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Seasonal Variation in the Infestation of Helminth Parasites in Indian Major Carps, Darbhanga, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The current investigation was undertaken to study of the seasonal variations in the intensity of helminth parasites in 160 specimens of Indian major carps collected from different ponds of Darbhanga district, Bihar, India. The host fish were found to parasitize there helminth endoparasites such as *Bothriocephalus*, cestode in intestine, *Camallunus* nematode in stomach, *Dactylogyrus* flukes in gills and *Gyrodactylus* flukes in skin. These parasites revealed seasonal fluctuation in their prevalence percentage, mean intensity and abundance. The highest prevalence and abundance was recorded for *Dactylogyrus* (70.21 and 18.33) in winter months followed by summer (42.51 and 10.66), post monsoon (10.51 and 5.66) and in monsoon months (6.65 and 3.33). Similarly the highest prevalence and abundance was recorded for *Gyrodactylus* in winter (7.91 and 2.05) but lowest in monsoon (2.01 and 0.66). The winter month did not show infection of any endoparasites *Camalluns* and *Bothriocephalus.* The observed seasonal variations have been attributed to temperature, feeding habit and lifecycle patterns of the parasites. The present investigation concludes that winter and summer seasons as the most susceptible seasons to parasitic attacks in Indian major carps.

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Keywords: Indian major carps; Bothriocephalus; Camallunus; Dactylogyrus; Gyrodactylus; Darbhanga city pond.

1. INTRODUCTION

Darbhanga district in Bihar is known as city of ponds. The district has huge freshwater resources in form of thousands of Government and private ponds. The pond water is generally used for domestic and fisheries activity. However, Darbhanga is categorized as one of the fastest urbanizing cities of north Bihar.

Parasites are an important group of pathogens causing infection and diseases in fish. In fact, parasitic infestations are becoming real threats to fish health and production. It is essential area for proper attention of aquatic biologists for sustainable aquaculture production. Parasitic infestations play a major role in disease occurrence (78%) in Indian freshwater aquaculture causing huge economic loss [1]. Andhra Pradesh and West Bengal fish farmers are put to a loss of 21% and 26% respectively in terms of production due to parasitic infestations and resultant diseases [2,3].

In most of the fish farms, it was observed that among all fish pathogens, parasitic infestation has been the major cause of concern because of high morbidity and slow growth rate. These parasites were difficult to be removed from the culture system, causing significant setback to freshwater aquaculture. Under poor water quality conditions [4] or stressful environment [5] these parasites multiply rapidly there by affecting fishes with high morbidity [6]. Fish parasites and diseases caused by them spread quickly when factors like water, food and temperature become favourable for mass reproduction of parasites [7]. The important such factors are changes in water temperature, water quality, dissolved oxygen, pH and the density of fish [8].

Fish parasites are of two types, ectoparasites and endoparasites. Endoparasites have been reported from almost every internal organs of fish, however species specificity of occurrence are there Marcogliese [9] Murray and Peeler, [10] Wali et al., [11]. Endoparasites have complex life cycles, most often involving at least two hosts. Helminths constitute one of the major and important group of parasites of fish and cause a severe loss in fish production [12]. Like other parasites, helminthes also draw nutrition from fish hosts thereby depriving them of essential nutrients and inhibiting growth resulting into morbidity and mortality with consequent economic losses [9].

Hence the objectives of the present study were to investigate the impact of seasonal variation in infestation of helminth parasites in Indian major carp of different culture ponds of Darbhanga, Bihar.

2. MATERIALS AND METHODS

The water samples were collected from different ponds Darbhanga in the period for one year from June, 2022 to May, 2023, specimens Indian major carps were collected monthly for once in every month and samples brought into laboratory in ice-box then the fish were refrigerated for isolation of parasites inhabiting stomach and intestine within 2-3 days of collection.

The endoparasites so isolated from the test organs were preserved / fixed in AFA (Alcohol formalin-Acetic acid) fixative. The AFA was prepared as follows:- Formalin (40% aqueous formaldehyde) -60 ml, Ethyl Alcohol (95%)- 500 ml, Glacial acetic acid – 40 ml, Distilled water – 400 ml were mixed and heated with a sprit lamp [13]. The aceto-carmine stained parasites were minutely observed under microscope. The identification of parasites were done using reference keys of Yamaguti [14,15] Cheng [16] Chubb et al*,* [17] and Chandra [18].

The season-wise prevalence percentage, mean intensity and abundance of the identified helminth parasites were determined by employing the following formulae (Margolis et al*.,* 1982).

