DIVERSITY OF ZOOSPORIC FUNGI FROM GODAVARI RIVER OF NANDED

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Abstract: Zoosporic fungi are depend on external organic matter, They are associated with almost every organism, as parasites, sometimes as symbionts and as decomposers.. They found in all kinds of aquatic habitats .For the isolation of Zoosporic fungi the samples were collected from water areas with low or moderate temperature and comparatively high total organic matter and dissolved oxygen. They are commonly isolated from its environments by baiting technique by using baits like Hemp seeds, leaves of *Pongamia*,fruits of guava, Cellulose paper and insect bodies, It is clearly evident from the results that *Pythium* spp and *Saprolegnia* spp.were the most common zoosporic fungal genera.The samples collected from Goverdhanghat, Nanded were the richest in aquatic fungi whereas those collected from Kawalgaon and Rahati were the poorest.Maximum zoosporic fungi were isolated from the Hemp seeds followed by fruits of Guava where as very less zoosporic fungi isolated from the insect bodies.

Keywords: Diversity Aquatic fungi,Baits,Godavari river,Zoosporic fungi.

INTRODUCTION:

Aquatic fresh water fungi are usually microscopic organisms, which do not produce visible fruiting bodies and reproduce asexually. A broad definition of 'freshwater fungi' includes any species which, for the whole or part of their life cycle, rely on free freshwater (Thomas ,1996).Freshwater fungi are a ubiquitous and diverse group of organisms. There are more than 600 species of freshwater fungi with more known from temperate, as compared to tropical regions. Zoosporic fungi' are commonly called 'watermoulds'. They belongs to class Phycomycetes', mostly, the members of Chytridiomycetes and Oomycetes as 'watermoulds'. They showed their diverse habitats. Zoosporic fungi are universally present in all types of freshwater systems and occur as saprotrophs on a wide variety of substrata, playing a key role in those ecosystems as decomposers of organic materials (Müeller ., 2004)They play very important role in decomposition and as saprophytes they decompose various types of organic matter including cellulose, keratin, chitin, etc. into simpler substances (Powell, 1993), thereby, forming a nutrient pool and make it available to the producers so as to make water ecosystem a self-regulating system (Bhairavnath and Manoharachary, 1985).Some specialized methods are needed to examine their diversity, population structure and ecological function.Hyde et al (2007) have estimated that there are approximately 1.5 million fungal species on earth. Of these, only around 3000 species are known to be associated with aquatic habitats and only 465 species occur in marine waters (Shearer, et al., 2007). This small proportion of aquatic fungal taxa is surprising because the aquatic environment is a good habitat for many species.

Zoosporic fungi are commonly isolated from its environments by baiting technique, where baits like leaves and fruits of plants, insect bodies and cellulose papers, seeds are usually used. There is correlations between Seasonal variations and occurrence of zoosporic fungi in various water areas. This type of correlations between Seasonal variations and occurrence of zoosporic fungi were studied by several investigators (Sparrow, 1968;Nasar and Munshi, 1980; Khulbe, 1981;Misra, 1982; Klich and Tiffany,1985;). The growth habit and the morphology of these organisms attracted the interest of many researchers and led to intensive studies on their isolation and characterization (Barr, 1975, 1980; Hassan, 1982, 1983**)**. This study aimed mainly to survey on zoosporic fungi in the Godavari river running through Nanded district of Maharashtra.

MATERIALS AND METHODS

Samplings : The samples were collected in sterile glass-stopper bottle (120 ml capacity) by holding the bottles horizontally without allowing any air bubble to pass in it for record the concentration of dissolved oxygen. In addition water samples were collected separately in sterilized polythene jars of one liter capacity. The water samples were also collected in autoclaved polythene vials (25 ml capacity) and and brought to the laboratory for further analysis.

