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Isolation of fungi from tropical peat of Southern India

K. P. Girivasan, K. Rajagopal,
V. Muruganandam and T. S. Suryanarayanan

PG and Research Department of Botany, Ramakrishna Mission
Vivekananda College, Chennai 600 004, India

Peat samples from Sandynallah basin of the Nilgiris were screened by three methods for the presence of mesophilic and thermophilic filamentous fungi. The samples were collected from a depth of 62 to 244 cm; their radiocarbon age ranged from 3730 to >40,000 yr BP. Only 24 fungi, including one thermophilic form, could be isolated from 17 peat samples. The genus *Aspergillus* was the dominant form.

PEAT soils are partially decomposed organic matter characterized by an acidic pH range and a high water-holding capacity. They are deficient in nutrients as well as oxygen¹. There are only a few studies on the mycoflora of peats² and even these are confined to the temperate regions. Therefore we screened some tropical peats for the presence of fungi.

Sukumar *et al.*³ and Geeta Rajagopalan *et al.*⁴ collected peat samples from Sandynallah region in the Nilgiri hills for palaeoclimatic reconstruction studies. These samples were obtained from Sukumar and screened for the presence of fungi. Sandynallah basin is at about 2200 m asl and receives a mean annual rainfall of about 1400 mm⁴. The peat is derived from C₃ and C₄ plants growing in this valley⁴. The radiocarbon age of the peat samples as analysed by Sukumar *et al.*³ and Geeta Rajagopalan *et al.*⁴ ranged from 3730 to >40,000 yr BP (Table 1). The peats were collected from a depth of 62 cm to 244 cm during October and December 1993. They were screened for fungi using Warcup method⁵, soil steaming⁶ and soil dilution plating methods⁷. Czapek-Dox agar medium (pH 4.5) was used for isolating mesophilic fungi and yeast phosphate soluble

Table 1. Radiocarbon ages of the peat samples collected from Sandynallah*

Sample no.	Depth (cm)	Radiocarbon age \pm SD (yr BP)
1	62-64	3730 \pm 100
2	78-80	4560 \pm 100
3	95-98	5370 \pm 150
4	110-113	11820 \pm 180
5	115-118	18440 \pm 510
6	121-124	28150 \pm 2180
7	129-132	25190 \pm 660
8	141-144	28410 \pm 890
9	153-156	22450 \pm 410
10	159-162	31790 \pm 1180
11	165-168	31380 \pm 1140
12	171-174	35560 \pm 2480
13	180-183	39690 \pm 2700
14	189-192	>40,000
15	201-204	>40,000
16	217-220	>40,000
17	241-244	>40,000

*Data taken from ref. 4.

Table 2. Fungi isolated from peat samples

	Fungus	Soil samples from which isolated*
Deuteromycetes	<i>Aspergillus fumigatus</i>	1-11, 13, 15-17
	<i>A. clavatus</i>	5
	<i>A. niger</i>	8, 10, 16, 17
	<i>A. chevalieri</i>	7, 10, 15, 16
	<i>A. flavus</i>	10
	<i>A. terreus</i>	4 [#]
	<i>A. candidus</i>	4 [#]
	<i>A. proliferans</i>	9
	<i>A. nidulans</i>	9 [#]
	<i>A. ochraceus</i>	13, 16
	<i>Curvularia</i> sp.	2, 12, 17
	<i>Drechslera</i> sp.	1-3, 7, 10, 11, 15, 16 [#]
	<i>Fusarium</i> sp.	15
	<i>Penicillium</i> sp.	1, 2, 6, 8, 9, 11-14, 17
	<i>P. wortmanii</i>	3, 16
	<i>Trichoderma</i> sp.	1, 3, 5, 7, 10, 15
<i>Geotrichum</i> sp.	4 [#]	
Ascomycetes	<i>Talaromyces</i> sp.	1-6, 8, 9, 11, 12, 16
	<i>Eurotium</i> sp.	2, 5
	<i>Chaetomium</i> sp.	5 ^{**}
Zygomycetes	<i>Mucor</i> sp.	4, 6, 12-14
	<i>M. pusillus</i>	1, 3-6, 8, 9, 11-14 [#]
	<i>Syncephalastrum racemosum</i>	7, 11, 17
	<i>Mortierella</i> sp.	9, 11

*Isolated by dilution plating.

