

**Studies on Morphology and Molecular Characterization of
Microsporidia in Economically important
selected edible fishes**

SUMMARY OF THE THESIS

SUBMITTED TO
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
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SUMMARY

Fish comprise a crucial biological component essential for maintaining the equilibrium of aquatic ecosystems. Parasitic infestations pose a significant threat to their sustainability, making any alterations in their habitat a cause for concern. Therefore, it is imperative to thoroughly investigate the mechanisms underlying microsporidian parasitism in *Labeo rohita* and delve deeper into the dynamics of the host-parasite relationship.

The phenomenon of parasitism is pervasive in nature, with host-parasite interactions exhibiting remarkable variability. Microsporidian parasites offer an ideal model for studying these interactions, boasting a diverse array of 144 genera and 1200 species. Their unique infection strategies across a wide host range set them apart. Despite decades of research on microsporidian parasites, numerous aspects of their life cycles, systematic classification, and morphological characteristics remain insufficiently elucidated, warranting further investigation.

While microsporidia have been extensively studied globally, there is a dearth of research on them in India. It is crucial to explore the diversity of microsporidia in various economically important fish species using both visual and molecular methods. The primary aim of this thesis is to examine the morphology and molecular mechanism of microsporidia in *Labeo rohita*.

My thesis focuses on evaluating the infection of microsporidia in *Labeo rohita* and examine the morphology and molecular mechanism of microsporidia. The

establishment of a unique host-parasite relationship outlined in this thesis opens up new avenues for future research. For instance, this system could be utilized to investigate broader anti-microsporidian defense mechanisms in fish, paving the way for innovative research directions.

First chapter of the thesis provides the general description and outline of microsporidian parasite, cover briefly about major breakthroughs in microsporidian research, Historical evolution of microsporidia, its discovery, taxonomic classification, spore structure, life cycle and its prevalence in fishes. Along with the aims and specific objective essential to get deeper insight about the proposed topic, it also addressed the technique of diagnosis by microscopy and molecular techniques with specific references to the *Labeo rohita* in microsporidia.

The second chapter of the thesis provides a review of the literature that deals the characterization of pathogens, their prevalence, economic importance of fishes, morphological specifications, molecular characterization, the implications of microsporidian infestation on their own hosts, factors that influence microsporidian development and progression.

