Study on Fish pathogenic fungi and its periodicity in Tunga river of Karnataka (South India)

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Abstract: A riverine ecosystem consists of a wide range of diversified flora and fauna. The microflora in the riverine ecosystem is dominated by Algae, Bacteria and fungi. Fungi in the riverine ecosystem play an important role, they vitally link the food web primarily as saprophytes and secondarily as pathogens. Tunga river ecosystem consists a diversified flora of aquatic phycomycetes, in which majority of them are Chytrids and Oomycetes. These fungi are zoosporic in nature and some of them mainly predate on Ichthyofauna and other riverine fauna. Aquatic phycomycetes are the primitive fungi and they are at the bottom of evolutionary series and they have their significance as pathogens, combating them in the riverine ecosystem has become a mammoth's task. During monsoon and winter the fisher mans face severe loss in fish productivity majority of them are due to fungal infections on fishes and on their eggs. Tunga river traverse a distance of 147 Km in Shimoga where the major fishing points are located in the right bank of some important Taluks viz., Thirthahalli, Mandagadde, Gajanur and Shimoga. In monsoon, these fishing docks face a considerable decline in Fish catch. Hence, sustainability and economical criteria of fish production in Tunga river adverse the fisher mans lively hood. In this scenario a detailed investigation was undertaken to identify the occurrence, periodicity and disease incidence of the phycomycetes fungi in the riverine ecosystem. [Nature and Science 2010;8(9):228-231]. (ISSN: 1545-0740).

Key words: Aquatic phycomycetes, Fish pathogenic fungi, oomycetes, Fish mycosis

1. Introduction

Several investigators reported the ability of Aquatic phycomycetes to parasite and predate on aquatic flora and fauna viz., (Tiffney, 1939), (Tiffney and Wolf, 1937), (Gopalakrishnan, 1963), (Scott & O'Bier 1962), (Vishniac & Nigrelli, 1957), (Bhargava et al, 1971), (Srivastava & Srivastava, 1977.a, b), (Khulbe, 1992,1995) and (Sati, 1982). Some of the fungi from the above mentioned class found to predate as a parasite on many fishes, fry and their eggs in a riverine ecosystem. Normally fungal infections are found in adult fishes after breeding and possible mechanical and handling injuries on the host. In this scenario we have observed the occurrence of fish pathogenic fungi with reference to its periodicity and incidence for a period of 12 months from April 2009 to March 2010. Around 12 aquatic fungal species have been isolated and its periodicity, incidence on host is determined with reference to the seasons.

2. Methods

The fungal infected fishes, such as adult and the fry are collected in the polythene bags and brought to laboratory from the referenced fishing points. The infected fishes are screened for lesions and ulcerations. A small bit of mycelium is plucked form the infected lesion using a sterile needles or forcep and placed in a pertiplate containing distilled water and it is baited using mustard seeds and further incubated at 15 ± 2^0 c for 2-3 days. The baits were examined regularly with the help of microscope. The colonized baits are identified using standard fungal monographs and handbooks (Khulbe, 2001) and cultured using corn meal agar (CMA) media (Sati, 2001).

Pathogenicity Test

Around 11 live fry's of culture fish *Catla catla* is taken for the experimental purpose. These fry are placed in an aquaria containing sterilized water and aerated regularly a ready made food is also provided. Around two or three drops of maclachite green (0.05%) is added to the aquaria to control the initial pathogenicity. Then the fry's are transferred to the individual aquaria or small tubs containing sterilized water and aeration. Around ten no of fry's in the individual aquaria are artificially induced by the pathogenic fungi in terms of adding equal amount of fungal spore inoculums, speeding the process of infection can be done by causing minute injuries to the dermis of the fishes. The eleventh one is also taken in a separate aquaria and treated as control with out adding any inoculum (Khulbe, 1995).

3. Results and Discussions

In the present scenario the *Achlya* Sp were found to be more dominant and virulent in Tunga riverine ecosystem. They are present in all the seasons and in all fishing points. Their occurrence was found to be more during monsoon when compared to post-monsoon and pre-monsoon. Their periodicity was found to be retarded in pre monsoon due to high temperature and less amount of dissolved oxygen. The results are depicted in the following table.

