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PREVALENCE OF DIFFERENT GILL ASSOCIATED PARASITES IN CULTURED INDIAN MAJOR CARPS AND THEIR INFLUENCE IN PISCICULTURE IN PURI DISTRICT. ODISHA, INDIA

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Abstract

Fish parasites influence freshwater aquaculture in a great extent. All the three Indian Major Carps (IMCs), namely Labeorohita (Rohu), Catlacatla (Catla), and Cirrihinusmrigala (Mirgal) are exposed greatly to fish parasites like Dactylogyrus spp., Myxobolus spp., and Trichoidina spp. due to their greater mobility, diverse feeding habits and greater metabolic rate. IMCs are cultured in the coastal regions of India as food fishes and this industry is important economically. Different seasons play vital role in the infestation of these parasites, as they are susceptible to certain seasons. But infestation of parasites may lead to different physiological disorders and occasionally death, which is an economic threat to this industry. All these pathogens are environment specific and some are host specific also. Increasing density of the fishes in a constricted water area may be a key factor for infection. Transmission gets easier through water and mud. Farmers should be aware of infection season and should take preventive measures to restrict infections. Some prevention methods have been described in this article.

Keywords: Freshwater Aquaculture, Infestation, IMCs, Parasites.

Introduction

Pisciculture is one of the precise business practices in Odisha state of India. It provides a good income source to people of rural areas and is also a favourable food for the people of these coastal areas. Indian major carps (IMCs) like Labeorohita (Rohu), Catlacatla (Catla), and Cirrihinusmrigala (Mirgal) are the fresh water food fishes cultured in fish farms in Odisha for the purpose of business. But the growth of this business is directly proportional to the health conditions of fishes cultured in the farms. Infestation of parasites is the major threat to the productivity of the farm. Sometimes parasites causing diseases may arise due to malnutrition and deprived water quality [1]. In certain seasons these fish parasites invade their hosts causing lots of physiological problems. It results in high mortality rate and financial slaughter [2]. Some pathogen genera have the potency to cause mortality of the host by negatively influencing development and reproduction [3]. Improper management practices and not having consciousness in disease prevention are major obstacles in fish production [4]. Density of fishes in pond is directly proportional to the rate of infection [5].

Methodology

The current study is to determine the occurrence of several pathogens associated with gills of fresh water IMCs like Labeorohita (Rohu), Catlacatla (Catla) and their influence in different weathers. The study has been concentrated in the different villages of Nimapada block of Puri district of Odisha state of India. Five different fish farms were selected to conduct the study. Visits were conducted at regular intervals to monitor the health condition of fishes. The study was carried out from April 2019 to March 2020. The objective was to observe the determine the parasite frequency in all three seasons namely Summer (March-June), Rainy (June-September) and Winter (November-February).

Tissue samples (mucus and white cysts) of gills were collected from those preselected farms. The samples were preserved in Neutral Buffer Formalin (NBF) solution. All the tissue samples (smear of gills) were studied under microscope for the detection and identification of the parasites. The scrap from gills were taken on slides with single drop of water and observed under microscope.

Parasitic Frequency Index (PFI)

PFI was calculated by taking the percentage of number of fishes infected by a particular parasite species, against the total number of fishes examined.

$$\text{Parasitic Frequency Index (\%)} = \frac{\text{Number of infected fishes}}{\text{Total number of fishes examined}} \times 100$$

Severity of Infection

It was determined by taking the Parasitic Frequency Index into consideration. Three categories such as rare (<10%), mild (<50%), and severe (>50%) were enlisted.

Results and Discussions

During the observations three types of parasites were identified namely, Dactylogyrus spp. (**Fig. 1**), Myxobolus spp. (**Fig. 2**), and Trichodina spp. (**Fig. 4**) which were associated with the gills of the carps.