The water samples were collected seasonally for a period of one year during November, 2012 to October, 2013 from Godavari river in sterilized plastic bottles. 50 ml of composite sample of each water sample was poured into sterilized petridishes, baited with different plant baits. Colonized baits were washed with sterilized water and placed in different sterilized petridishes containing sterile water. The isolates were identified with the help of various standard monographs (Coker, 1923; Johnson, 1956; Scott, 1961 and Dick, 1990)**.**

Isolation ofAquatic Fungi: Isolation of aquatic fungi was carried out by standard isolation techniques: Incubation Method Baiting technique (Bandoni et al., 1975). For the isolation of aquatic fungi the hemp seeds, fruits, leaves and insect bodies were added to beakers separately as baits. Beakers were kept at 20±2°C, and examined at different time intervals. The colonized baits were then transferred into sterile petri-dishes containing sterile distilled water to which Millipore filter sterilized penicillin G (2 units/m l water) was added. The dishes were then incubated at 20±3°C and examined periodically for about 6 weeks and Serial dilution method (Cappuccino and Sherman, 2006). Cultures were maintained on Potato Dextrose agar (PDA) and Czapeks agar

Identification: Identification of pure cultured fungi was done by direct mount from baits or culture. Identification of fungi was made with the help of aquatic fungi manual by Khulbe (2001) with the support of various standard references and monographs, Sparrow (1960); Barnett (1962); Barnett and

Hunter (1972); Fuller and Jaworski (1987) and Dick (1990).Identified fungi were further confirmed by experts.

RESULTS AND DISCUSSIONS :

The zoosporic fungi contribute towards the energy flow and productivity of aquatic and semi-aquatic systems through degradation of plant matter. On account of its climatic variability, the river Godavari of the Nanded exhibits significant diversity of zoosporic fungi. These fungi have been reported from diverse habitats, viz. water, seeds, fruits and leaves. The present study revealed a varied number of aquatic fungus species at the different sites of Godavari river. The data obtained indicate that the largest numbers of aquatic fungus species observed on hemp seeds as baits and less number of zoosporic fungi on insect bodies at all the stations selected for study.

The aquatic fungi of the Godavari river were relatively different. 12species which belong to 07genera of aquatic fungi were recovered from water samples. *Saprolegnia* spp. *Chytridium* spp and *Pythium* spp were the most frequent occurring species as they recovered from most of the stations. On the other hand, 6 fungal species viz., *Achlyaprolifera, Aphanomyces irregularis, Rhizophydium macrosporum* and *Synchytrium macrosporum* were isolated only once and showed restricted distribution The maximum number of fungal species recovered in Godavari river at station III-Goverdhanghat((10sps.) and station II Old bridge, Nanded (09sps.) in rainy season, and at station I (8sps.) during spring season. The higher number of water moulds was observed during spring and rainy season might be due to high amount of organic matter along with moderate water temperature. The results are similar to Klick and Tiffany (1985). Higher temperature during summer and low temperature (below 15^0C) during winter has been found unfavorable for most of the aquatic fungi (Dayal and Tendon, 1962;Khulbe, 1991). On the basis of relative contribution, rainy season contribute highest occurrence of zoosporic fungi, whereas both the spring and summer season contribute less occurrence of zoosporic fungi. The minimum number of zoosporic fungi were observed during winter season. Lower temperature during winter might account for least number of species (Khulbe and Bhargava, 1977). Nine zoosporic fungal taxa were identified from the Hemp seeds baited in water of the three different water bodies (Table 1). The most numerous were the Chytridiales and followed by the Pernosporales. The most common species were: *Olpidium longicollum, Karlingia rosea, Rhizophydium carpophilum, R.sphaerotheca, Myzocytium microsporum* and *Pythium periplocum.* The results showed that more number of fungal taxa (10) occurred on Hemp seeds followed by the fruits of guava (09) in the water of all the sites, A relatively less number of zoosporic fungi species (06) were observed from insect bodies,

Both the zoosporic taxa belongs to class Chytridiomycetes found on fruits of Pongamia. Similarly it was reported that three species of *Olpidium* and most species of the Chytridiales found on fruits of Pongamia (Karling, 1977).The present study revealed that most of the zoosporic fungi are saprophytic while few are parasitic. Similarly it is reported earlier that *Chytridium xylophilum, Entophlyctis rhizina*, *Synchytrium macrosporum. Chytridium xylophilum* are the saprophytic fungi of higher plants (Batko, 1975). Czeczuga and Muszyńska (2001) observed these fungi on leaves of some angiospermic plants. In the present study they were observed on the partially decomposed leaves of Pongamia. Two species of the class Hyphochytriales like *Rhizidiomyces apophysatus* and *R. hirsutus* observed on hemp seeds. These fungi have been found on grass leaves **(**Karling, 1945, 1968) and on squash pollen (Batko, 1975). All the three species of the genus *Saprolegnia* have been reported as a typical mycobiont representative in the waters heavily polluted by municipal wastes as a nitrophilous fungus and also on gymnosperm pollen (Czeczuga and Muszyńska, 2001).Similarly Seasonal variations and occurrence of zoosporic fungi in various water areas were studied by several investigators (Khulbe, 1981; Klich and Tiffany,1985; Misra, 1982; Nasar and Munshi, 1980; Sparrow,1968**).**

