1. INTRODUCTION

India has a vast coastline of about 5,700 km divided into east and west coasts. Mangroves as one of the coastal wetland ecosystems offer an ideal environment for fish farming. Several species of flora and fauna, native to mangrove environment, depend on the stability of this environment (Untawale, 1987). The biomass produced in mangroves is enormous and it is recycled by various organisms including wood borers, fungi and bacteria. The recycling of nutrients helps in the sustenance and maintenance of this environment.

Mangrove vegetation or 'mangal' is the tropical counterpart of tidal salt marshes of temperate regions. Mangrove trees are fascinating study objects for the mycologists because, the bases of their trunks and aerating roots are permanently or intermittently submerged, whereas the upperparts of roots and trunks are never reached by salt water, although they sometimes are under salt spray. Thus the terrestrial fungi and lichens occupy the per part of the trees and marine species occupy the lower part. At the edge of the intertidal area along trunks and roots, there is an overlapping between marine and terrestrial fungi (Kohlmeyer, 1969).

The study of marine fungi is relatively recent field, though the mycologists have long been fascinated with morphological and functional variety of terrestrial and freshwater fungi.

Barghoorn and Linder (1944) discussed a variety of unique Ascomycetes and Deuteromycetes that inhabit the wood submerged in the sea.

The term 'marine fungi' actually denotes the fungi which have the capability to grow and reproduce under aquatic condition where the salinity of water may range from upper values of 34 per cent as in the ocean to about 10 per cent as in the brackish condition. However, as the marine environment is having terrestrial counter part, it is essential to study the terrestrial fungi associated with the marine habitats and hence, Kohlmeyer and Kohlmeyer (1979) classified marine fungi as facultative marine fungi, which are predominantly terrestrial species that may also occur and possibly sporulate in the sea, and obligate marine fungi, that are exclusively grow and sporulate in the marine environment.

Microbes in the marine environment form an important link in the biogeochemical cycling, and the cycling activities often determine the productivity of any ecosystem. They, further clean up the environment from the pollution. As they inhabit the unusual conditions, now-a-days scientists look at them for the production of novel secondary metabolites.

It is therefore important to have better understanding of the fungi adopted to different habitats of the marine ecosystem.

In the marine ecosystems, fungi hold a wide range of habitats viz., water including sea foam, sediments and plant and animal debris. Among the plant debris, intertidal driftwoods are the important and interesting substrates for the activity of fungi and hence it is suitable for study of the diversity of fungi. Such substrates are expected to harbour rich and novel fungal biodiversity because they are the part of the plants of unknown origin. They get exposed to sunlight and atmosphere and also wetting and drying at frequent intervals due to the tidal variations.

In India, the first fungus to be reported from mangroves was by Raghukumar (1973). Studies on mangrove fungi from west coast of India (Patil and Borse, 1984; Chinnaraj and Untawale, 1992; Chinnaraj, 1992, 1993a) are mainly survey reports. Reports on ecological investigations are very few, and frequently on the occurrence of mangrove fungi (Borse, 1988). Contributions to marine mangrove fungi from East coast were made mainly by B.P.R. Vittal and his students from Chennai. Biodiversity and ecological studies on marine and mangrove fungi were initiated by Ravikumar (1991) along East coast of India. Ravikumar and Vittal (1996) reported the substrate preference shown by manglicolous fungi on ***Rhizophora*** sp.. Chinnaraj (1993b) has surveyed Andaman and Nicobar Islands and reported 63 manglicolous fungi.

Terrestrial fungi in mangrove habitats are generally ignored as transiet mycoflora (Raghukumar, 1996; Jones, 2001). But, whatever fungi it may be, they play an important role in the nutrient regeneration cycles as decomposers of dead and decaying organic matter in the estuaries. Fungi exhibit lipolytic activity (Dingle and Solomons, 1952; Jensen, 1974; Hankin and Anagnostakis, 1975; Adams and Deploey, 1978; Trigiano and Fergus,1979, Federici,1982; Yeoh *et al.*, 1986) and also play an important role in the degradation of lignin (Fries, 1953; Johnson and Sparrow, 1961; Merril and French, 1964). Cellulose and pectin (Venkatesan and Ramamurthy, 1971; Velho and D'Souza, 1982) degradation by way of their mechanisms of enzyme production play an important role in the degradation of leaf litter (Fell and Master, 1973; Lee and Baker, 1973; Newell, 1976).

The dominant biodeteriorative role of fungi in terrestrial ecosystem is well known (Anderson and Domsch, 1975) while the ecology of fungi in the marine environment especially in mangrove vegetation has been little examined till 1970. Decomposition processes have received considerable attention in studies on terrestrial ecosystems as a consequence of the dominant detritus pathway in such ecosystem. Litter decomposition in soil is influenced by a host of variables including the nature of the decomposer community, the substrate quality and the physico-chemical environment. It has been proved beyond doubt that the decomposition of plant materials is affected by the prevailing temperature and relative humidity condition, and as to how these influence the rate of decomposition, which depends upon the moisture and temperature requirements of the microorganisms and the nature of the substratum. Although, studies covering these aspects have been carried out extensively in different plant species in terrestrial ecosystem, studies on this nature are scanty with reference to mangrove ecosystem.

