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INVENTORY AND POPULATION STUDY OF FUNGI FROM THE RIVERINE DRINKING WATER

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ABSTRACT

The present work was carried out on studying the impact on diversity of aquatic fungi to assess the water quality. Tamiraparani river water was assessed at Kuzhithurai study stations in the study month of September, 2012, With reference to aquatic fungal diversity. During the study, 12 aquatic fungal species fungal species belonging to *Aspergillus sp., Fusarium sp., Penicillum sp.,* were isolated and identified. Maximum percentage of fungal species identified is *Aspergillus sp.,* and the lowest is *Sporothrix sp.,* and *Phialophora sp.,*. The present investigation revealed that the difference in the percent of occurrence, distribution of aquatic fungi in Tamiraparani river

KEY WORDS: Fungi, drinking Water, Aspergillus sps.,

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INTRODUCTION

Fungi are the members of a large group of eukaryotic organisms, widely distributed in nature and can occur as unicellular yeast or filamentous and, multicellular molds. The groups contain more than 70,000 species of fungi, less than 0.5% of them concerned in human diseases and cause about 90% of all fungus infections. They are involved in different forms of diseases, including allergies to fungal antigens, production of toxins, or direct invasion of hosts (McGinnis, 1996). Secondary contamination of water distribution systems has been investigated for many years by engineers and epidemiologists. The consequence of this phenomenon is an increase in the number of bacteria, actinomycetes, cyanobacteria, fungi and protozoa in the distribution system adversely affecting both the taste and odour of the water (Grabińska et al., 2007). Ecology of aquatic fungi has not attained the degree of importance as the ecology of soil fungi. The qualitative composition of the fungal population in water is now becoming fairly well known. Heterotrophic organisms are usually present in natural water in direct proportion to the physico-chemical nature of aquatic environment. A wide variety of aquatic fungi such as chytridiomycetes, Saprolegniales and Peronosporales are found in fresh water (Prasad Dei et al., 2009). Fresh water distribution systems are colonized by saprophytic heterotrophic microorganisms (such as bacteria, fungi, yeast) that grow on biodegradable organic matter (Servais et al., 1992).

Fresh water bodies receives various categories of waste materials, many of them are organic in nature. These organic wastes are easily degraded by microbes like fungi and bacteria, naturally present in river water. The aquatic fungi play a key role in the decomposition of leaf litter in aquatic environments (Chauvet and Dobson, 1999). Hunter (1975) studied the water molds and their role in the degradation of wastes in the river great use and its tributaries. The various wastes accumulated in the water bodies creates several problems and are responsible to kill aquatic fungi, which are useful for the bio-degradation process (Prasad Dei et al., 2009). Several species of fungi are capable of infecting healthy hosts and causing diseases ranging from mucosal to life-threatening disseminated infections (van Burik and Magee, 2001). *Penicillium* species have been frequently recovered from water in the various studies performed. Several of the species in both genus *Penicillium* and *Aspergillus* are known to produce mycotoxins in other substrates, such as food and beverages (Moreau 1979; Pitt & Hocking, 1999). The subsequent investigation indicated that the epidemic was caused by water contaminated by microorganisms, such as *Aspergillus fumigatus, Mucor, Absidia, Candida, coliform bacteria,* and other bacterial species. The implication of fungi such as e.g. *Aspergillus, Penicillium* and *Cladosporium* with allergy, asthma and other respiratory problems has been widely investigated with respect to indoor environments (Denning et al., 2006; Straus 2004). Fungal infections are difficult to treat since the agents are eukaryotes, as human cells. Despite their wide occurrence, little attention has been given to their presence and significance in aquatic environments (Souza *et al.,* 2003). The study of aquatic fungi have been carried out in all over the world by Coker (1923), Dick (1990), Johnson (1956), Scott (1961), Middleton (1943), Seymour (1970), and Robertson (1980). The studies of aquatic fungi in India was carried out by Bhargava (1946), Dayal (1968), Khulbe (1977), Mer et al. (1980), Mishra and Dwivedi (1987), Manoharachary (1991), Sati (1997), Paliwal and Sati (2009), referred by Prasad Dei et al., (2009). The aim of the present study was to determine the heterotrophic population in fresh water fungi and their species diversity present in the fresh water system

MATERIALS AND METHODS

Water samples

The water samples were collected in Tamiraparani River in Kanyakumari District, Tamil Nadu. A riverside water samples were

collected for this study. It was collected in the month of September, 2012. All the samples free from soil/plant debris were collected in sterile containers and transferred immediately into laboratories for further analysis.