[#]Isolated by Warcup method.

^{**}Isolated by soil steaming method.

starch agar medium (pH 4.5) for thermophilic fungi. Prepared petri dishes were incubated for 12 days at 30 \pm 1°C or 45°C (for thermophilic fungi). The species diversity was calculated using Shannon-Weaver Index⁸ and the percentage of occurrence of *Aspergillus* was calculated using the following formula:

Total no. of all colonies of *Aspergillus*
species in 6 plates

×100.

Total no. of colonies of all the species in 6 plates

A total of 24 different species of fungi were isolated from the different peat samples (Table 2). Of these, 70.8% belonged to the Deuteromycetes, 12.5% to the Ascomycetes and 16.7% to the Zygomycetes. The genus *Aspergillus* constituted nearly 60% of the Deuteromycetes and was represented by 10 species (Table 2). The percentage of occurrence of *Aspergillus* species tended to increase with increasing depth of the peat although, the species diversity of the fungi, in general, decreased with increasing depth (Table 3). These observations indicated the adaptability of this genus to such a habitat. The preponderance of *Aspergillus* in tropical peat is interesting since temperate peats harbour less or no *Aspergillus*^{2,9}. The peat samples harboured less number of fungi than normal soils. This, as well as the reduction in species diversity with depth could be due to low temperature, water-logging conditions and anaerobic environment. These conditions favour peat formation in the tropics⁴ but are inimical to fungi¹⁰.

Kustes and Locci¹¹ reported the presence of thermophilic fungi in peat. In the present study, *Mucor pusillus*, a thermophilic fungus was occasionally isolated, suggesting that such fungi can occur in tropical peat also. A *Chaetomium* sp. could be isolated only by soil steaming technique – justifying the fact that more than one type of isolation technique should be used in such studies.

Our study shows that tropical peats harbour restricted number of fungi, perhaps due to selection pressure, and *Aspergillus* is the most dominant fungus in such peats.

Table 3. Species diversity (Shannon index) and % of occurrence of *Aspergillus* in peat

Depth (cm)	Species diversity	% occurrence of <i>Aspergillus</i>
62–64	1.5	20
78–80	1.5	11
95–98	1.2	13
110–113	0.7	9
115–118	0.9	9
121–124	1.3	2
129–132	1.0	68
141–144	0.9	70
153–156	0.5	6
159–162	0.8	12
165–168	0.8	4
171–174	0.3	4
180–183	0.5	43
189–192	0.1	5
201–204	0.7	61
217–220	0.5	39
241–244	0.8	43

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Tiny digitate stromatolite (*Yelma digitata* Grey), Chitrabhanukot Formation, Kaladgi Basin, India

Mukund Sharma, Sushma Nair*, Shilpa Patil*,
Manoj Shukla and Vivek S. Kale*[†]

Birbal Sahni Institute of Palaeobotany, 53, University Road,
Lucknow 226 007, India

*Department of Geology, University of Pune, Pune 411 007, India

Tiny digitate stromatolite *Yelma digitata* Grey, 1984 (ref. 1) has been recorded from Chitrabhanukot Dolomite Formation, Bagalkot Group of Kaladgi Basin for the first time. They are columnar, parallel branched, multifurcate to bifurcate, walled, having cornices at places. Individual fascicles are rounded in cross section. Individual columns are 20–50 mm in height and 3–5 mm in diameter. Its microstructure is regular banded type and microfabric is radial fibrous to vermiform.

The occurrence of *Yelma digitata* has been recorded from Orosirian (Late Palaeoproterozoic) sediments in other parts of the world. Its occurrence suggests that the Bagalkot Group may be older than previously considered.

THE Kaladgi Basin on the northern edge of the Dharwar craton, contains shallow marine sediments, divided into the older Bagalkot Group and younger Badami Group^{2,3}. The oldest sequence in this basin, comprising the basal units of the Bagalkot Group, represents a transgressive suite of shoreline siliciclastics (Saundatti Quartzite and

[†]For correspondence.