

Mycofloral Diversity of Kanchathumalai Hill, Pudukottai (Dt)

¹*Jayaramanathan, V., Senthilkumar, R.

¹Asst.Professor, Department of Biotechnology, J.J. College of Arts and Science (Autonomous), Pudukkottai, Tamilnadu,
India

²Asst.Professor, Department of Microbiology, J.J. College of Arts and Science (Autonomous), Pudukkottai. Tamilnadu,
India

ABSTRACT : The present work is aimed to assess the fungal diversity of mycofloral diversity from the Kanchathumalai of Pudukottai district. To isolate and identify the fungal diversity, physiochemical parameter like pH, electrical conductivity, organic carbon, nitrogen, organic matter and phosphorous of the soil sample during the year 2012. Total number of fungal species observed in the natural ecosystem of the Kanchathumalai hill. The most common genera *Aspergillus*, *Curvularia*, *Penicilium* and *Rhizopus*.

KEYWORDS: Soil sample, mycoflora,

I.INTRODUCTION

Soil fungi play an important role as major decomposers in the soil ecosystem. They also provide mankind with very useful pharmaceutical product like antibiotics. The fungal derivatives like organic acids, enzymes, pigments and secondary metabolites are being used in the food industry and fermentation technology. In addition, some of the product from soil fungi are biological control agents for plant pathogens and insect pests. (Manoch, 1998). The variety are being used as fungi and their natural beauty occupy prime place in the biological world and India has been the cradle for such fungi. Only a fraction of total fungal wealth has been subjected to scientific security and mycologists have to unravel the unexplored and hidden wealth. One third of fungal diversity of the globe exists in India. Out of 1.5 million of fungi, only 50% are characterized until now. Unfortunately, only around 5–10% of fungi can be cultured artificially. Fungi are not only beautiful but also play a significant role in the daily life of human beings besides their utilization in industry, agriculture, medicine, food industry, textiles, bioremediation and natural cycling as biofertilizers. Fungal biotechnology has become an integral part of the human welfare (Punangsombat *et al.*, 2010).

According to Hawksworth (2002), fungi are a major component of biodiversity, essential for the survival of other organisms and are crucial in global ecological processes. Fungi play a major role in soil ecosystems and are the principal decomposers of forest litter or dung, fruits or other organic materials (Carlile *et al.*, 2001).

The soil is one of the most important habitats for microorganisms like bacteria, fungi, yeasts, and nematodes, etc. The filamentous fungi are the major contributors to the soil biomass (Alexander1977). They form the major group of organotrophic organisms responsible for the decomposition of organic compounds and has been found that more number of genera and species of fungi exist in soil than in any other environment (Nagmani *et al.*, 2005). Contribution in nutrient cycle and balance of nutrient in ecosystem, fungi play an important role in soil formation, soil fertility, soil structure and soil improvement (Hao-quin *et al.*, 2008). The majority of bio geographic studies have focused on terrestrial and marine environments but little is known about biogeography in air, although air is the primary park bordered by wood land.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

II. MATERIALS AND METHODS

Soil samples were collected from Kancathumalai, Pudukottai district 1 kg of soil sample was collected from the surface area reaching about 10-15 cm depth and near the soil. The collected soil samples were taken to the laboratory in sterile polythene bags and stored at 4°C until further work.

Isolation and identification of fungi

Isolation of fungi from the soil samples were carried out by soil dilution plate methods (Warcup 1955) using Potato dextrose agar media. The fungi were identified with the help of standard literature (Barneutt 1998, Ellis 1993, Gilman, 2001, Raper and Fennel 1965 and Subramanian 1971).

Soil physicochemical properties:

The soil samples was analyzed in moisture content, pH, organic C, total N, available P and K content. Moisture content was determined by weight loss after drying 10g of soil at 105°C for 24 hours and expressed as percentage dry weight. Soil pH was measured in a 1:5 water suspension using a portable digital pH meter. Colorimetric method (Anderson and Ingram, 1993), Micro kjeldhal distillation and titration method (Jackson 1967) were applied to estimate organic carbon, total nitrogen, available phosphorus and exchangeable potassium respectively.