Enumeration of total fungal count

A volume of 100 ml of the each sample was passed through a sterile 0.45-micrometer filters using a filtration apparatus under a laminar airflow chamber. Using sterile forceps, the filters were placed directly on malt extract agar (containing 4 mg gentamycin and 10 mg chloramphenicol in 100 ml of medium) and incubated at 25-28^{0}C for 3 to 7 days. After 7 days of growth, the numbers of the colony-forming units (CFU) per 100 ml of samples were assessed (Hedayati *et al*., 2011).

Identification of fungal colonies

The fungi occurred in water samples were identified by standard mycological techniques based upon gross cultural (macroscopic) and microscopic characteristics (Hedayati *et al.,* 2011). Fungi that could not be identified by this manner were subcultured on potato dextrose agar, water agar and slide cultures for further identification study.

RESULTS AND DISCUSSION

Enumeration of total fungal count

In this study 10 samples in each four seasons for two years was analysed. Entire samples
were preliminarily tested for their total heterotrophic fungal colonies. The total number fungal count per sample was mentioned Table 1. The objective of this study was to determine the frequency and densities of filamentous fungi in water. The prevalence of fungi was investigated in parallel with the standard indicator microorganisms in drinking water samples from riverwater used for drinking purpose in residences and workplaces.

Identification of fungal colonies

Based on the standard mycological techniques such as cultural, morphology and staining techniques the fungal colonies were identified.

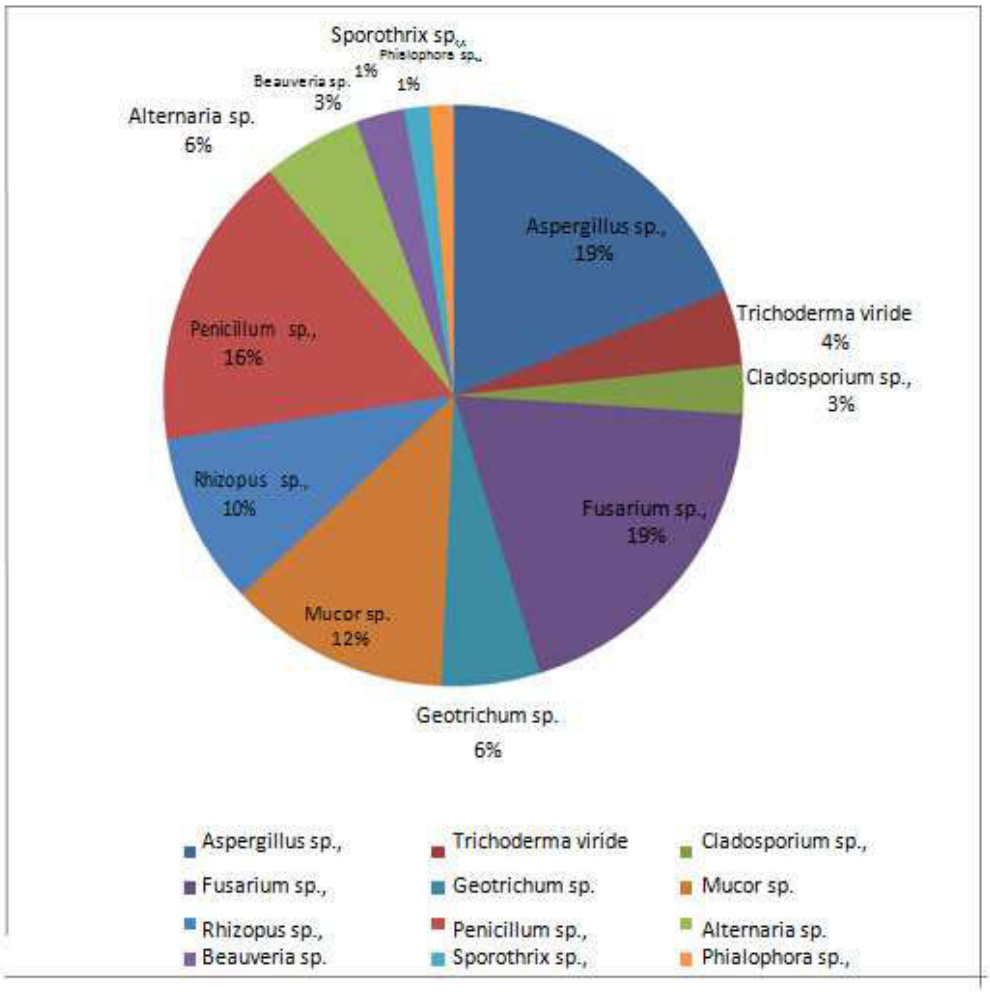
Table 1
Showing list of identified fungus

