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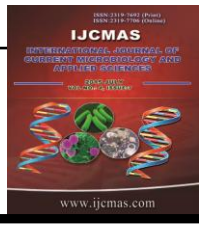

Original Research Article

Diversity of Soil Mycoflora in Coffee Field of Perumparai, Dindigul Dt., Tamil Nadu, India

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A B S T R A C T

In the present investigation, a total of 76 species belonging to 24 genera of fungi were isolated from coffee plant (*Coffea arabica* L.) cultivated field at Perumparai, Dindigul Dt. during September 2013 to August 2014. The mycoflora were isolated by using soil dilution technique on potato dextrose agar medium supplemented with antibiotic streptomycin. The maximum number of fungal isolates belonging to the class Deuteromycetes (18 genera and 70 species), followed by Ascomycetes (4 genera and 4 species) and Phycomycetes (2 genus and 2 species) were recorded. The genus *Aspergillus* (27 species) was dominant followed by *Penicillium* (17 species) and *Trichoderma* (4 species). The relationship between various physico-chemical parameters of soil and total fungal colonies were statistically analyzed.

Keywords

Coffee field, Mycoflora, *Aspergillus*, Physico–chemical parameters

Introduction

Fungi are an important component of the soil micro biota typically constituting more of the soil biomass than bacteria, depending on soil depth and nutrition conditions (Ainsworth and Bisby, 1995). Fungi are fundamental for soil ecosystem functioning (Warcup, 1951). Especially in agricultural soils, they play a key role in many essential processes such as organic matter decomposition, elemental release by mineralization, and protection against leaching by elemental storage in biomass (Christensen, 1989) and their mycelia contribute to soil aggregate stability, thereby avoiding erosion. Soil mycoflora plays a pivotal role in evaluation of soil conditions and in stimulating plant growth. Microfungi play an important role in nutrient cycling by regulating soil biological activity (Arunachalam *et al.*, 1997). The investigation on soil mycoflora becomes significant in the view of conservation of soil ecosystem and soil microbial diversity and sustainable agriculture.

Coffee is an important commodity and a popular beverage. Over 2.25 billion cups of coffee are consumed in the world every day. Indian coffee is said to be the finest coffee grown in the shade rather than direct sunlight anywhere in the world (Yeboah and Salomey, 2010). Coffee production in India

is dominated in the hill tracts of South Indian states, with the state of Karnataka accounting 53% followed by Kerala 28% and Tamil Nadu 11% of production of 8,200 tonnes.

The coffee areas in Tamil Nadu can be divided into three agroclimatic zones viz., Palani, Shevaroys and Nilgiris. Palani comprises of six liaison zones viz., Perumalmalai, Pannaikadu, Perumparai, Adalur, Sirumalai and Bodinayakanur. Two principle economic species that is extensively cultivated in India. They are Arabica (*Coffea arabica* L.) and Robusta *(Coffea canephora*). Therefore in the present investigation was designed to assess the diversity of soil mycoflora in *Coffea arabica* L. cultivated field of Perumparai, Dindigul Dt.

Materials and Methods

Study site and location

Perumparai is a small Village in Athoor Taluk in Dindigul District of Tamil Nadu State, India. It comes under Manalor Panchayath. It is located between latitude 10°29' N and longitude 77°72' E and elevated 309 m above sea level.

Collection of soil samples

The soil samples were collected from coffee field of Perumparai, Dindigul Dt. during September 2013 to August 2014 in every month. The soil samples were collected at a depth within 15 cm using a metal spatula into a small sterilized polythene bags and brought to laboratory for further studies (Fig. 1).

Isolation of soil fungi

The soil fungi were enumerated according to method described by Warcup (1950). Soil sample weighed 1g was diluted in 10 ml of distilled water. One ml of the diluted sample (10^{-2} and 10^{-3}) was poured and spreaded on the petriplates containing sterilized PDA medium (Potato - 200 gms, dextrose- 20 gms, agar -15 gms, distilled water - 1000 ml, pH -6.5) supplemented with one percent streptomycin sulphate solution for preventing bacterial growth. The inoculated plates were incubated in a dust free cupboard at the room temperature (24±2°C) for 3 - 5 days.