Fungal population in the soil sample:

Population of mycoflora by serial dilution plate method (Manoch, 1998) by using Potato dextrose Agar Medium (Martin, 1950) was used. The inoculated petri plates were incubated at 25±1°C. Colony Forming Units (CFU) were estimated by counting the number of colonies after five days. Fungi were identified according to their macroscopic and microscopic characters Identification at the species level was carried out according to the morphological characters found in publications by Gilman (1957), Barnett and Hunter (1972) and Ellis (1993) pure cultures of fungi were maintained in test tubes slants containing preserved in deep freezer at -20°C for future work.

III. RESULTS AND DISCUSSION

In the present study, totally 310 colonies of fungi were isolated from the collected soil sample. Colonies were distributed in the 44 different species belonging to 16 genera were identified in soil sample. The following genera *Allomyces*, *Aspergillus*, *Biopolaris*, *Curvularia*, *Dreschlera*, *Fusarium*, *Helminthosporium*, *Mucor*, *Neurospora*, *Penicillium*, *Rhizobus*, *Phoma*, *Trichoderma*, *Verticospolina* and *Verticillum* respectively. Maximum number of species present in *Aspergillus* sp belong to 15 species are present in the sample and only one species were observed in *Bipolaris*, *Mucor*, *Neurosora*, *Phoma*, *Trichoderma*, *Verticospolina* and *Vericillum*.

Commonly higher number of fungal colonies were isolated during the months August and December when minimum number of colonies were isolated in the month of April and June 2012 (Table.1). Microorganisms play key roles in the process and the appearance of some microorganisms reflects the quality and maturing of compost (Ryckeboer, *et al.*, 2003).

The samples were analysed with physiochemical parameter like pH, electrical conductivity, organic carbon, nitrogen, organic matter, phosphorous, potassium, sodium, calcium, magnesium, sulphur, copper, zinc, copper and iron content (Table 2).

The colour of soil sample was brown to black, with variation in pH (7.82 - 8.65). The temperature of the soil was high (30.2 – 33.2° C) with great variation in the moisture content (0.35 – 0.95), organic carbon (0.2568 – 0.4125) and organic nitrogen (0.2213 – 0.3555). The results revealed that the soil samples from various sites were shown heterogeneity with their physicochemical parameters.

However, the microbial population is determined by a number of environmental factors like pH, Moisture content and soil organic matter (Kennedy *et al.*, 2005) higher fungal population during rainy and autumn seasons were supported and reported by other workers (Arunachalam *et al.*, 1997, Lorgio *et al.*, 1999, and Shyamala and Belagali, 2014), which perhaps is due to prevailing favorable moisture and temperature setting during the period of leaf litter and other plant



ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

residues are decomposed faster during rainy season and sufficient organic matter and humus accumulates that may have enhanced the colonization of the soil microbes in subsequent period Domsh *et al.*, (1993). Hackl *et al.*, (2000) the indicated the plant species growing on the soil also equally influence the population and composition of species of the soil fungi. Dominance of the genus *Aspergillus* sp greater rate of spore production and dispersal and partly due to their resistance over extreme environmental conditions (Schimel, 1995).

In this present investigation the higher percentage of contribution was *Aspergillus versicolor* and *Helminthosorium oryzae* represented in Kanchathumalai hill's fungal diversity during the year 2012. Most of the soil fungi which belonged Zygomycetes and Deuteromycetes and these two classes were commonly available in agricultural area (Chandrasheker *et al.*, 2014).

Soil can be managed to optimize its fertility and health under natural and agricultural land uses, so as to benefit fungal diversity. Due to the dispersal nature of the soil asset, a broad but consistent and economically appealing approach to its protection is needed. Soil fungal diversity was lowest in the subtropical and tropical forests, slightly higher in boreal forests, and highest in the temperate forests. (Peter *et al.*, 2013).

ACKNOWLEDGEMENT

The author thanks to the Management and principle of the respective college for the encouragement and the Indian Biotrack research institute, Thanjavur extending the research work.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

