Activity of Soil Fungi of Mangalvan, The Mangrove Ecosystem of Cochin Backwater

It has long been established that fungi possess an important role in the degradation of plant material (Kaushik & Hynes, 1971; Jones, 1974). Their role in the mangrove ecosystem is less well known, although it is presumably similar to that of other forest and swamp ecosystems (Findlay et al., 1986). This paper presents the results of the screening of fungal flora of the soil for production of degradative exoenzymes which play an important role in the breakdown of organic substrates and consequently regeneration of nutrients in the Mangalvan mangrove ecosystem of Cochin backwater.

The ecosystem is situated between, approximately 9°59'N to 10° N lat. and 76° 16'E to 76°18'E long.(Fig.1). The average depth is about 1 m forming a shallow muddy pool of 2.8 hectares with a thick mangrove vegetation at the periphery. It is connected to the main backwater through a feeder canal. *Avicennia officinalis* is the dominant macrophyte followed by *Acanthes illicifolius* and a few *Rhizophora mucronata*. During monsoon and post-monsoon periods, free floating plants, *Eichhornia crassipes, Salvinia molesta* and *S.rotundifolia* form a mat moving with the tide and a part of this is left behind to die and decay adding to the detritus load of the ecosystem. The area is an active ground of fish and prawn breeding. Apart from a good population of fiddlers crab, other crustaceans also exist there. As the flora and fauna perish and decay, the ecosystem is enriched with organic detritus.

Details of the sampling techniques used for the isolation of fungi from the mangrove soil has been presented earlier (Prabhakaran *et al.*, 1989). The screening for the enzyme production was conducted on solid media either in petriplates or in test tubes. Enzyme tests were performed according to the following references: amylase, chitinase, gelatinase and lipase (Hankin & Anagnostakis, 1975), cellulase (Tansey, 1971), pectinase (Hankin *et al.*, 1971), caseinase (Rajamani & Hilda, 1987) and phosphate solubilization (Pikovskaia, 1948). All the media for the above tests were prepared with aged sea water and distilled water (1:1 v/v). Discs of mycelial mats (5 mm diameter for all the tests except for cellulase-12mm diameter) cut by sterilized cork borer from actively growing petri plate cultures, were used. All the plates were incubated in the dark at 28 ± 2°C for five days. For cellulase activity the tubes were incubated at 28 ± 2°C for 35 days. Each analysis was carried out in triplicate and the average of the three was recorded in the result. Identification of fungi was carried out according to standard mycological books.

Results of the qualitative screening of fungal isolates for the production of hydrolytic enzymes and phosphate solubilization are given in Table 1. Table 2 presents the percentage of the positive isolates for each enzyme production. It is found that most of the fungal isolates were capable of producing one or the other hydrolytic

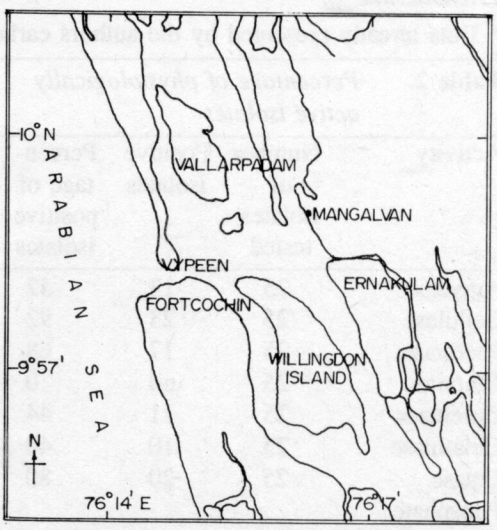

Fig. 1. Map showing the position of Mangalvan

Table 1. *Enzymatic and phosphate solubilization abilities of fungal isolates of mangrove soil*

Mycoflora	Amylase	Cellulase	Pectinase	Chitinase	Caseinase	Gelatinase	Lipase	*Phosphate solubilization
Acrothecium sp.	+	+	+	-	-	+	+	-
Alternaria fasciculata	-	+	+	-	-	-	+	-
Aspergillus candidus	+	+	+	-	-	-	-	+
A. chevalieri	+	+	+	-	+	-	+	-
A. fumigatus	-	+	-	-	+	+	+	+
A. niger	+	+	-	-	-	-	+	+
A. nidulans	-	+	-	-	-	-	+	-
A. oryzae	+	+	+	-	-	+	-	-
A. sydowi	+	+	-	-	+	+	+	-
A. terius	+	+	+	-	+	+	+	+
A. ustus	+	+	+	-	+	+	+	-
Chalara sp.	-	-	-	-	-	+	-	-
Cladosporium herbarum	+	+	+	-	+	+	+	-
Cuvularia lunata	-	+	-	-	-	-	+	-
Fusarium neoceras	-	+	+	-	+	+	+	-
F. oxysporum	+	+	+	-	+	+	+	-
F. solani	-	+	+	-	+	-	+	-
Geotrichum candidum	-	-	+	-	-	-	-	-
Helminthosporium sp.	-	+	+	-	-	-	-	-
Mucor hiemalis	-	+	-	-	-	-	+	-
Penicillium citrinum	+	+	+	-	+	-	+	-
P. janthinellum	+	+	+	-	+	-	+	+
P. monoverticillate symmetrica	+	+	+	-	-	-	+	-
Trichoderma koningi	-	+	-	-	-	-	+	+
Trichoderma sp.	-	+	+	-	-	-	+	-

* Data already presented by the authors earlier (Prabhakaran *et. al.*, 1989)

Table 2. *Percentage of physiologically active isolates*

Activity	Number of isolates tested	Positive isolates	Percentage of positive isolates
Amylase	25	13	52
Cellulase	25	23	92
Peetinase	25	17	68
Chitinase	25	nil	0
Caseinase	25	11	44
Gelatinase	25	10	40
Lipase	25	20	80
Phosphate solubilization	25	6	24

exoenzyme and majority of them actively produced more than one enzyme. Most of the isolates were cellulase producers whereas lipase producers were next in number. A good number of these isolates were pectinase and amylase producers, some could produce caseinase and gelatinase and a few could also solubilize insoluble phosphate. None of them could produce chitinase. Matondkar *et al.* (1980) studied the fungal flora of mangrove swamps of Goa and screened them for the production of cellulase, amylase and pectinase and found majority of them produced amylase.

This investigation reveals that the

heterogeneous fungal flora present in the mud of Mangalvan mangorve ecosystem is capable of producing different types of degradative exoenzymes which can act upon not only plant but also animal substrates to form detritus and again for further release of nutrients from them.

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