Mycoflora diversity in different soils of Puducherry

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ABSTRACT

The present investigation was carried out to know the fungi present in different soil samples of Puducherry region, India. Fungal isolation was done by the serial dilution method incubated at 28°C for 72 hours. Totally 72 fungal species belonging to 22 genera were isolated from soil samples. Besides the above, maximum number of species diversity was encountered with the fungal species belonging to the class Deuteromycetes. The predominant fungal genus namely Alternaria, Aspergillus, Cladosporium, Curvularia, Fusarium, Geotrichum, Penicillium, Rhizopus and Trichoderma were reported. The physico-chemical characteristics of soil samples were found to influence the distribution and population of fungi.

Keywords: Fungi soil, ecosystem, physicochemical parameters, Puducherry

INTRODUCTION

Soil usually consists of microorganisms such as bacteria, viruses, fungi, actinomycetes, protozoa and algae [1, 12]. Fungi have the potency to grow at acidic and alkaline conditions [6, 17]. Fungi behaves as to accomplish the habitat, it may be freshwater, terrestrial and marine environment [9]. The physico-chemical parameters of soil sample and the surrounding environment predicts the presence of microbes. There are many factors influences the soil formation they are mainly climate, topography, parent material, and time [2].

The physical and chemical breakdown of rocks to fine particles with large surface areas and the accompanying release of plant materials initiate the soil forming process [14]. The present study was carried out to understand the ecology and diversity, seasonal variations, frequency of occurrence and distribution fungi in relation to physico-chemical status of marine ecosystem in east coast of Puducherry.

MATERIALS AND METHODS

Study sites

Pondicherry region is situated on the Coromandel Coast between 11°46’ and 12°30’ N latitudes and 79°36’ and 79°53’ E longitudes. The region is bounded on the north, south and west by Marakkanam, Cuddalore and by Villupuram districts of Tamilnadu, and on the east by Bay of Bengal. It covers an area of 29377 ha, according to village revenue records and it consists of 179 villages. The present study was carried out in three different localities of rural villages; Bahour (S1), Kanniakoil (S2), Karikalampakkam (S3) Thavalakuppam (S4) and Pooranankuppam (S5) coastal areas on May 2014. The villages are adjacent and previously agriculture was in practice. Recently the agriculture was overthrown and buildings were raised.
Methods for collection of soil samples
The samples were collected 3 inches below the soil surface using the sterile spatula and carefully collected in the containers. The soil samples were collected randomly from the each place within the radius of 1 km. The sealed containers were brought to the Microbiology Laboratory, Botany Department, KMCPGS, Puducherry for further investigation.

Determination of physicochemical properties of soil samples
The pH values, electrical conductivity, soil moisture, organic carbon, nitrogen, phosphorous, potassium, iron, manganese, copper and zinc were analyzed (Table 1).

Preparation of samples
Dispensed one gram of organic sample in 10 ml of distilled water, mixed well by Vortexing and transferred one ml of suspension to another test tube to make \(10^{-5}\) dilution. Dilution procedure was continued up to \(10^{-6}\).

Spread plate methods
Nutrient agar plates were prepared and 0.1 ml of suspension was pipetted from each dilution on the agar surface. The L rod was dipped in 95% alcohol which was taken in the beaker. The glass rod was removed from the beaker and the bent position was sterilised in the Bunsen burner flame. The rod was cooled for 10-15 sec. and softly touched on the agar and spread the suspension on the agar surface. The procedure was repeatedly carried out to prepare up to \(10^{-6}\) and then the plates were incubated in an inverted position at 25\(^\circ\)c for 24 to 48 hrs.

Enumeration of colonies
The method, Most Probable Number (MPN), was used for the enumeration of cultured colonies. The different colonies in the plate were counted manually.