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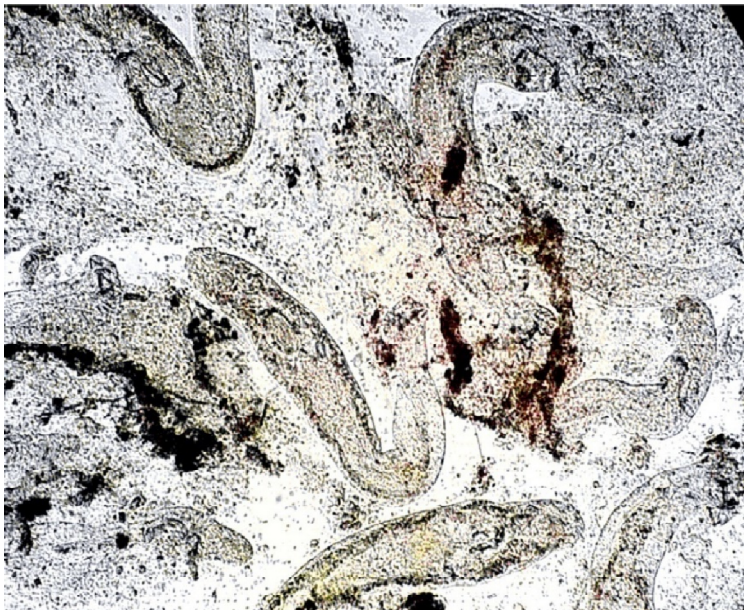

Fig. 1 Wet-mount microscopic photograph of Dactylogyrus spp.

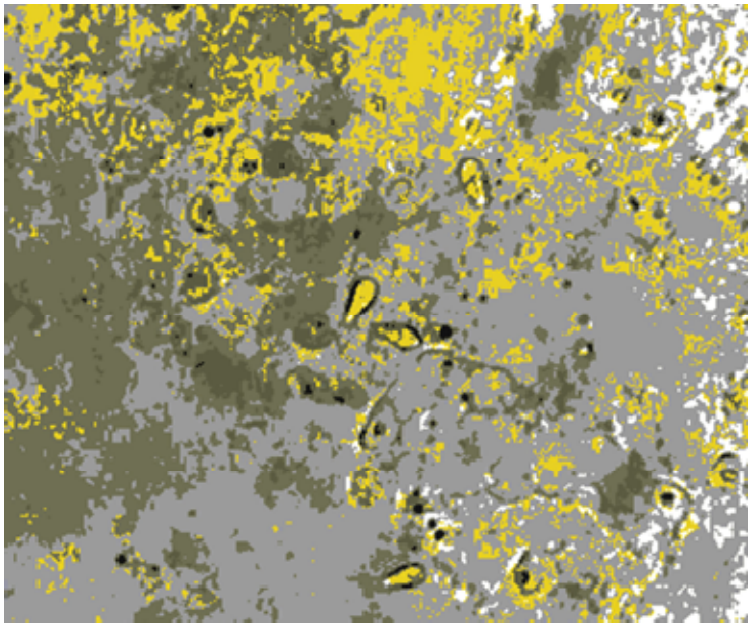

Fig. 2 Wet-mount microscopic photograph of Myxobolus spp.

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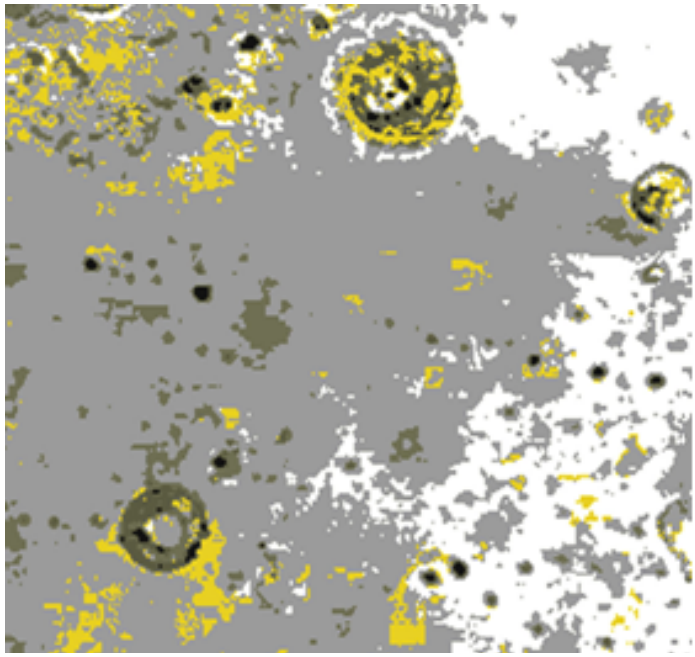

Fig. 3 Wet-mount microscopic photograph of Trichodina spp.