Identification of soil fungi

Fungal morphology were studied macroscopically by observing colony features (Colour and Texture) and microscopically by staining with lactophenol cotton blue and observed under Nikon microscope for the conidia, conidiophores and arrangement of spores (Aneja, 2001). Identification and characterization of the mycoflora were made with the help of authentic manuals of fungi (A Manual of Soil fungi - Gillman, 1957; A Manual of Penicillia - Raper and Thom, 1949; The Genus *Aspergillus* - Raper and Fennell, 1965 and Fungi in agricultural Soils - Domsch and Gams, 1972).

Presentation of data

$$\% \text{ contribution} = \frac{\text{No. of colonies of fungus in a sample}}{\text{Total number all colonies of all the species in a sample}} \times 100$$

$$\% \text{ frequency} = \frac{\text{Number of samples in which a particular fungus occurred}}{\text{Total number of samples examined}} \times 100$$

Based on the frequency occurrences the fungi were grouped as rare (0–25% frequency), Occasional (26–50% frequency), Frequent (51–75% frequency) and common (76-100% frequency) species.

Physico-chemical analysis of soil

The collected soil samples were characterized for its physico-chemical properties. The physico-chemical parameters were measured by standard methods (APHA, 1989). The physico-chemical parameters of the soil samples were analyzed at Soil Testing Laboratory, Department of Agriculture, Government of Tamil Nadu, Tiruchirapalli- 20.

Statistical analysis

Pearson's correlation analysis was used to assess the relationship between physico-chemical parameters and total fungal colonies. The data were computed and analyzed using Statistical Package for Social Sciences (SPSS) software.

Results and Discussion

In the present investigation, a total of 76 species belonging to 24 genera of fungi were isolated from coffee plant (*Coffea arabica* L.) cultivated field at Perumparai, Dindigul Dt. during September 2013 to August 2014 (Table 1). Posada *et al.* (2013) also reported a total of 849 fungal isolates were obtained (438 from Colombian and 411 from Mexican farms) from eight coffee plantation soils of Colombian and Mexican farms.

Correspondingly, Gaddeyya *et al.* (2012) reported that a total of 15 species belonging to 6 genera of fungi were isolated from agricultural fields at Salur Mandal during March 2011 to November 2011 in three intervals. Similarly Shiny Niharika *et al.* (2013) accounted 232 fungal colonies from eight different crop fields such as sunflower, sesame, capsicum, rice, green gram, sugarcane, ground nut and black gram. The abundance of fungal colonies was high in the fields of sugarcane (34 colonies), Sesame (33 colonies) and groundnut (31 colonies).

The maximum number of fungal isolates belonging to the class Deuteromycetes (17 genera and 70 species), followed by Ascomycetes (4 genera and 4 species) and Phycomycetes (2 genus and 2 species) were recorded (Fig. 2). Deuteromycotina were the most prevalent group of isolated fungi. The abundance of this group of fungi on agricultural filed has been reported by Gaddeyya *et al.* (2012), Shiny Niharika *et al.* (2013), Rakesh Sharma and Raju (2013) and Pandey *et al.* (2014).

In the present study, the genus *Aspergillus* (27 species) was dominant followed by *Penicillium* (17 species) and *Trichoderma* (4 species). Studies carried out by Prince and Prabakaran (2012) and Mahalingam *et al.* (2012) indicated that species of *Aspergillus Penicillium*, *Trichoderma* and *Fusarium* were dominantly isolated from soil of sugarcane growing areas in Thanjavur and Dharmapuri Dt. The occurrence of abundance of species in genus *Aspergillus* and *Penicillium* were probably due to their capability of producing a diverse range of antibiotics and mycotoxins which protect them from other soil organisms and may also hinder the growth of other fungal species.

Evidently, Rakesh Sharma and Raju (2013) reported that *Aspergillus*, *Penicillium* and *Fusarium* were dominant genera in different crop fields at Heggadadevana Kote of Mysore District.

Table.1 List of isolated soil mycoflora from coffee field of Perumparai, Dindigul Dt.