Table-1, Periodicity of fish pathogenic fungi on the host from April 2009 to March 2010

Species of Aquatic phycomycetes	Host	Periodicity		
		PM	M	PO-M
Achlya debaryana	*Cyprinus carpio*	+	+	+
Achlya irregularis	*Catla catla*	+	+	+
Achlya oryzae	*Labeo rohita*	+	+	+
Achlya ambisexualis raper	*Clarius batrachus*	-	+	+
Dicthycus sterile	*Tilapia mossambica*	-	+	+
Achlya prolifera nees	*Ctenopharyngodon idella*(Grass carp)	-	+	+
Achlya orion	*Clarius batrachus*	-	+	+
Pythium undulatum	*Labeo rohita*	-	+	+
Saprolegnia parasitica	*Cyprinus carpio*	+	+	+
Saprolegnia ferax	*Cyprinus carpio*	+	+	+
Leptolegnia caudate	*Ctenopharyngodon idella*	-	+	+
Pythium splendens	*Clarius batrachus*	-	+	+

PM=Premonsoon season (Apr 09, May 09, Feb 10, March 10)
M= Monsoon season (June 09, July 09, Aug 09, Sep 09)
PO-M= Post Monsoon Season (Oct 09, Nov 09, Dec 09, Jan 09)
"+"=Presence, "-"= Absence

From the above depicted table (table-1) we can easily make out the scenario that, the *Achlya* Sp, and *Saprolegnia* Sp Viz, *Achlya debaryana*, *A. irregularis*, *A. oryzae*, *A. ambisexualis raper*, *Saprolegnia parasitica* and *S. ferax* were found to be the most dominant in the riverine eco system than the other fungi. It shows that maximum fungal activity has occurred during monsoon when compared to the other two seasons. The infection of these fungi on the fishes causes mycosis, which leads to loss of normal glaze, descaling and formation of lesions with cotton wolly outgrowth.

Pathogenicity

The genus *Achlya* and *Saprolegnia* was found to be more virulent compared to genus *Pythium*, *Leptolegnia and Dicthycus*. The species *Achlya debaryana*, *A.Irregularis*, *Saprolegnia parasitica* were found to be more virulent, about 70% of infection was caused by these fungi. They formed the surface lesions on the host with cotton wolly out growth structure than the other Species. The *Saprolegnia parasitica* invaded the host tissue with in three days and formed the lesions outgrowth on early infected. For uninfected host both *A. debaryana* and *S. parasitica* has taken a week for causing infection.

Disease incidence (Table-2)

In the month of April and March the disease incidence was found to be negligible. Infection started slightly in the beginning of monsoon during June and was wide spread in the middle of July and August where the yield decreased rapidly and many of infected fishes are found in the month of September, October, November and December. The infection was found to be at its peak in the month of August and September. The relation of some physicochemical parameters of the riverine ecosystem with disease incidence is also depicted. The peak of disease incidence was found to be more when the temperature was found to be low i.e., in the months of July and August (23^0c) and the incidence was found to be retarded during the months of April and May. When the temperature was found to be high. During monsoon and post monsoon due to the neutral pH (7.0) and high amount of Dissolved oxygen (DO, 8.6 mg/l) and low Biological oxygen demand (BOD, 2.44 mg/l) favor the incidence.

Acknowledgement:

Our sincere thanks to Dr. S.C. Sati, Professor, Department of Botany, Kumaun University, Nainital, Uttarakhand, India for his needful assistance and fruitful guidance in the field of fresh water aquatic mycology.

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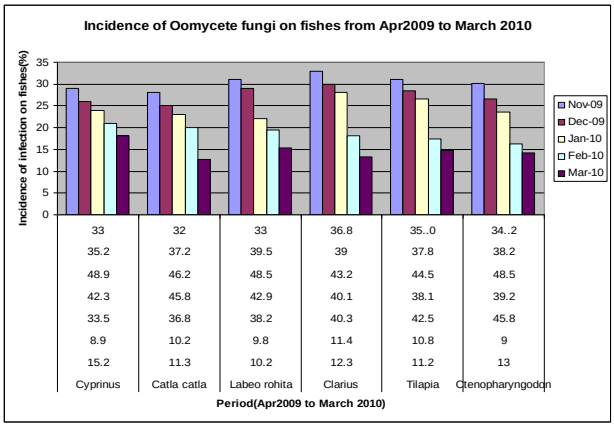
Table-2, Incidence of infection of fish species from the fungal pathogen (%) from April 2009 to March 2010