Table: Seasonal distribution of parasites and severity of infection in IMCs (Rohu, Catla). [The severity of infection is categorised into three classes like rare (PFI: <10%), mild (PFI: 10-50%) and severe (PFI: <50%) according to the PFI]

Season	No. Of Fishes Examined	Name of the Parasite	No. Of Fishes Infested	Parasitic Frequency Index (PFI in %)	Severity of Infection
Summer (March-June)	47	Dactylogyrus spp.	32	68.08	Severe
		Myxobolus spp.	2	4.25	Rare
		Trichodina spp.	22	46.80	Mild
Rainy (June-September)	41	Dactylogyrus spp.	24	58.53	Severe
		Myxobolus spp.	12	29.26	Mild
		Trichodina spp.	14	34.14	Mild
Winter (November-February)	59	Dactylogyrus spp.	9	15.25	Mild
		Myxobolus spp.	41	69.49	Severe
		Trichodina spp.	16	27.11	Mild

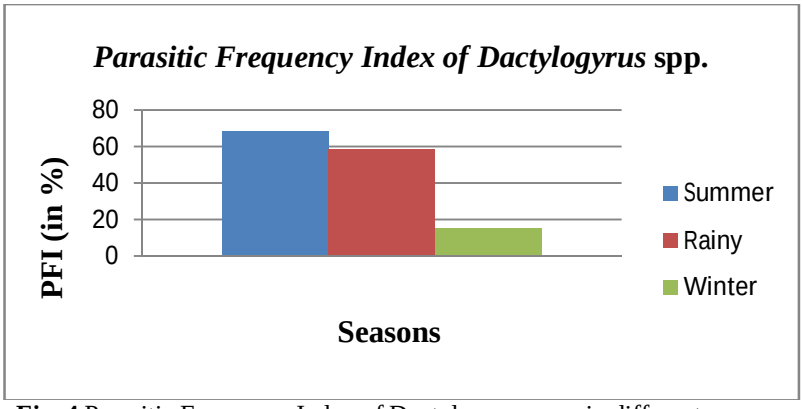

Fig. 4 Parasitic Frequency Index of Dactylogyrus spp. in different seasons

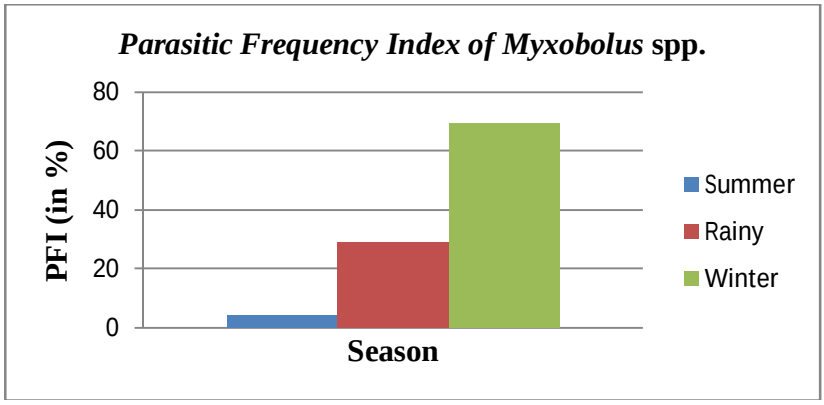

Fig. 5 Parasitic Frequency Index of Myxobolus spp. in different seasons

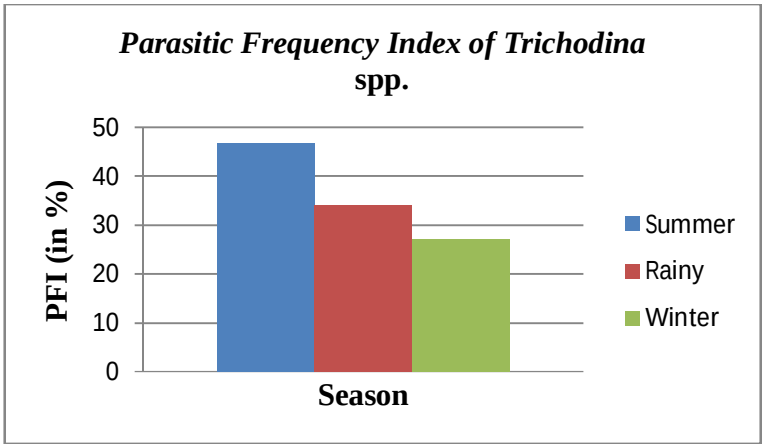

Fig. 6 Parasitic Frequency Index of Trichodina spp. in different seasons

The present study revealed that Indian major carps (mostly Rohu and Catla) suffered from excessive mucus, gulping of air, cessation of feeding and white cysts in gills due to presence of the above said parasites in their gills.

Fish parasites are transmitted through water and mud as fishes are usually cultured in huge numbers in a constricted water area [6]. Myxozoan parasites can use all three IMCs as their host. These have been reported from freshwater fishes of wetlands of Punjab [7]. Some of their infestations are correlated with ecological alterations [8]. These infestations, resulting in gill lesions have also been reported in Odisha [9]. Myxozoans are responsible for gill myxoboliosis [10] and cysts in gill [11]. Myxoporeans resulting in gill infections in cultured fishes can cause considerable tissue injury [12]. Globally genus Myxobolus comprises of a large range of species [13].

With more than 900 species, Dactylogyrus is the largest parasitic helminth genus [14]. These are often called gill flukes and are highly host specific. Symptoms of infestation are accelerated respiration, leading to gill hemorrhages hence less tolerance in low Oxygen environments, excess mucous secretion, and appetite loss.

It has been reported in several studies that Trichodina exist on skin and gills of cyprinid fishes [15, 16]. In freshwater fishes, these species are very frequent. Pathogenic symptoms of this parasite are hyperplasia and necrosis of the epidermal cells [17] and in some cases complete destruction of gill epithelium may occur.

Immunological control