SL. No.	Fungal Name	No. of colonies
1	*Aspergillus sp.,*	14
2	*Trichoderma viride*	3
3	*Cladosporium sp.,*	2
4	*Fusarium sp.,*	14
5	*Geotrichum sp.*	4
6	*Mucor sp.*	9
7	*Rhizopus sp.,*	7
8	*Penicillum sp.,*	12
9	*Alternaria sp.*	4
10	*Beauveria sp.*	2
11	*Sporothrix sp.,*	1
12	*Phialophora sp.,*	1

Studies on the mycoflora of water distribution systems have focused on the determination of the density and the type of microscopic fungi in the water phase and biofilm in water distribution systems, while their occurrence in other possible habitats of these organisms, i.e. the biomass “suspended” in the water phase and sediments on the inner surface of water distribution pipes, has not been examined. *Aspergillus sps. penicillum sps., Fusarium sp,* were dominant mould species in this basin; *Cladosporium sps.,* and *Geotrichum candidum* are species pathogenic or opportunistic pathogenic to humans in this group the significance of fungi in

drinking water has scarcely been evaluated. Two contradicting aspects are of importance when considering fungal water studies with respect to the community.

Chart . 1
Percentage chart on Fungi diversity



Beauveria sp. Phialophora sp., and Beauveria sp., is the least population in the river water. First, we have to publishing important scientific results, and that the public have a right to know what is in the water they are consuming daily. In light of the knowledge obtained from fungal water studies, and the insufficient epidemiological knowledge about health impacts, it seems like a good idea to take precautionary measures for high-risk patients. Other possible health impacts with respect to the rest of the population are poorly understood, and require further studies. Identification of fungi to the species level is difficult, and may require a polyphasic approach, implementing morphology and molecular techniques, as well as metabolite analyses. In future, new molecular and spectral methods may prove to be usable tools for analyses of fungi in water. The possible health impacts of fungi in water are still contradictory, although precautionary recommendations and measures implemented in the case of high-risk patients now include the elimination of waterborne fungi. In future, monitoring of water systems for the present of fungi may be required, especially in hospital water systems. Adequate water treatment could be a solution, and further studies are required, both with respect to

establishing accurate methodologies and to investigate the effects of water treatment against fungi in water. In addition, the water suppliers need to be informed about the different aspects of fungi in water. Epidemiological studies should also be conducted to determine the health significance of fungal-contaminated drinking water. Until knowledge about the significance of fungi in water is obtained, controversy will most certainly remain. In the meantime, we should be concerned about fungi in drinking water for the same reasons as for air-borne fungi, because increased levels may reduce the quality of drinking water, and constitute a potential health risk.

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