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Evaluation of loss in terms of mortality and growth reduction in *Catla catla* (Hamilton, 1822) under experimental infection of anchor worm

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ABSTRACT

Anchor worm (*Lernaea* spp.) infestation is one of the major parasitic diseases affecting carp culture all over the world, particularly in the Indian subcontinent resulting in huge economic losses. The present study evaluated the loss in terms of mortality and growth reduction in *Catla catla* fingerlings under experimental infection of *Lernaea* sp. In the experimentally infected tanks, mortality of catla fingerlings ranged from 50-100% as compared to no mortality in control tanks. Furthermore, fish that survived in the *Lernaea* infected tanks showed an average weight loss of 23.65%.

Keywords: Anchor worm, *Catla catla*, Economic loss, Indian major carps, *Lernaea*

Indian major carps (IMCs) are the most popular cultured finfish species in India. In the state of Andhra Pradesh alone more than 40,000 t of IMCs are produced annually, valued at more than ₹600 million (Shankar *et al.*, 2000). Average annual loss of more than ₹70 million due to disease-induced mortality and impaired growth is reported from the state. Ectoparasitic infection accounts for 70% of the fish diseases, while bacteria and fungi account for 27.5 and 2.5% of the diseases, respectively (Rao *et al.*, 1992). *Lernaea* spp. are important ectoparasites of freshwater fishes of the world (Piasecki *et al.*, 2004). Lernaeid infections are frequently reported from carp culture systems in India (Nandeeshia *et al.*, 1984, 1985; Tamuli and Shanbhogue, 1996; Zafar *et al.*, 2001). Among the three species of IMCs, *Catla catla* is the most susceptible species to *Lernaea* infection (Abbas *et al.*, 2014). *Lernaea* infection in fish leads to weight loss, growth retardation as well as alterations in blood and behaviour of fish (Gabielli and Orsi, 2000). Apart from these issues, another matter of serious concern is the adverse impacts of the indiscriminate use of pesticides to control this infection, on the ecosystem.

In this study an attempt was made to estimate the direct loss due to *Lernaea* sp. infection in fingerlings of *C. catla*. Adult *Lernaea* sp. with egg sacs were collected from naturally infected live catla fishes. Egg sacs were separated from the parasite using forceps and placed in a beaker containing filtered tap water for hatching and

further development up to the infective copepodid 1 stage. Numbers of live copepodites in 5 ml sample were counted in a petridish with the aid of a dissecting microscope and the density calculated.

Fingerlings of catla were acclimatised in the laboratory tanks prior to the experimental infection. Twenty numbers of catla fingerlings (mean weight 17.88 g) were stocked in each of four plastic tanks (1000 l). Fish in two tanks (treatment) were experimentally infected by adding suspension of *Lernaea* copepodites after reducing the water level to 1/3rd in order to favour better infestation. Tank 1 was infected with 12,935 nos. of copepodites and tank 2 with 10,851 nos. After 90 min, water was filled in the tanks to its full capacity. Other two tanks stocked with 20 catla fingerlings each, without introduction of *Lernaea* copepodites served as controls. There was no water exchange or removal of faecal matter from the tanks during the initial 7 days post-infection, to prevent accidental removal of free living infective stages. After one week, faecal matter and uneaten feed materials settled at the bottom of the tanks were removed as and when needed by siphoning. As per need, water was exchanged by replacing one-fourth of the tank water with filtered freshwater. Fish were fed *ad libitum* with commercial pelleted feed. The water temperature, pH and dissolved oxygen levels were monitored throughout the experimental period. Length and weight of the fish at the start and at the end of 30 days experiment were also recorded.

Prevalence (P) and mean intensity (MI) of *Lernaea* infection were recorded as per Margolis *et al.* (1982). Percentage cumulative mortality and weight loss in the tanks were recorded during the 30 days study period. The water quality parameters in the experimental tanks during the course of study were within the optimum range (pH: 7.2 to 7.4; temperature: 25 to 28°C; dissolved oxygen: 5.5 -7.1 mg l⁻¹). No mortality was observed in the uninfected control tanks during the experimental period (Table 1). During the 30 days post-infection (dpi), 100%

by *Lernaea* sp. (Hoffnagle *et al.*, 2006; Perez-Bote, 2010; Sanchez-Hernandez, 2011).

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Table 1. Growth parameters in terms of weight and mortality in catla fingerlings during the 30 days experimental infection of *Lernaea* sp.

Treatment	MIW (g fish ⁻¹)	MFW (g fish ⁻¹)	CM (%) (30 d)	MWG (g fish ⁻¹)	PWG	MWL (g fish ⁻¹)	PWL (%)
Control 1	17.28	19.59	Nil	2.31	13.37	Nil	-
Control 2	18.48	21.03	Nil	2.55	13.80	Nil	-
Tank 1	20.83	-	100	Nil	-	-	100
Tank 2	18.08	13.8	50	Nil	-	4.28	23.65

MIW - Mean initial weight, MFW - Mean final weight, CM - Cumulative mortality, MWG - Mean weight gain, PWG - Percentage gain in weight, MWL - Mean weight loss, PWL - Percentage weight loss

mortality was observed in tank 1, while 50% mortality was observed in tank 2. The prevalence of infestation was 100% in tank 1 and 50% in tank 2. The mean intensity of parasite infection per fish was 5.75 and 3.85 in tank 1 and tank 2, respectively. All fishes were not uniformly infected with *Lernaea* sp. Success of infection depends on several factors including the number of copepodites to which the host is exposed and on the characteristics of the host itself. Hemaprasanth *et al.* (2011) reported mortality of up to 30% in experimentally infected catla fingerlings under monoculture, while 100% mortality recorded under polyculture, during 5 days post-infection. Djajadiredja *et al.* (1981) reported 10-30% mortality of fish fry and fingerlings infected with *Lernaea* sp. in Indonesia. However, the risk of *Lernaea* spp. pathogenicity depends on the affected organ, parasite intensity, environmental conditions and concomitant infections (Alvarez, 1998).

During the 30 days experiment, fish in control tanks registered mean weight gain of 2.43 g fish⁻¹ whereas fishes survived in the tank 2, registered 23.65% loss in weight. It was also observed that the infected fishes became weak and went off feed. *Lernaea* sp. infection is accompanied by marked emaciation and loss of weight as also reported by Stoskopf (1993) and Gilberto Pavanelli, (1998). Shariff and Sommerville (1986) reported that *Lernaea* sp. infested carps were up to 35% lighter in weight than uninfected carps. Information on growth retardation due to *Lernaea* spp. infection either under experimental or field studies is scanty except for a few reports on lower condition factor (length-weight factor) in fishes infected

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