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IMPACT OF DENUDATION AND CULTIVATION ON THE AEROMYCOFLORA IN A TROPICAL FOREST OF SOUTH ORISSA, INDIA

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The occurrence of air borne fungi was studied in three different sites of a tropical forest of south Orissa over a period of 13 months. An estimated total of 1808 propagules belonging to 53 genera and 126 species of microfungi were trapped with gravity petriplate method. Deuteromycotina group was found to contribute maximum population and *Aspergillus* was the dominant genera in all the three sites. The Forest site with dense surface and overlying vegetaion had the highest concentration of fungal spores. But the denudation and cultivation of forest land considerably influenced the homogeneity of occurrence and dominance of mycoflora species in air. Moreover, it was found that there was enhancement in concentration of some selective genera at cultivated site.

Keywords: Aeromycoflora; Denudation; Propagules; Tropical forest.

Introduction

Among all microorganisms, fungi are the major decomposers of many agricultural and forest habitats dominating both microbial biomass and metabolism[1,2]. Apart from their presence in soil, fungi constitute a major portion of air flora in form of spores. Aerobiological survey conducted in and around human habitations and crop fields indicate the presence of rich aerospora and their seasonal variations[3-5]. But studies of aerospora in a forest habitat are scarce and fragmentary[6,7]. Moreover no significant work of this kind has been reported from Orissa. This project was underataken with a view to study the impact of vegetation, denudation and conversion of forest land to agricultural fields on the aeromycoflora composition and concentration in a tropical forest habitat of south Orissa.

Materials and Methods

The study was conducted at the Tropical Reserve Forest of the Ghumusar North Forest Division (84° .21' - 84° SE, 19° .43' to 20° .18'N) in South Orissa, India. The forests are a part of the Eastern Ghats, having an elevation of 300-400' with an average rainfall of 140 cms.

The three sites selected for the study were situated around one Kilometer from each other. The first site (Site A) was in a virgin forest comprising tall trees of mixed category, where *Shorea robusta* was the dominant tree species. The understorey was a thick growth of seasonal herbacious plants and climbers. The second site (Site B) was a deforested area clear felled for timber . It comprised only of a few grasses and herbacious weeds. The third site (Site C) was a big patch of land used for seasonal cultivation of some cereals and vegetables by the tribals of that locality.

Sampling was done at monthly intervals over a period of 13 months by gravity petriplate method. Potato dextrose agar (PDA) plates supplemented with streptopenicillin was exposed at the sites in triplicate for two minutes. The suitability of media and exposure time was standardised previously. The exposed plates were then carried to the laboratory and incubated in a culture room

under simulated conditions.

The fungal colonies were studied and identified at an interval of three days for two weeks following the procedures laid by Gilman[8], Barren[9], Subramanian[10] and Ellis[11]. The percentage contribution of individual fungi was calculated taking into account the number of colonies per petriplate, as per the formula:

$$\frac{\text{Total colony of an individual fungi during investigation}}{\text{Total colony of all the fungi}} \times 100$$

The Atmospheric temperature at experimental sites was recorded by a centigrade thermometer. Other data like month wise rainfall, temperature and relative humidity of the area was collected from the state agricultural meteorology station nearby (Bhanjanagar).

Results and Discussion

The variation in atmospheric temperature, relative humidity and rainfall of the locality indicated in Fig. 1 shows that the lowest temperature was in the month of December while the highest was in May. Maximum rainfall was recorded during June to November and minimum in December-January period. Relative humidity exhibited a correlation with the rainfall i.e. the maximum and minimum range corresponded to the amount of rainfall during that period.

Out a total of 1808 fungal propagules trapped during the investigation site A contributed 695, site B 470 and site C 643 respectively (Table 1). The density of fungal spores was highest during February and March in all the three sites and lowest during April and May. The presence of maximum propagules in Site A is a clear evidence of the plantation effect corroborating the findings of Bartzakas[4] and Reddy *et al.*[12] Similarly the decrease in total number of propagules in all the three sites during the rainy season and increase in winter is akin to the findings of Kumar[5]. Climatologically, the wet (June-Nov.) and dry (Dec. - May) periods of the year contributed 43-45% and 51-53% of the total annual spora of the three sites. This does not confirm to the findings of Janaki Bai and Reddy[13].