Prevalence= Total no. of host infected X 100/ Total no. infected host examined

Mean Intensity = Total no. of collected parasites / Total no. infected host examined

Abundance (Relative Density) = Total no. of parasites / Total no. infected host examined

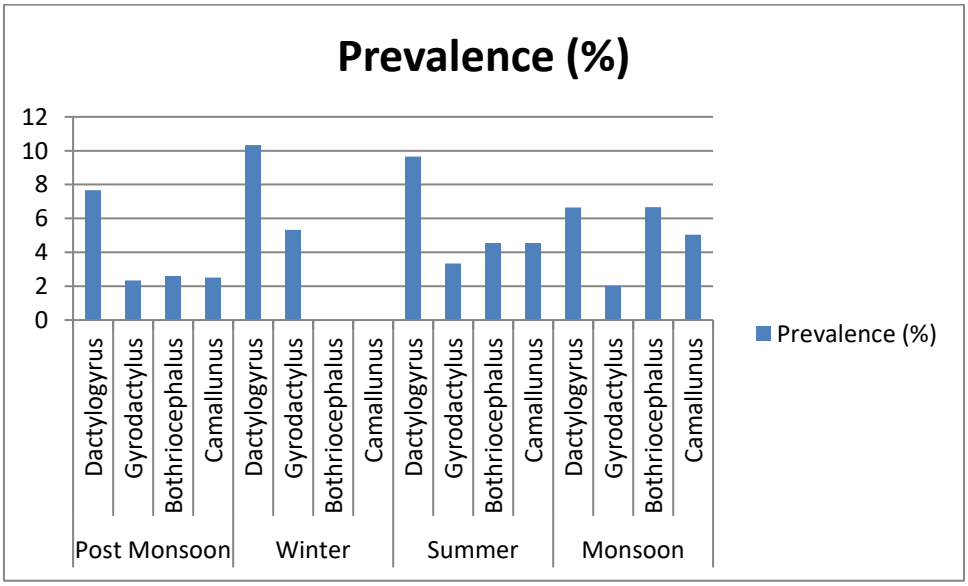
3. RESULTS

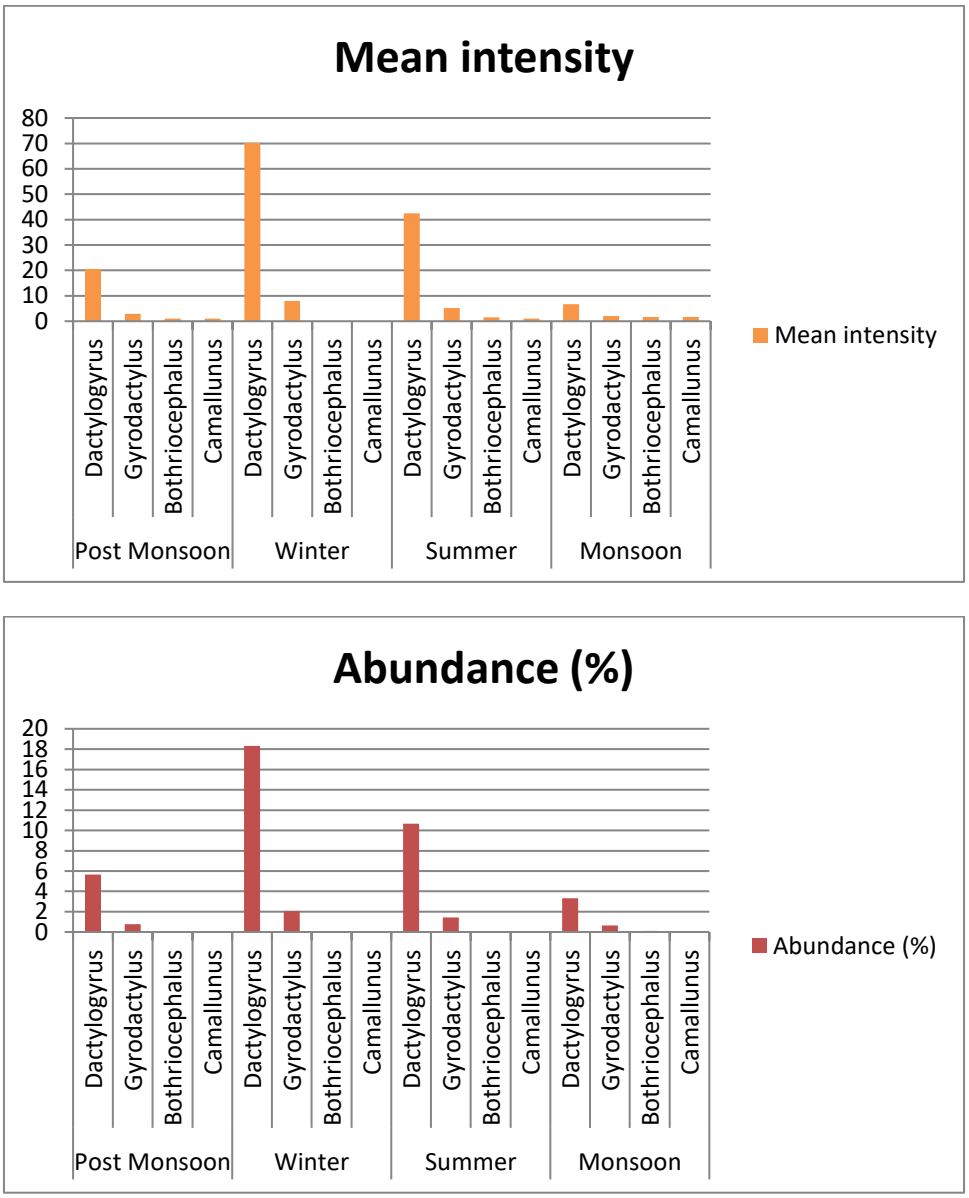
The results of the present study have been elaborated in Table 1. The specimens no. 160 Indian major carp, *Labeo rohita, Catla catla* and