Table 1: The physicochemical analysis of Kanchathumalai hills during 2012

S.no	Parameter	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	pH	6.96	5.55	5.56	4.64	4.62	4.41	5.31	5.55	5.656	5.73	5.22	7.57
2	Electrical conductivity (dsm ⁻¹)	2.43	1.54	1.65	1.07	1.12	1.05	1.81	12.1	2.08	1.92	1.96	2.45
3	Organic carbon	8.56	6.57	6.60	4.16	4.25	4.59	6.64	6.26	6.44	6.38	6.31	8.66
4	Nitrogen %	17.08	15.5	15.43	12.43	12.4	14.67	15.34	16.5	15.3	15.3	15.9	17.64
5	Organic matter %	1.87	1.33	1.47	0.98	0.89	0.76	1.32	1.21	1.22	1.44	1.13	1.77
6	Phosphorus %	0.38	0.12	0.01	0.08	0.06	0.21	0.24	0.25	0.25	0.26	0.25	0.59
7	Potassium %	2.37	2.12	2.09	2.06	2.10	2.13	2.15	2.11	2.14	2.13	2.12	2.56
8	Sodium %	0.62	0.47	0.15	0.19	0.23	0.41	0.46	0.44	0.41	0.41	0.48	0.71
9	Calcium %	2.69	2.41	2.14	2.13	2.17	2.39	2.41	2.42	2.47	2.48	2.41	2.63
10	Magnesium %	2.06	1.89	1.56	1.65	1.49	1.83	1.89	1.78	1.98	1.94	1.96	2.01
11	Sulphur %	0.24	0.20	0.15	0.17	0.19	0.19	0.20	0.97	0.87	0.76	0.95	0.26
12	Zinc (ppm)	2.54	2.23	2.22	2.10	2.09	2.10	2.21	2.22	2.24	2.23	2.21	2.51
13	Copper (ppm)	1.30	1.19	1.17	1.09	1.08	1.09	1.18	1.16	1.18	1.19	1.17	2.58
14	Iron (ppm)	16.35	14.69	12.98	12.65	12.54	14.67	14.87	14.76	14.69	14.43	14.76	16.33
15	Manganese (ppm)	5.48	4.65	4.87	3.42	3.21	3.62	4.76	4.98	4.54	4.76	4.67	5.65
16	Chromium (ppm)	0.39	0.21	0.24	0.12	0.11	0.14	0.25	0.27	0.28	0.26	0.25	0.41
17	Nickel (ppm)	0.68	0.45	0.04	0.03	0.02	0.01	0.47	0.44	0.49	0.45	0.47	0.39
18	Cobalt (ppm)	0.23	0.17	0.18	0.10	0.09	0.06	0.19	0.15	0.19	0.16	0.19	0.23
19	Cadmium (ppm)	0.18	0.11	0.18	0.05	0.04	0.06	0.16	0.19	0.18	0.16	0.18	0.08

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

Table 2: Studies on the population dynamics of mycoflora from Kanchathumalai hills soil sample

S.no	Name of the organisms	2012												Average no of colonies	% of Contribution
		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec		
1	<i>Allomyces arbuscules</i>	07	11	13	05	-	-	16	14	12	11	14	20	10	83
2	<i>A.cinerariae</i>	10	10	14	02	-	-	-	14	14	12	-	21	08	66
3	<i>Aspergillus candidus</i>	11	14	-	-	-	05	-	16	-	13	-	-	05	41
4	<i>A.flavipes</i>	13	14	11	01	-	-	-	14	11	16	14	-	08	66
5	<i>A.flavus</i>	14	13	15	-	-	-	14	13	15	14	13	21	09	75
6	<i>A.fumigates</i>	-	16	13	-	02	07	-	11	10	13	14	-	08	66
7	<i>A.funiculosus</i>	-	-	-	-	-	-	12	10	-	-	12	23	04	33
8	<i>A.koningi</i>	21	13	11	-	02	-	15	13	11	12	12	-	09	75
9	<i>A.luchuensis</i>	-	12	-	-	01	-	-	11	14	10	11	21	07	58
10	<i>A.nidulans</i>	-	14	-	-	-	-	16	15	12	11	10	-	06	50
11	<i>A.niger</i>	-	-	11	-	-	03	13	14	14	12	12	21	08	66
12	<i>A.oryzae</i>	25	11	13	07	-	01	15	10	-	11	16	-	09	75
13	<i>A.sydowi</i>	-	-	-	06	-	-	-	12	-	11	16	20	05	41
14	<i>A.tamari</i>	-	14	12	-	-	-	12	11	14	12	12	-	07	58
15	<i>A.terreus</i>	19	13	14	-	-	02	16	11	12	15	11	21	10	83
16	<i>A.tericola</i>	-	13	13	-	-	05	-	14	-	15	10	20	07	58
17	<i>A.ustus</i>	15	-	12	-	-	-	12	12	14	12	15	-	06	50
18	<i>A.variecolor</i>	14	12	13	01	02	01	12	14	12	10	14	23	12	100
19	<i>A.versicolor</i>	13	14	13	05	-	02	12	14	-	12	15	-	09	75
20	<i>Bipolaris turcica</i>	-	13	-	-	-	-	14	13	14	14	13	23	07	58