Oualitatively, a total of 126 fungal species belonging to 53 genera were recorded form the three sites out of which the Zygomycotina had 5 genera and 7 species, Ascomycotina with 2 genera and 3 species and Deuteromycoina had a share of 46 genera and 116 species respectively (Table 2). Lesser number of taxa were recorded in site B (33 genera and 69 species) and site C (30 genera and 69 species) than in site A (35 genera and 70 species). Based on the frequency of occurrence, it was observed that comparatively more species appeared at site A than at the other two (Table 3).

Table 4 which enlists fungi contributing more than 2.5% of the total aerospora shows that the *Aspergillus* is of highest occurrence followed by members of *Penicillium*, *Curvularia, Fusarium* and *Cladosporium* in decreasing order. Although there was a marginal difference in the number of genera and species in the three sites of study, the forest site with vegetational cover had the highest spores while the deforested site was lowest throughout the year. However in the cultivated site, higher concentration of some specific fungi like *Drechslera hawaiiensis, Fusarium solani* and *Aspergillus terreus* (Table 4) indicated the influence of cultivated crop on the aeromycoflora of that area.

The present study indicates that denudation of the forest has direct bearing on the pattern of distribution of fungal spores in

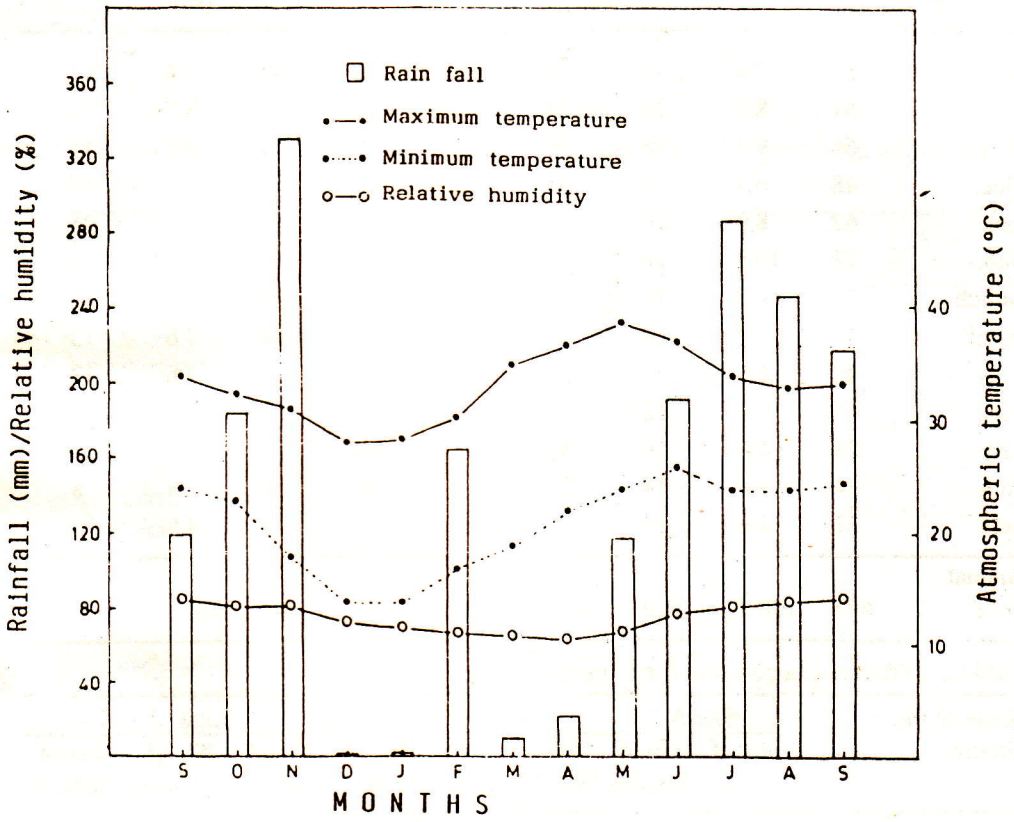

Fig. 1 : Climatological data of the study site

air whereas cultivation of forest land encourages the selective presence of aeromycoflora in that locality.

