

ECOLOGICAL ANALYSIS AND ISOLATION SAPROPHYTIC THERMOPHILES FROM SUNDERBAN MANGROVE FOREST

Priya Srivastava* and A.K. Jaitly

Microbiology Lab. Department of plant science, M.J.P.Rohilkhand University, Bareilly-243001

*priyasrivastava051@gmail.com

Abstract: Thirty five saprophytic fungi were isolated from mud, wood debris and leaf litter samples taken from Sunderban mangrove forest, West Bengal, in India. Of the medium used, yeast powder soluble starch agar supports better fungal growth. Among the isolated fungi, eight *Aspergillus* species were most frequent. The highest fungi species were found from Sajnakhali site because the presence of the highest organic matter and moisture content.

Keyword: Ecological condition, sunderban mangrove forest, saprophytic fungi

INTRODUCTION

Sunderban forest is the largest mangrove forest in the world. It is located in western part of the Ganga and Brahmaputra delta. The unique ecological characteristics of the mangrove forest are the presence of high organic matter, moisture, salinity and pH; moderate temperature, poor aeration and evergreen dense state. It has a warm humid climate with an annual rain fall of about 1600 to 1800 mm. That provides a good environment for the decomposition of organic matter. Sunderban mangrove forest is rich in wood debris and leaf litters which along with its ecological parameters provide a good habitat for the growth and activity of decaying organisms including. Thermophilic the term thermophiles has been (Apinis; 1964) to denote fungi which grow at temperature of 45°C or above. Cooney and Emerson (1964) have divided them into two categories – True Thermophilic and thermotolerant. Saprophytic fungi play an important role in waste disposal and their utilization (Manzoor and Shaekat; 2004). Rajasekaran and Maheshwari (1993) suggested that the mangrove forest in environment thermophilic fungi may be at a physiological disadvantage compared to mesophilic fungi. Present study has been undertaken from Sunderban mangrove forest of India to evaluate ecological parameters of the studied sites, isolation to saprophytic thermophiles and to find out a correlation between fungal isolates and ecological factors.

MATERIAL AND METHOD

Mud, wood debris and leaf litter samples were collected from different localities of Sunderban mangrove forest, like Gosaba, Gangasagar, Sudanakhali, Sajnakhali and Basanti. The collected wood debris and leaf litter were divided into three categories: undecomposed, partially decomposed and totally decomposed.

Ecological factor

pH and temperature of soil samples were measured with meter (systronic pH system 361). Soil samples were collected localities were taken into preweighted watch glass. These were dried in oven at 80°C for 24 hours, weight of oven dried sample were taken. Percent moisture content and salinity of the samples were calculated by taking the difference in weight. Soil organic matter was calculated using the method of Walkey and Black (1947).

% Organic matter = $6.791 / W (1-T1/T2)$

W = Weight of sample

T1= Volume of titrant used against sample

T2= Volume of titrant used against water black

Isolation of fungi:

The fungal form were isolated by direct and dilution plate technique (Lee, 2004) using yeast powder soluble starch agar medium (pH 7.0). The mesophilic and thermophilic forms were isolated at two different temperatures, i.e., 29°C and 45°C respectively. The appearing fungal forms were transferred and maintained onto agar forms were identified with the help of morphological characteristics (Kane *et al.*, 2005) using camera Lucida, photomicrographs and available literature.

RESULT

The ecological parameters of the studied sites of Sunderban mangrove forest are presented in table – 1. The salinity of the collection sites was found to range from 2.4 to 6.0 %. Maximum moisture content (42 %) was found in Sajnakhali while the lowest (26.6 %) was recorded from Gosaba. The highest percent organic matter of 7.78 % was evaluated in Sajnakhali and the lowest (2.05 %) was recorded from Gosaba. A total number of thirty five saprophytic fungi were isolated using YPSS medium. Of these five species belonging to the Zygomycotina (14 % of total isolated), five species of to the Ascomycotina (14 % of total isolated) and the rest belonged to the Deuteromycotina (72 % of total isolated). Among the *Aspergillus* species the member of Deuteromycotina was obtained in the highest number followed by *Humicola* species and *Sporotrichum* species. Nature of the thermophilous

fungi was observed by growing them at two different temperatures *i.e.*, 20°C and 50°C. Maximum numbers of fungi were isolated from Sajnakhali followed by Sudanakhali and Basanti. The highest numbers of fungi were obtained from semi-decomposed samples as compare to fresh and fully decompose (table – 2).