Identification of organisms
After the growth of microbial colonies in the spread plates the various colonies were differentiated by colony morphology. Then the colonies are streaked onto the different agar slants by taking a loop full of culture. From those slants a single colony was inoculated into the sterile broths and incubated for 4 to 6 hrs. These were used for further experiment.

Table 1: Physico-Chemical parameters of five regions of Puducherry

<table>
<thead>
<tr>
<th>Sample</th>
<th>pH</th>
<th>EC</th>
<th>Lime</th>
<th>Soil texture</th>
<th>Macronutrient</th>
<th>Micronutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>S1</td>
<td>7.1</td>
<td>1.12</td>
<td>N</td>
<td>S</td>
<td></td>
<td>120.65 L</td>
</tr>
<tr>
<td>S2</td>
<td>7.4</td>
<td>0.17</td>
<td>N</td>
<td>S</td>
<td></td>
<td>64.90 L</td>
</tr>
<tr>
<td>S3</td>
<td>6.8</td>
<td>0.22</td>
<td>N</td>
<td>S</td>
<td></td>
<td>78.96 L</td>
</tr>
<tr>
<td>S4</td>
<td>7.4</td>
<td>0.17</td>
<td>N</td>
<td>S</td>
<td></td>
<td>64.90 L</td>
</tr>
<tr>
<td>S5</td>
<td>7.1</td>
<td>1.1</td>
<td>S</td>
<td>S</td>
<td></td>
<td>118.65 L</td>
</tr>
</tbody>
</table>

Isolation of soil mycoflora
The two techniques we followed for isolation are Soil dilution \(^{(19)}\), and Soil plate method \(^{(18)}\) on different media such as potato dextrose agar and Sabourard Dextrose Agar at pH 6.5. All the Petri dishes were incubated at room temperature 27 ± 3\(^{\circ}\)C for a period of 4 – 7 days and then examined. The first set of observations were made at the end of two days to make sure that the fast growing flocculent types such as Rhizopus, Mucor and Trichoderma, etc., has grown excessively to interfere with observations of other species. Second observation was made when these had come to an advanced stage to enable identification. Finally, the slow growing organisms has to be sub- cultured in different media for the purpose of further growth to save them from being overrun by the more aggressive types. The number of colonies per plate in 1 g of soil was calculated.

Identification
Identification of the organisms was made by microscopic analysis using taxonomic guides, standard procedures and relevant literature \(^{(7, 8, 4, 5)}\). While presenting the data two terms, viz; periodicity of occurrence and ‘percent contribution and statistical analysis were used. The percent contribution of each isolate was calculated by using the following formula:

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A survey of the literature showed that a number of fungi have been reported from saline soils, mangrove mud and other coastal habitats. These fungi include Absidia spp., Aspergillus spp., Fusarium spp., Penicillium spp., and Trichoderma viride correlates with the previous work done [4]. These results were in accordance with our result which included Absidia spp., Alternaria spp., Aspergillus spp., Paecilomyces spp., Penicillium spp, and Trichoderma spp. Genus Aspergillus mainly Aspergillusflavus was the highest occurrence (frequency 100%) followed by A. niger, and A. fumigatus. Aspergillus genus was the most in incidences, though its isolation varied in the different coastal soil samples according to area. Aspergillus genus has been cited as one of the fungi which are present in the atmosphere at extraordinary levels already reported by [3, 10, 13, 15]. Aspergillus showed the broadest spectrum range, it represented by 5 species Aspergillus flavus, A. versicolor, A. fumigatus, A. niger and A. terreus. All the soils samples obtained from the different sites of Puducherry did not give the same conclusion was obtained. [13, 15, 11].

Consequently it might be concluded that the costal saline soil is a unique habitat where there are diverse sanctuaries for fungi. In the present study the identification of 14 fungal species from coastal soils of Puducherry, revealed that although the coastal soil is extreme habitat but it is also a potential substrate for harboring a large number of fungi. Furthermore an extensive study is required for exploitation of soil fungi and its diversity from different places in Puducherry.

REFERENCES


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