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REFERENCES

Bandoni, R.J., Parsons, J.D. and Redhead, S.A. 1975. Agar "Baits" for the Collection of Aquatic Fungi. Mycologia., 67(5) : 1020 – 1024.

Barnett, H.L.(1962). Illustrated genera of imperfect fungi. Burges Publishing Co., p. 58

Barnett, H.L. and Hunter, B.B. 1972. Illustrated Genera of Imperfect Fungi,3rd Eds. Burgess Publish Co, Minneapolis, Minnesota. pp. 1- 300.

Barr, D. J. S. 1973. Six - *Rhizophydium* species (Chytrdiales) in culture. *Can. J. Bot*. 51: 967-975.

Batko, A. (1975). Zaryshydromikologii [Hydromycology - an overview]. PWN, Warszawa, [Polish].

Bhairavnath and Manoharachary, 1985 Mycoecological studies of two water bodies from Andhra Pradesh India Indian J.Bot.8(1):69-78

Cappuccino, J.G. and Sherman, N. 2006. Microbiology, A laboratory manual Addison-Wesley Longman, Inc

Coker WC. The Saprolegniaceae with notes on other watermolds. Univ. of North Carolina, Carolina press Chapel Hill, North Carolina, USA. 1923: 201.

Czeczuga, B. and Muszyńska, E. (2001). Zoosporic fungi growing on gymnosperm pollen in water of varied trophic state. Polish Journal Environmental Studies 10: 89-94.

Dayal R, Tandon RN. Ecological studies of some aquatic Phycomycetes. Hydrobiologia 1962; 20: 121-127

Dick, M.W. 1990. Key to *Pythium*. Department of Botany, University of Reading, UK

Johnson, TWJr. The genus Achlya; morphology and taxonomy. Univ. of Michigan Press, Ann. Arbor. 1956: 180.

Fuller, M.S. and Jaworski, A. 1987. Zoosporic fungi in teaching and research, Southeastern Publishing Corp, USA Fuller MS, Jaw orski J. Zoosporic. Fungi in Teaching and Research South eastern Publishing, Athens. p. 310.

Hassan, S. K. M. 1983. Two chytrids from the environment of Warsaw.*Nova Hedwigia*. 38: 727-740.

Hyde, K., Bussaban, B. et al. (2007). Diversity of saprobic microfungi. Biodiversity and
Conservation, 16(1), 7-35

Karling, J.S. (1945). Rhizidiomyces hirsutussp. nov., a hairlyanisochytrid from Brazil. Bulletin of the Torrey Botanical Club 72: 47-51.

Karling, J.S. (1968). Zoosporic fungi of Oceania. Journal of the Elisha Mitchell Scientific Society 84: 166-178.

Karling, J.S. (1977). Chytridiomycetarum Iconographia. An illutrated and brief descriptive guide to the chytridiomycetous genera with a supplement of the Hyphochytridiomycetes. Lubrech and Cramer, Vadus.

Khulbe RD, Verma BL. Aquatic fungi in some rice fields of Tarai, Nainital. Trop. Plant. Sci. Res. 1983; 1(3): 269-270.

Khulbe, R.D. 1991. An ecological study of water molds of some rivers of Kumaun Himalayas. Indian Tropical Ecology.,32 : 127 - 135.

Khulbe, R.D.(2001) A Manual of Aquatic Fungi (Chyridiomycetes and Oomycetes) Daya Publishing House, New Delhi pp.1-204.

Khulbe, R. D. 1981. Distribution of aquatic fungi in relation to some ecological factors. *Geobios*(Jodhpur) 8: 24-216.

Khulbe, R. D. & K. S. Bhargava. 1977. Distribution and seasonal periodicity of water moulds in some lakes in Nainital Hills, India. Hydrobiologia54: 67-72.

