1% alcoholic). Stained histo-pathological sections were examined under Olympus research microscope. Microphotography was taken both at high magnification and low magnification.

RESULTS

Parasites Collected

Three helminth species were recorded during the investigation period from freshwater eel *Mastacembalus armatus*. This includes one digenetic trematodes i.e. *Clinostomum sp.*, one species of nematode species *Eustrongylides* and one species of acanthocephalan i.e. *Pallisentis sp*.

Monthly variation in infection in Mastacembalus armatus

Out of 38 specimens of *Mastacembalus armatus* examined, 14 were found infected with helminth parasites. The maximum prevalence (50%) was recorded in month of October of investigation while the minimum prevalence 25.00 % was recorded in August month.

In *Mastacembalus armatus*, the maximum intensity (1.07) was recorded in October month. The lowest intensity (0.27) was recorded in month of November. The recorded value of relative abundance ranged from 0.104 – 0.394. The highest abundance (0.394) was recorded in October month and the lowest density (0.104) in month of November.

Effect of helminth parasites on hepato-somatic index

Hepato-somatic index (HSI) for infected *Mastacembalus armatus* ranged between 1.015 to 2.1 gm, as compared to non-infected host fish i.e. 1.62 to 5.88 gm **(Figs. 1, 2 & 3).**

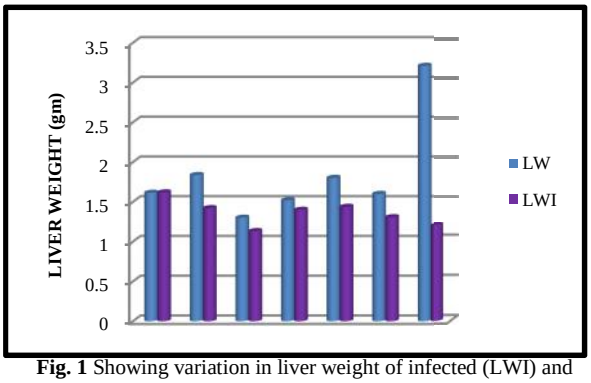

Fig. 1 Showing variation in liver weight of infected (LWI) and uninfected host fishes (LW)

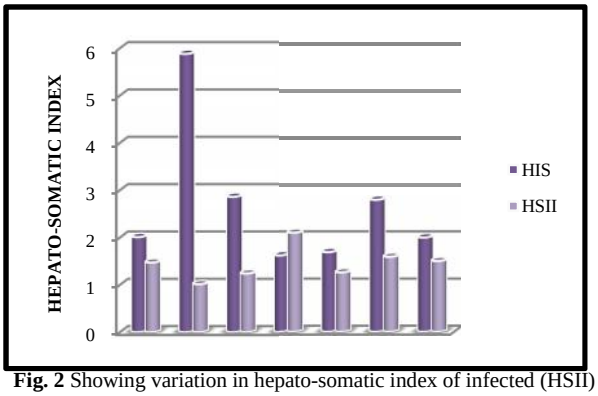

Fig. 2 Showing variation in hepato-somatic index of infected (HSII) and uninfected host fishes (HIS)

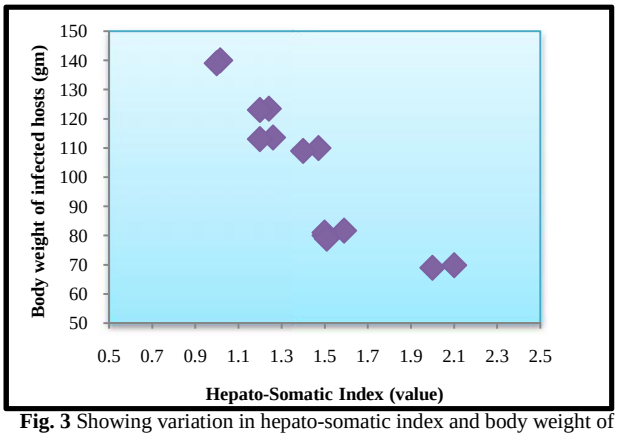

Fig. 3 Showing variation in hepato-somatic index and body weight of infected host fishes

Histological effect of parasites on liver

Infected liver of *Mastacembalus armatus*, appeared pale yellow and very thin in its morphological appearance. External surface showed few encysted parasites. Histologically liver showed loosening in hepatic parenchyma, irregular lobular arrangement and necrosis. Most of the hepatocytes are indistinguishable with eccentric and enucleated. (**Figs. 4, 5, 6**).

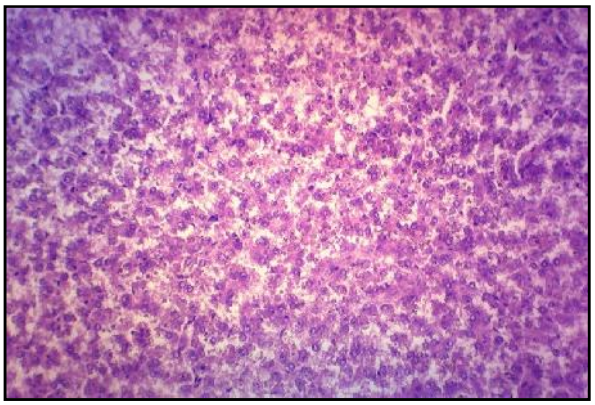

Fig. 4 Microphotograph of infected liver of *M. armatus* showing eccentric hepatocytes, loosening of hepatic parenchyma X100

DISCUSSION

During the present study 38 specimens of *Mastacembalus armatus* specimens were observed for the occurrence of helminth infection. During present study, fish samples were observed as the parasitic load varies according with change in environment condition. This may also affect the health condition of the host fish. As during present study, uninfected

fish specimens were found in a better (healthy) condition as compared to infected ones.