Cirrhinus mrigala were found to parasitize there helminth endoparasites. There were four different species of helminthes were identified such as *Bothriocephalus* cestode in intestine, *Camallunus* nematode in stomach and two ectoparasites *Dactylogyrus* flukes isolated from gills and *Gyrodactylus* flukes from skin. The seasonal fluctuations in intensity of infestation of these parasites in terms prevalence (%), mean intensity and abundance have been shown in Table 1, Histogram 1. The seasonal fluctuation in the infection level of all four parasites revealed very comparative results. The highest prevalence and abundance was recorded for *Dactylogyrus* (70.21 and 18.33) in winter months followed by summer (42.51 and 10.66), post monsoon (10.51 and 5.66) and in monsoon months (6.65 and 3.33). Similarly the highest prevalence and abundance was recorded for *Gyrodactylus* in winter (7.91 and 2.05) but lowest in monsoon (2.01 and 0.66). The maximum prevalence and abundance of the endoparasites were recorded in summer followed by monsoon, post monsoon and winter months. The highest prevalence and abundance was recorded for *Bothriocephalus* in monsoon (6.67 and 0.12) but in winter no infection was recorded. The highest prevalence and abundance was recorded for *Camallunus* in monsoon (5.05 and 0.09) but in winter no infection was recorded.

Table 1. Seasonal variation of Helminth parasites infestation in Indian major carps

Seasons	Parasites	Prevalence (%)	Mean intensity	Abundance (%)
Post Monsoon	*Dactylogyrus*	7.66	20.51	5.66
	Gyrodactylus	2.33	2.91	0.76
	Bothriocephalus	2.6	1.0	0.02
	Camallunus	2.5	1.0	0.03
Winter	*Dactylogyrus*	10.33	70.21	18.33
	Gyrodactylus	5.32	7.91	2.05
	Bothriocephalus	0.0	0.0	0.0
	Camallunus	0.0	0.0	0.0
Summer	*Dactylogyrus*	9.66	42.51	10.66
	Gyrodactylus	3.33	5.21	1.44
	Bothriocephalus	4.55	1.5	0.07
	Camallunus	4.54	1.07	0.03
Monsoon	*Dactylogyrus*	6.65	6.65	3.33
	Gyrodactylus	2.02	2.01	0.66
	Bothriocephalus	6.67	1.62	0.12
	Camallunus	5.05	1.65	0.09





Histogram 1. Seasonal variation of Helminth parasites infestation in Indian major carps

4. DISCUSSION

The findings of present study are in conformity with those of Chandra et al. (1997), Moffasshalin et al. [19] Thakur et al. [20]. The results of the study reveal the maximum infestation in terms prevalence, mean intensity and abundance of the ectoparasites in winter followed by summer, post monsoon and monsoon. In endoparasite the maximum infestation were observed in summer but no infestation was observed in winter. Seasonal variation in prevalence, abundance intensity as well as infection level was observed in present study may be host tolerance, temperature, metabolic activities and adverse impact exerted by parasites on immune system of fish as suggested by Moffasshalin et al. [19] Thakur et al. [20]. Some earlier reports also support the work occurrence and intensity of infestation of helminth parasites with temperature, oxygen content, salinity and pH [9,21].

5. CONCLUSION

This study concludes that water bodies of Darbhanga region need proper management particularly during post winter and summer which are pick months of helminth parasites infection causing heavy mortality to fishes and fingerlings in nursery leading to loss of production.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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