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

21	<i>Curvularia andropogonis</i>	20	12	14	-	-	-	15	14	16	12	16	-	08	66
22	<i>C.indica</i>	08	11	14	-	-	-	14	13	-	11	13	23	08	66
23	<i>C.lunata</i>	06	-	13	01	-	03	-	13	13	11	14	-	08	66
24	<i>Dreschlera avenacea</i>	15	13	17	07	-	-	14	-	-	15	-	20	07	58
25	<i>D.tritici-repentis</i>	11	-	19	-	-	-	-	12	14	11	11	10	07	58
26	<i>Fusarium moniliforme</i>	12	14	13	05	-	-	12	14	15	13	13	-	08	66
27	<i>F.oxysporum</i>	-	15	14	-	05	-	11	13	13	12	12	-	09	75
28	<i>Helminthosporium oryzae</i>	19	13	19	06	07	06	11	12	12	16	10	24	12	100
29	<i>H.velutinum</i>	25	12	17	-	-	09	15	11	16	11	09	23	10	83
30	<i>Mucor albobarter</i>	13	-	-	06	-	-	12	11	-	11	-	-	05	41
31	<i>Neurospora sphaerica</i>	12	14	16	-	06	-	-	-	14	-	12	23	07	58
32	<i>Penicillium citrinum</i>	-	14	-	-	-	06	11	12	14	12	13	-	07	58
33	<i>P.funiculosum</i>	19	-	-	-	-	-	15	14	-	14	-	21	05	25
34	<i>P.janthinellum</i>	-	-	18	-	-	-	-	-	11	-	11	-	03	25
35	<i>P.purpurrescens</i>	-	16	-	-	-	-	16	14	15	14	13	25	07	58
36	<i>Phanerochaete chrysosporium</i>	20	13	13	-	-	-	12	14	15	15	14	19	09	75
37	<i>Phoma humycola</i>	-	13	-	-	-	02	16	-	-	-	-	20	04	33
38	<i>Rhizopus nigricans</i>	21	-	15	-	01	-	-	12	13	13	14	-	07	58
39	<i>R.stolonifer</i>	-	-	-	-	-	-	-	17	12	12	-	23	04	33

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

40	<i>Trielavia terricola</i>	21	14	12	-	02	-	-	-	-	-	-	20	05	41
41	<i>Trichoderma koningi</i>	-	11	14	05	-	-	12	15	15	15	14	20	09	75
42	<i>T.viride</i>	19	-	12	-	-	-	15	-	-	-	-	-	02	16
43	<i>Verticosporina ramulosa</i>	-	11	16	-	-	-	12	14	14	13	13	19	08	66
44	<i>Vericillium sp</i>	-	13	14	-	-	02	15	12	11	-	12	21	08	66