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Table 1: Monthwise Percentage contribution of fungal species at three sites.

Months	A			B			C		
	Total colony	Contri-bution (%)	Total species	Total colony	Contri-bution (%)	Total species	Total colony	Contri-bution (%)	Total species
Sept.	52	7.4	12	42	8.9	12	48	7.4	13
Oct.	61	8.7	16	34	7.2	11	56	8.7	14
Nov.	66	9.4	16	34	7.2	16	53	8.2	14
Dec.	48	6.9	18	35	7.4	17	55	8.5	16
Jan.	62	8.9	19	36	7.6	20	57	8.8	25
Feb.	73	10.5	18	56	11.9	11	66	10.2	18
March	73	10.5	19	41	8.7	16	63	9.7	19
April	55	7.9	14	20	4.2	7	49	7.6	15
May	46	6.6	7	36	7.6	7	49	7.6	13
June	65	9.3	12	35	7.4	8	52	8.0	15
July	28	4.0	10	36	7.6	10	35	5.4	6
Aug.	34	4.8	14	28	5.9	8	31	4.8	8
Sept.	32	4.6	10	37	7.8	13	29	4.5	10
Annual Total	695	100.0	70	470	100.0	69	643	100.0	69

Table 2: Different categories of fungi trapped at three sites.

Name of the Groups	Site A		Site B		Site C		Total (A + B +C)	
	No. of Genera	No.of Species	No.of Genera	No. of Species	No. of Genera	No. of Species	No. of Genera	No. of Species
Zygomycetes	4	4	5	5	5	7	5	7
Ascomycetes	2	2	2	3	1	1	2	3
Deuteromycetes	29	64	26	61	24	61	46	116
Moniliales	24	59	18	53	21	58	35	105
Sphaeropsi-dales	4	4	6	6	2	2	9	9
Melanconiales	1	1	1	1	1	1	1	1
Mycellia sterilia	-	-	1	1	-	-	1	1
Total	35	70	33	69	30	69	53	126

Table 3: Number of fungal species in different categories based on their frequency of occurrence.

Frequency Category	A (Forest site)	B (Denudated site)	C (Cultivated site)
0 - 20%	45	54	46
21 - 40%	17	8	16
41 - 60%	03	5	3
61 - 80%	4	2	2
81 - 100%	1	-	2

Table 4 : Relative ranks of some dominant fungi based on their percentage abundance (above 2.5%) recorded at three sites.

Sl. No.	Fungi	A Forest Site			B Deforested site			C Cultivated site		
		No. of Colony	contri-bution (%)	Rank	No. of Colony	Contri-bution (%)	Rank	No. of colony	Contri-bution (%)	Rank
1.	*Aspergillus niger*	116	16.6	1	65	13.8	1	77	11.9	1
2.	*Penicillium citrinum*	40	5.7	2	-	-	-	-	-	-
3.	*Curvularia lunata*	35	5.0	3	41	8.7	2	71	11.0	2
4.	*Fusarium oxysporum*	34	4.8	4	31	6.5	3	51	7.9	3
5.	*Penicillium oxalicum*	28	4.0	5	20	4.2	6	22	3.4	7
6.	*Aspergillus flavus*	26	3.7	6	20	4.2	5	23	3.5	5
7.	*Aspergillus carbonarius*	25	3.5	7	24	5.1	4	-	-	-
8.	*Cladosporium oxysporum*	24	3.4	8	-	-	-	18	2.7	10
9.	*Penicillium veruculosum*	20	2.8	9	12	2.5	9	-	-	-
10.	*Cladosporium cladosporioides*	19	2.7	10	18	3.8	7	18	2.7	9
11.	*Trichoderma viride*	18	2.5	11	-	-	-	-	-	-
12.	*Penicillium chermissinum*	-	-	-	13	2.7	8	-	-	-
13.	*Drechslera hawaiiensis*	-	-	-	-	-	-	28	4.3	4
14.	*Fusarium solani*	-	-	-	-	-	-	22	3.4	6
15.	*Aspergillus terreus*	-	-	-	-	-	-	18	2.7	8

(The percentage abundance of fungi in site 'A' is arranged in decreasing order against which the percentage abundance of fungi isolated at other two sites are compared.)

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