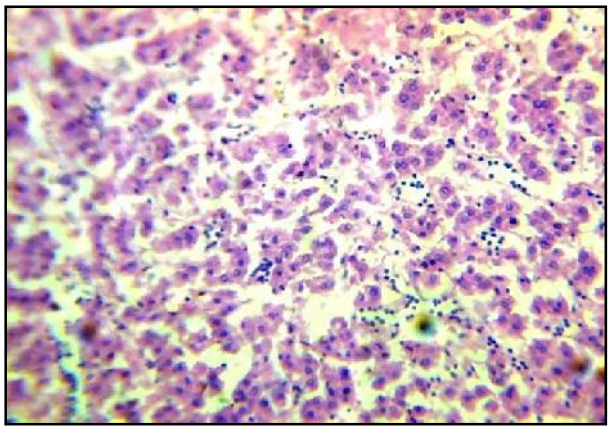

Fig. 5 Microphotograph of infected liver of *M. armatus* showing loosening of hepatic parenchyma, necrosis X400

[11] reported that the main factors determining the variety of parasite fauna as well as the intensity and incidence of infection can be summarized as follows: the diet of the host, life span of the host, the mobility of host throughout its life including the variety of habitats it encounters, its population density and the size attained, large hosts provide more habitats suitable for parasites than do small ones.

The condition of the liver (hepatosomatic index HSI) and the whole body (Fulton condition factor FCF) can provide information on potential impacts caused by diseases and pollution. Although, these parameters may serve as an initial screening biomarker to indicate exposure and effects [12]. Morphological parameters that are often used in field research are the hepatosomatic index to identify possible liver diseases, and the condition factor to assess the general condition of fish [12].

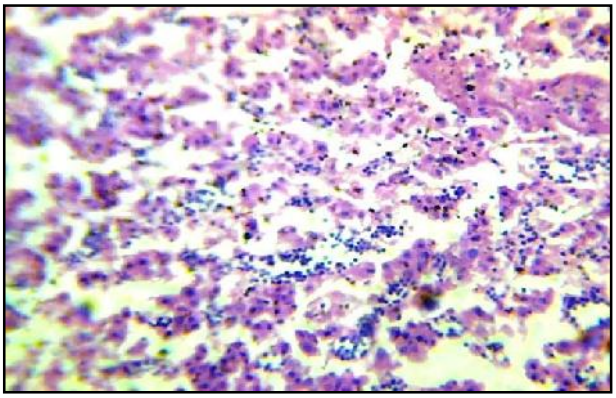

Fig. 6 Microphotograph of infected liver of *M. armatus* showing loosening of hepatic parenchyma, eccentric and enucleated hepatocytes X400

[13] and [14] claimed that HSI might be useful as an indicator of chemical water pollution; others showed that it was inconsistent as a biomarker [15] and that it is dependent on the seasonal cycle [16]. [13] also explained that HSI is associated with liver energetic reserves and metabolic activity.

[17] mentioned that HSI does not change over the range of body weight suggesting that HSI is an appropriate expression of liver size. [18] revealed seasonal changes in condition, hepatosomatic index and parasitism in sterlet *(Acipenser ruthenus* L.) and showed seasonal changes exist in condition, hepatosomatic index, and parasitism.

It is generally reported that the histopathological biomarkers are useful as indicators of the general health of the fish and are considered as a mirror that reflects of the exposure to a variety of anthropogenic pollutants [19]. Histology of Liver of infected fish is briefly illustrated that helminth parasites mildly affected the histo-architecture.

[20] reported that the presence of metacercariae, in some sensitive organs in *Clarias* species which does not necessarily imply a debilitating impact on the fish, even at relatively high infection loads. [21] studied the histo-pathology of the liver of *Nandus nandus* infected by *Clinostomum complanatum* exhibited loosening of hepatic tissue, eccentrically situated nuclei of hepatocytes and necrosis and mechanical damage of liver tissue due to larval migration resulted into large space around the metacercariae.

[22] studied the effect of digenetic trematode, *Euclinostomum heretostomum* on the histo-architecture of liver of *Channa punctata and revealed that* in case of mild infection, the metacercariae were found attached to the external surface of hepatic tissue. While in case of acute or chronic infection, the encysted metacercariae of *Euclinostomum heterostomum* were found deeply embedded in the entire hepatic tissue due to which liver appeared thin, compressed and pale with yellowish- black nodules of encysted metacercariae. A space occupying cavity is created by the metacercarial cysts due to which tissue appeared in the form of lumps.

CONCLUSION

It may be inferred that during present investigation endo-parasites infection possessed effect on hepatic tissue of host fishes. This may affect the metabolic activity of whole body, as endo-parasites have qualitative and quantitative effect not only on liver but also hinders the growth of fishes.

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