Klich, M. A and Tiffany, L. H. 1985. Distribution and seasonal occurrence of aquatic Saprolegniaceae in north westIowa.*Mycologia*77: 373-380.

Misra, J. K. 1982. Occurrence, distribution and seasonality of aquatic fungi as affected by chemical factors in six alkaline ponds of India. *Hydrobiologia* 97: 185-191.

Müeller, G.M., Bills, G.F. and Foster, M.S. (2004). Elsevier Academic Press, Burlington, UK

Nasar, S. A. K. and Munshi, J. D. 1980. Studies on the seasonal variations in the fungal population of a fresh-water pond of Bhagalpur, India. *Limnological* Berlin), 12: 137-139.

Powell, M. J. 1993. Looking at mycology with a Janus face.A glimpse at Chytridiomycetes in the environment.Mycologia 85: 1-20.

Scott WW. A monograph of the genus Aphanomyces.Vir.Agr. Exp. Sta. Tech. Bull. 1961; 115: 95

Shearer, C., Descals, E., Kohlmeyer, B., Kohlmeyer, J., Marvanová, L., Padgett, D., et al. (2007).Fungal biodiversity in aquatic habitats. Biodiversity Conserv, 16(1), 49-67.

Sparrow, F.K. 1960.Aquatic Phycomycetes.(2nd Eds.) University of Michigan. Press
Ann Arbor. pp. 11-87.

Sparrow, F. K. 1950. Some cuban phycomycetes. *J. of the Washington Academy of Science* 40: 50-55.

Sparrow, Fr.K. (1968).Ecology of freshwater fungi. In: The Fungi. Vol. 3(eds. G.C. Ainsworth and A.S. Sussman). Academic Press, New York, London: 41-93.

Thomas K. 1996. Fresh water fungi. In: Introductory Volume to the Fungi. Part 2 C. (Grgurinovic, ed), pp 1-37, Fungi of Australia Vol IB, ABRS, Canberra.

Table - 1: Aquatic fungi encountered from the various baits in the water of Godavari river,

S No	Aquatic Fungi	Baits				
		Hemp seeds	Leaves of Pongamia	Fruits of guava	Cellulose paper	Insect bodies
1	*Achlya prolifera* C.G.Nees	+	+	+	-	-
2	*Aphanomycesir regularis* W.W. Scot	+	+	+	-	-
3	*Rhizophydium macrosporum* Karling	+	+	-	+	-
4	*Pythium periplocum* Drechsler	+	-	+	+	-
5	*Pythium salinum* Höhnk	-	+	+	-	-
6	*Pythium debaryanum* Hesse	+	-	+	+	-
7	*Saprolegnia ferax* (Gruith	+	-	+	+	+
8	*Saprolegnia mixta* de Bary	+	-	+	+	+
9	*Saprolegnia parasitica* Coker	+	+	-	+	+
10	*Chytridium xylophilum*Cornu	+	+	+	+	-
11	*Chytridium globosum*A.Braun	+	+	-	+	-
12	Synchytrium macrosporum Karling	-	+	+	-	+

Table - 1: Qualitative analysis of fungi encountered during study period at sampling stations of Godavari river, Nanded

S No	Aquatic Fungi	Sampling Stations on Godavari River at Nanded				
		I	II	III	IV	V
1	*Achlya colorata* Pring	+	+	+	+	+
2	*Aphanomycesir regularis* W.W. Scot	-	+	+	-	-
3	*Rhizophydium macrosporum* Karling	-	+	-	-	-
4	*Pythium periplocum* Drechsler	+	-	+	+	+
5	*Pythium salinum* Höhnk	-	+	+	-	+
6	*Pythium debaryanum* Hesse	+	+	+	+	+
7	*Saprolegnia ferax* (Gruith	+	+	+	+	-
8	*Saprolegnia mixta* de Bary	+	+	+	+	-
09	*Saprolegniaparasitica* Coker	+	+	+	+	-
10	*Chytridium xylophilum* Cornu	-	+	+	+	-
11	*Chytridium globosum* A.Braun	+	-	-	+	-
12	*Synchytrium macrosporum* Karling	-	+	+	-	+

Station I-Vishnupuri Station II- Oldbridge,Nanded Station III- Goverdhanghat,Nanded
Station IV-Kawalgaon Station V-Rahati