Dead plant materials constitute one of the most widely distributed sources of energy. Cellulose is by far the most abundant compound in these materials and its decomposition by soil microorganisms has received considerable attention because of its significance in the biological cycle of carbon. Cellulose decomposing fungi have been reported from soil as well as many different sources. Several techniques have been used for studying fungi associated with cellulose decomposition.

It is difficult to classify soil fungi strictly as cellulose decomposer and non-cellulose decomposer because the capacity for cellulose decomposition may vary in different species from very feable to very strong. The study of enzymatic capability of fungi under field condition is also difficult. Therefore, isolation of fungi and testing of their cellulose decomposing abilities are the ways towards understanding the fungal activity. Qualitative screening of degradative enzymes such as cellulase, xylenase, laccase and tyrosinase in 16 marine fungi was reported by Rohrmann and Molitoris (1992).

There is a wealth of information available on the extracellular lignin-degrading enzymes of terrestrial wood-rot fungi. Among the wood rot fungi, white rot fungi are the only kind of wood-rotting fungi that efficiently attack all the wood components i.e., lignin, cellulose and hemicellulose. White-rot fungi belong to Basidiomycotina and have extensively been studied for their lignin degrading enzymes. Lignin degradation of these fungi is a cometabolic process, in that lignin degradation is coincidental to their metabolism of energy / carbon substrates such as cellulose, hemicellulose as well as simple carbohydrates and glycerol. It has been suggested that degradation of cellulose or hemicellulose provides carbohydrate for the growth of the fungus and when carbon source is exhausted, the fungus starves and shifts from a primary metabolism to a secondary metabolism mode, which in turn triggers the production of enzymes involved in lignin degradation. During utilization of sugars from polysaccharides of wood, H_2O_2 is produced by the action of glucose oxidase and glyoxal oxidase (Reddy and Kelley, 1986) and this is a prerequisite for white rot fungi such as ***Phanerochaete chrysosporium*** and ***Trametes versicolor*** to degrade lignin.

In the recent years considerable interest has been shown in the secondary metabolites of marine fungi, because of their importance (Kirk and Catalfomo, 1970) in medicine (Cuomo *et al.*, 1995; Kobayashi *et al.*, 1996; Varoglu *et al.*, 1997; Crews, 1998; Jenkins, 1999; Hoeller *et al.*, 1999). Therefore, it is proved that the ocean can provide an inexhaustible source of water, metabolically derived products, food materials and nutrients. Over the past three decades fungi in different mangrove environments have been described (Paugh, 1968; Rai *et al.*, 1969; Lee and Baker, 1972a, b; Ulken, 1972; Kohlmeyer and Kohlmeyer, 1979, 1981, 1987, 1995; Prasanarai and Sridhar, 2003; Ananda and Sridhar, 2004; Frayer *et al.*, 2004; Maria and Sridhar, 2004; Liu, 2006; Figueira and Barata, 2007). But studies on their potential utilization for various purposes have received little attention.

Thus it is obvious from the highlights in the foregoing paragraphs that the studies on the fungi in the marine environmental could provide new knowledge about the fungal diversity in the marine environment, their ecology, colonization potentialities as expressed by their enzymes producing abilities and the secondary metabolites as the source of diverse bioactive compounds.

The thesis deals with the fungal diversity recorded from four different sites along the east coastal regions comprising of Ennore, Pichavaram, Muthupet and Thondi, which are characterized by differences in the composition of vegetation, physicochemical properties of the soil and the environment.

A perusal of the literature proved that information on the study of diversity of fungi in the marine environment is lacking in India, particularly in the East coast environments and no substantial work is available on the enzymes producing ability of fungi. The very basic requirement for initiating microbial technology is to enumerate the natural microbial population and to understand their ecological characteristics. Keeping these points in view the present investigation has been planned to study the mycoflora of East coast mangrove environments of Tamil Nadu, India, with the following objectives

(i) to study the soil fungi diversity of east coast of Tamil Nadu with reference to Ennore, Pichavaram, Muthupet and Thondi.

(ii) to study the physico-chemical properties of the soil samples collected from the study sites (Ennore, Pichavaram, Muthupet and Thondi).

(iii) to study the population dynamics of soil fungi with reference to four study sites.

(iv) to record the endophytic marine fungi from the driftwood samples collected from the coastal regions.

(v) to screen the fungi isolated from the soil samples to determine their enzyme producing potentialities.

(vi) to optimize the enzyme (amylase, cellulase and pectinase) producing capabilities of selected fungi isolated from the soil samples.