Immune system is classified into innate and acquired systems. Specificity of the innate system is a genetic trait [18]. Innate immunity is the primary defence system working against fish pathogens composed of epithelial barrier, humoral and cellular machinery. Several immunoglobulins, antimicrobial peptides, and complement factors are there in fish mucus. Acquired immunity reflects the immune experience of the immunity system but is not a genetic trait. Acquired immunity requires synthesis of specific

receptor proteins and is long lasting. Improvement of the acquired immunity in IMCs is due to their greater food intake, metabolic rate, and mobility, all these leading to maximum exposure to parasites.

Vaccines

Life cycle of the fish parasites is complex and they are also difficult to cultivate in sufficient quantity for vaccine production. Hence production of anti-parasite vaccines is not quite easy. Construction of recombinant proteins by the detection of parasitic antigens is an approach of vaccine development. Influence of vaccines varies with respect to different fish species, age and culture conditions of the fishes. Variable environmental temperature may also affect the vaccination. Fully developed adaptive system is necessary to attempt vaccination. Sometimes a completely developed acquired immune system does not guarantee full immunological proficiency [19].

Probiotics

Microbes like Bacillus spp. and Yeasts, have been used in aquaculture. Certain probiotics such as MacroGard (β-glucans) and Ergosan (polysaccharide from seaweed) have been designed for aquaculture purposes [20]. Use of microbes against fish pathogens has been proved to be advantageous [21].

Immunostimulation

Products of bacteria, virus, parasites, or plants may induce immunostimulation. Several forms of β-glucans are introduced in the food and also as vaccine [22]. In lower concentration of glucan, the belongings are positive but these are negative in higher concentration [23]. Synthetic double stranded RNA is also used as immunostimulant [24]. But these have negative effects on the immune system of fish larvae [25]. Addition of vitamins, carotenoids and herbal remedies to food has been reduce stress response, increase innate immunity response and improve disease resistance [26].

Conclusion

When these parasitic infestations become severe these may injure the integumentary section providing route to secondary contagious pathogens. These are harmful for fish physiology and also reduce the economic growth of the aquaculture industry. More intensive study may increase awareness among the farmers which will be beneficial for both the health of the fishes and for the growth of these industries. Training programmes on preventive measures of pathogenic infections should be arranged in remote areas.

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