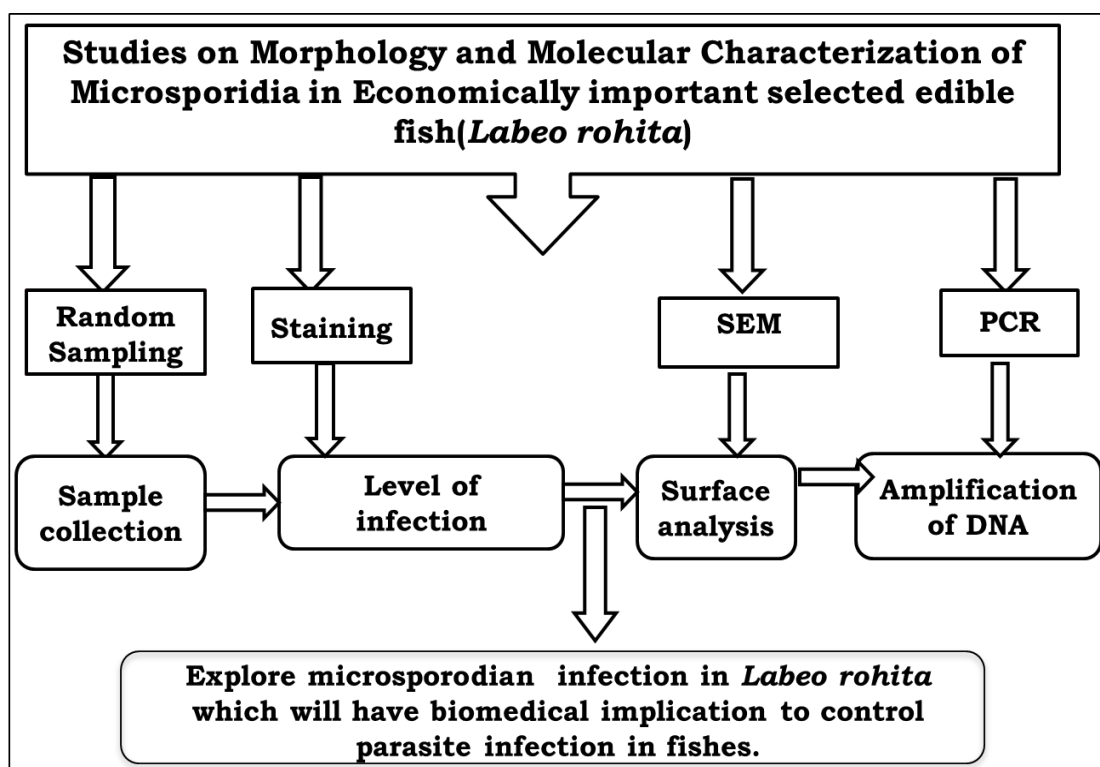


Figure: Brief experimental methodology

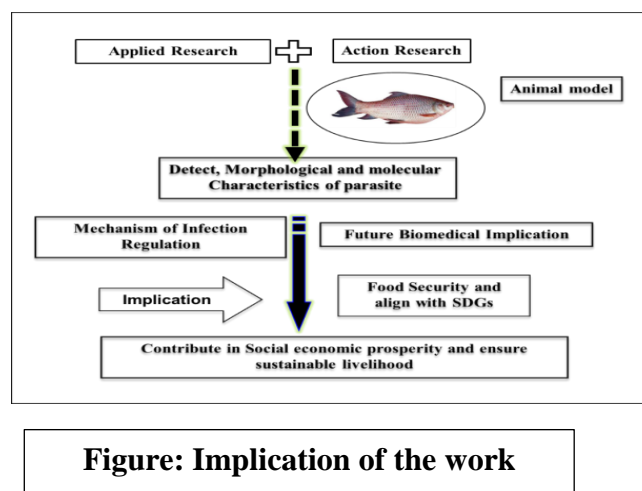
The third chapter of the thesis elaborates the incidence of microsporidia in *Labeo rohita* recognized under light and scanning electron microscopy, that corresponds to the genus *Ovipleistophora*. Microsporidia have been observed severely infecting the fishes, contributing to the fact of high prevalence of in *Labeo rohita* of Lucknow and also being a leading cause for their decline in this region.

Images of Light Microscopy and Scanning Electron Microscopy revealed adequate morphological and structural characteristics of microsporidian spores in current study. The increased incidences and variety of reports of these microsporidian parasites call for additional investigation.

The fourth chapter of the thesis investigates with the confirmation of the microsporidia infecting fishes. Molecular techniques like PCR were employed to test the occurrence of microsporidian pathogens. SDS based genomic DNA extraction was

performed. In the present study the description of present parasite belongs to the genus *Ovipleistophora* is strongly supported by the molecular data. The sequence shows (99.38%) similarity with the *Ovipleistophora ovariae*.

The fifth chapter of the thesis describes the summary, significance of the study & future perspectives.



SIGNIFICANCE AND FUTURE PROSPECTS:

Microsporidian parasites are an evolutionary puzzle and need deeper understanding and insights to explore and elucidate host parasite relationship. The present study has significance considering the fact that modulation of host through parasite may interfere in infection, cell proliferation and also may hinder host growth in multiple ways.

Thus, the results of the present investigation open up avenues for understanding the role of parasites in fishes; provide a new perspective, approach and insights on the regulation of parasite and divulge for identifying potential new therapeutic strategies which has the potential to improve the socio-economic livelihood of the fish farmers and contribute in growth, prosperity and development, at the same time help to achieve Sustainable development goals.

1. Given the widespread nature of microsporidia, infecting a diverse array of hosts, employing random sampling methodology can significantly enhance our understanding of infection severity. This approach aids in raising awareness among fish farmers, enabling them to adopt preventive and control measures to mitigate economic losses in aquaculture.
2. Both morphological and molecular characteristics hold promise for future diagnostic and taxonomic investigations.
3. In addition, research on Microsporidian parasite in *Labeo rohita* give insight in to the biological niche of these parasites in the ecosystem as well as their major role in environmental influence.

Finally, the following points were compiled in the current study:

- Random sampling of *Labeo rohita* from different regions of Lucknow.
- Investigation of microsporidian infection in *Labeo rohita* by using staining method.
- Study morphological characters of microsporidia isolated from *Labeo rohita* using Scanning Electron Microscopy.
- Study molecular characterization of microsporidia in *Labeo rohita* using PCR.