Fish Sp / Months	*Cyprinus carpio*	*Catla catla*	*Labeo rohita*	*Clarius batrachus*	*Tilapia mossambica*	*Ctenopharyngodon idella*
April 2009	15.2	11.3	10.2	12.3	11.2	13.0
May 2009	8.9	10.2	9.8	11.4	10.8	9.0
June 2009	33.5	36.8	38.2	40.3	42.5	45.8
July 2009	42.3	45.8	42.9	40.1	38.1	39.2
August 2009	48.9	46.2	48.5	43.2	44.5	48.5
September 2009	35.2	37.2	39.5	39.0	37.8	38.2
October 2009	33.0	32.0	33.0	36.8	35..0	34.2
November 2009	29.0	28	31	33.0	31.0	30.2
December 2009	26.0	25.0	29.0	30.0	28.5	26.5
January 2010	24.0	23.0	22.0	28.0	26.5	23.5
February 2010	21.0	20.0	19.5	18.2	17.5	16.3
March 2010	18.2	12.8	15.3	13.2	14.8	14.2



References

1. APHA. Standard methods for the examination of water and waste water. Washington, DC 1989.
2. Bhargava, K. S., Swarup. K & Singh C. S. Fungi parasitic on certain freshwater fishes of Gorakhpur. Indian Biologists. 1971; 3:65- 69.
3. Chidambaram. 1942. Quoted in Gopalakrishnan, V. 1966. FAO World Symp. Warm water pond fish Cult. FRIX/R-4: 319-343.
4. Coker, W. C. 1923. The Saprolegniaceae with notes on other water moulds. Univ. of north Carolina Press Chapel Hill. N.C.U.S.A.
5. Coker, W.C. & V. D. Matthews. Blastocladiales, Monoblepharidales and Saprolegniales. North Amer. Flora. 1937; 2:1-76.
6. Gopalakrishnan, V. Controlling pests and diseases of cultured fishes Indian Livstk. 1963; 1(1): 51-54.
7. Gopalakrishnan, V. Recent developments in the prevention in the control of parasites of fishes cultured in Indian water. Proc. of Zool. Soc. India.1964; 17(l): 85-100.
8. Khulbe RD, Chandra joshi & Bisht GS, Fungal diseases in Nanak sagar lake, Nainital, India. Mycopathologia. 1995; 130: 71-74,
9. Khulbe, R.D. Watermolds and their activity in Kumaun Himalaya, India. Water Sci Tech 1992; 26: 2595-259834.
10. Khulbe, R.D. A manual of aquatic fungi. Daya publishing house, Delhi (Book, 2001).
11. Mer G S, Sati S C, Khulbe R D. Occurrence distribution and seasonal periodicity of some aquatic fungi of Sat Tal (Nainital), India. Hydrobiol. 1980;76;200-205
12. Prasad. D, Rajanaika, Joy. H and Krishna.V. Diversity of aquatic fungi in relation to environmental conditions in Tunga river (south India). Researcher. 2009;1(6).
13. Sati SC, Mer GS, Khulbe RD. Studies on parasitic Watermolds Some new host records for Saprolegnia parasitica Coker. Mykosen 1982: 25: 638-640.
14. Sati.S.C, Diversity of aquatic fungi in Kumaun Himalaya: Zoosporic fungi .Recent researchers in Ecology, Environment pollution.1997;Vol X: 1-16.
15. Scott, W. W. & A. H. O'Bier. Aquatic fungi associated with diseased Tropical fish and fish eggs. Prog. Fish. Cult.1962; 24:3-15.
16. Siddique, M. A. B. Bashar, M. A. Hussain, M. A. and Kibria A. S. M. Fungal disease of freshwater fishes in Natore district of Bangladesh. J. Bangladesh Agril. Univ. 2009;7(1):157–162, 2009.
17. Srivastava, G. C. & R. C. Srivastava. Ability of Saprolegniaceous fungi to parasitise Colisa fasciatus (B1.), Geobios. 1977b; 4(1): 31-32.

18. Srivastava, G. C. & R. C. Srivastava. *Dictyuchus anomalus Nagai*, a new pathogen of freshwater teleosts. Curr. Sci. 1977a; 46(4): 118.
19. Srivastava, G. C. & R. C. Srivastava. Fungi associated with the diseases of freshwater fishes. Mycopathologia1.1978; Vol. 63, 2: 121-126, 1978.
20. Tiffney, W. N. & Wolf. F. T.1937. *Achlya flagellata*, as a fish parasite. J. Elisha Mitchell Sci. Soc. 53: 298-300.
21. Tiffney, W. N. The identity of certain species of *Saprolegniaceae* parasitic to fish. J. Elisha Mitchell. Sci. Soc. 1939; 55: 134-153.
22. Vishniac, H. S. & R. F. Nigrelli. The ability of saprolegniaceae to parasitise Platyfish. Zoologica. 1957; 42: 131-134.

19/08/2010