REFERENCES

- Alexander, M., (1977) Introduction to soil Microbiology, *John Wiley & Sons*, New York..
- Anderson, J.M and Ingram, J.S.I., (1993). Tropical Soil Biology and Fertility. A Handbook of Methods. Second edition. CAB International, Wallingford, Oxon. UK. 221.
- Arunachalam, K., Arunachalam, A., Tripathi, R.S. and Pandey, H.N., (1997). Dynamics of microbial population during the aggradations phase of selectively logged sub-tropical humid forest in north-eastern India. *Tropical Ecology*; 38: 333-341.
- Barnett, H.L and Hunter, B.B., (1998). Illustrated Genera of Imperfect Fungi, IV edition. Published by APS Press St. Paul, Minnesota.
- Carlile, M.J., Watkinson, S.C. and Graham, W.G.(2001). The Fungi. Second edition .San Diego, California: Academic Press, *University*, 32(1): 8-10.
- Domsh, K.M., W. Gams and T. Anderson. (1993) Compendium of Soil Fungi. Vol 1, 2nd ed Academic Press, London. 860 pp.
- Ellis, M.B.(1993.) Dematiaceous Hypomycetes, CAB International. Published by Common wealth Mycological Institute, Kew, Surrey, England.
- Gillman, J.C., (1957). Manual of Soil Fungi. Oxford and I.B.H Publishing company (Indian reprint).
- Gilman, J.C., (2001). A Manual of Soil Fungi, 2nd Indian Edition, Biotech Books Delhi.
- Hackl E., Bancgamann, G and Boltestron, Zechmeister, S.,(2000). Soiol microbial biomass and rhizosphere effects in natural forest stands. *Phyton*, 40: 83-90.
- Hao quin Pan, Jin- Feng Yu, Yue- ming Wu, Tian- Yu Zhang and Hong- Feng Wang. 2008. Area: *J. Zhejiang Univ. Sci. B*; 9(10): 829-834.
- Hawksworth, D.L., (2002). Tropical Mycology Vol.2, Micromycetes *CABI*: 111.
- Jackson, M.L., (1967). Soil chemical analysis .Prentice hall of india , Pvt Ltd., New Delli, P.498
- Kennedy, N.M., Gleeson, D.E., Connolly, J. and Clipson, N.J.W. (2005). Seasonal and management influences on bacterial community structure in an upland grassland soil. *FEMS Microbiol Ecol*: 53:329-337.
- Lorgio E. Aguilera, Julio R. Gutierrez and Peter L. Meserve (1999). *Journal of Arid Environments*; 42 : 61 – 70.
- Manoch, L. (1998). Biodiversity of soil fungi in Thailand, pp. 126-140. In Proceedings of the Asia-Pacific Mycological Conference on Biodiversity and Biotechnology, Hua Hin.
- Martin J.P., (1950). Use of acid, rose bengal, and streptomycin in the plate method for estimating soil fungi. *Soil Sci*; 69:215-232.
- Nagmani, A and Kunwar, C., (2005). Manoharachary, Handbook of Soil Fungi. Published by *I.K International Pvt, Ltd*. New Delhi Published by APS Press St. Paul, Minnesota.
- Nwe, N. and Stevens, W.F (2002). Production of fungal chitosan by solid substrafermentation followed by enzymatic extraction. *Biotechnology Letters* 24: 131-134.
- Peter, E., Mortimer, J. W. Ferry Slik Xiao-Ming Zou Jianchu Xu Wen-Ting Feng and Lu Qiao, (2013). Variation in forest soil fungal diversity along a latitudinal Gradient Fungal Diversity .
- Poornima, M., Kanimozhi, G and Panneerselvam A., (2014). Diversity of Mycoflora from Sirumalai Hills of Eastern Ghatsat Dindigul District, Tamil Nadu, India *Int.J.Curr.Microbiol.App.Sci* (2014) 3(6): 32-35
- Puangsoombat, P Sangwanit U and Marod, D (2010)..Diversity of Soil Fungi in Different Land Use Types in Tha Kum-Huai Raeng Forest Reserve, Trat Province Kasetsart. *J. (Nat. Sci.)*; 44 : 1162 – 1175.
- Raper, K.B. and Fennell, D.I., (1965). The Genus *Aspergillus*, *The Williams and Wilkins Company*, Baltimore.
- Ryckeboer, J., Mergaert, J., Coosemans, J., Deprins, K. and Swings, J., (2003). Microbiological aspects of bio-waste during composting in monitored compost bin. *Journal of Applied Microbiology*; 94:127-137.



ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 11, November 2015

25. Schimel, J., (1995). Ecosystem Consequences of Microbial Diversity and Community structure. Ecological studies. Chapin and Korner (Eds.), Vol. 113, Springer-Verlag, Berlin, Heidelberg, pp: 239-254.
26. Shyamala, D.C. and Belagali, S.L., (2014). Seasonal Variations of Microbial Populations during Composting Processes of Municipal Solid Wastes. *International Journal of Innovative Research in Science, Engineering and Technology* ; 3(6): 14126- 14134.
27. Subramanian, C.V., (1974). Hyphomycetes , Published by ICAR, New Delhi.
28. Tan, S.C., Tan, T.K., Wong, S.M. and Khor, E. (1996). The chitosan yield of zygomycetes at their optimum harvesting time. *Carbohydr. Polym*; 30: 239-242.
29. Warcup, J.H., (1955) On the origin of colonies of fungi developing on soil dilution plates. *Transactions of the British Mycological Society* 38(3):298–301.
30. Warcup, J.H., (1960). Methods for isolation and estimation of activity of soil. In the ecology of soil fungi (eds. Parkinson D. & Ward J.S.) Liverpool Univ. Press, Liverpool: 321.