DISCUSSION

The higher numbers of thermophilous fungi have been isolated from the studied sites of Sunderban mangrove forest. The highest numbers of saprophytic fungi were isolated from Sajnakhali because; here organic matter was 7.78 % salinity was 3.10 %. The least number of saprophytic fungi were isolated from Gangasagar as well as same reason here organic matter 2.93 while salinity was 4.04 %. Highest numbers of fungi were isolated in semi-decomposed samples as compared to undecomposed and fully decomposed samples. This may be due to the fact that semi-decomposed samples contained complex

nutrient which can support the growth of fungal forms in a better way. In fully decomposed samples most of the complex nutrients are utilized. The might be on of the reason for isolated of higher number of fungal forms are semi-decomposed samples. Fungi well know agents of decomposition of organic matter (Jahangeer *et al.*, 2005). The *Aspergillus* was the most commonly exhibiting that this genus has a greater capability to adopt in extreme conditions of the mangrove forest. The growth of thermophiles was effected by many factors like temperature, pH, organic matter and moisture content etc (Taney, 1972; Kathiresan and Thangam, 1990). Deuteromycotina were isolated in the highest number indicating that it is the major group inhabiting this habitat (Rai *et al.*, 1981; Jaitly, 1982). *Aspergillus*, *Humicola*, *Sporotrichum* and *Penicillm* were the most frequently isolated genera belonging to Deuteromycotina, indicating that these forms are capable of growing in mangrove environment and have developed ecological adaptability.

Table. 1

Ecological Factors from different localities of Sunderban mangrove forest					
Ecological factors	Basanti	Gangasagar	Gosaba	Sajnakhali	Sudanakhali
pH of soil	7.6	7.0	8.9	8.0	7.0
Salinity %	4.0	4.4	2.5	3.6	6.0
Mositure Content	31	33.6	27	42	37.6
Organic Metter	2.2	2.7	2.2	7.7	5.5

Percent frequency of thermophilous fungi isolated from Sunderban mangrove forest

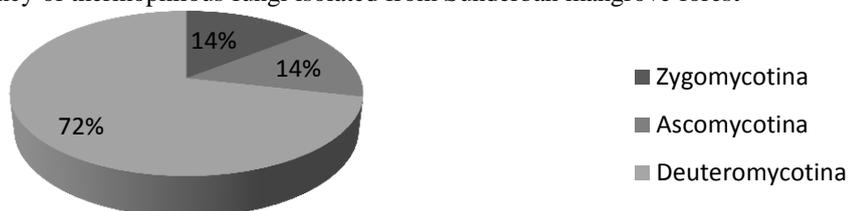


Table. 2

Saprophytic fungi from Sunderban Mangrove forest frequency of occurrence				
Name of fungi	TP / TT	% Frequency		
		Undecomposed	Semi-decomposed	Fully decomposed
Zygomycotina				
<i>Abisida corymbifera</i>	TP	0	09	10
<i>Mucor circinelloides</i>	TT	06	05	0
<i>Mucor species</i>	TT	12	22	18
<i>Rhizpus orygae</i>	TP	13	16	20
<i>Rhizpus species</i>	TP	07	0	02
Ascomycotina				
<i>Chaetium thermophile</i>	TP	26	26	29
<i>Chaetium species</i>	TP	11	21	15
<i>Emericella nidulans</i>	TT	12	17	10
<i>Myrothecium Species</i>	TP	05	0	0

<i>Thermoascus aurantiacus</i>	TP	25	35	26
Deutromycotina				
<i>Aspergillus candidus</i>	TT	0	05	06
<i>Aspergillus flavus</i>	TT	27	25	22
<i>Aspergillus oryzae</i>	TT	09	14	10
<i>Aspergillus niger</i>	TT	82	75	89
<i>Aspergillus fumigatus</i>	TT	80	68	92
<i>Aspergillus nidulens</i>	TT	09	12	0
<i>Aspergillus parasiticus</i>	TT	03	0	04
<i>Aspergillus terreus</i>	TT	18	23	28
<i>Humicola grisea</i>	TP	28	37	35
<i>Humicola fuscoatra</i>	TP	10	18	08
<i>Humicola insolens</i>	TP	23	36	31
<i>Trichoderma</i>	TP	38	44	29
<i>Trichoclodium opacum</i>	TP	02	01	0
<i>Penicillium species</i>	TT	18	23	14
<i>Penicillium chrysogenum</i>	TT	35	32	26
<i>Sporotrichum species</i>	TP	18	12	14
<i>Sporotrichum thermophile</i>	TP	22	20	20
<i>Melbrechea sulfurea</i>	TP	07	04	0
<i>Melbrechea pulchella</i>	TP	03	09	06
<i>Cladosporium herbarum</i>	TT	0	02	0
<i>Cladosporium species</i>	TT	01	0	03
<i>Curvularia species</i>	TT	0	05	0
<i>Scouleriopsis brumptii</i>	TP	02	06	08
<i>Mortierella polycephala</i>	TT	01	0	02
<i>Ulocladium consortiale</i>	TP	03	0	0

TP - Thermophile

TT - Thermotolerant

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