S. No.	Isolated soil mycoflora
1.	*Absidia repens*
2.	*Acrophialophora fusispora*
3.	*Aspergillus alliaceus*
4.	*A. avenaceous*
5.	*A. brevipes*
6.	*A. cervinus*
7.	*A. chevalieri*
8.	*A. clavatoflavus*
9.	*A. duricaulis*
10.	*A. elegans*
11.	*A. fumigatus*
12.	*A. humicola*
13.	*A. luchuensis*
14.	*A. luteoniger*
15.	*A. melleus*
16.	*A. nidulans*
17.	*A. niger*
18.	*A. oryzae var. globosus*
19.	*A. phoenicis*
20.	*A. quadrilineatus*
21.	*A. quercinus*
22.	*A. restrictus*
23.	*A. ruber*
24.	*A. sachari*
25.	*A. sparsus*
26.	*A. ustus*
27.	*A. versicolor*
28.	*A. viridienutans*
29.	*A. wentii*
30.	*Cephalosporium* sp.
31.	*Chloridium chlamydosporum*
32.	*Curvularia geniculata*
33.	*C. lunata*
34.	*C. subulata*
35.	*Fusarium moniliforme*
36.	*F. neoceras*
37.	*F. oxysporum*
38.	*Gliomastix murorum*
39.	*Helminthosporium nodulosum*
40.	*H. oryzae*
41.	*Helminthosporium* sp.
42.	*Humicola* sp.
43.	*Melanospora* sp.
44.	*Metarhizium anisopliae*
45.	*Neonectria ramulariae*
46.	*Nigrospora sphaerica*
47.	*Penicillium citrinum*
48.	*P. cyaneum*
49.	*P. decumbens*
50.	*P. funiculosum*
51.	*P. granulatum*
52.	*P. herquei*
53.	*P. javanicum*
54.	*P. lanosum*
55.	*P. nigricans*
56.	*P. oxalicum*
57.	*P. puberulum*
58.	*P. purpurogenum*
59.	*P. purpurascens*
60.	*P. restrictum*
61.	*P. roqueforti*
62.	*P. rubrum*
63.	*P. turbatum*
64.	*Rhizoctonia solani*
65.	*Rhizopus* sp.
66.	*Torula herbarum*
67.	*Trichocladium* sp.
68.	*Trichoderma hamatum*
69.	*T. harzianum*
70.	*T. koeningi*
71.	*T. viride*
72.	*Trichosphaeria pilosa*
73.	*Truncatella truncate*
74.	*Ulocladium consortiale*
75.	*Verticillium chlamydosporium*
76.	*Verticillium* sp.

Table 2. Total number of colonies, mean density (CFU/g) and percentage contribution of fungi from coffee field of Perumparai, Dindigul Dt.

S. No.	Name of the organism	September 2013 – August 2014																								Total no .of colonies	% Contribution
		Sep.		Oct.		Nov.		Dec.		Jan.		Feb.		March		April		May		June		July		August			
		TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD	TNC	MD		
1	*Absidia repens*	2	0.67	1	0.33	2	0.67	-	-	-	-	3	1.00	1	0.33	2	0.67	-	-	-	-	1	0.33	-	-	12	1.21
2	*Acrophialophora fusispora*	3	1	2	0.67	1	0.33	1	0.33	2	0.67	1	0.33	-	-	-	-	1	0.33	-	-	4	1.33	2	0.67	17	1.71
3	*Aspergillus alliaceous*	-	-	-	-	3	1.00	2	0.67	-	-	-	-	4	1.33	2	0.67	-	-	1	0.33	-	-	2	0.67	14	1.41
4	*A. avenaceous*	2	0.67	-	-	2	0.67	1	0.33	5	1.67	3	1.00	2	0.67	1	0.33	-	-	-	-	-	-	-	-	16	1.61
5	*A. brevipes*	-	-	3	1.00	4	1.33	-	-	-	-	2	0.67	1	0.33	1	0.33	2	0.67	-	-	-	-	3	1.00	16	1.61
6	*A. cervinus*	-	-	5	1.67	1	0.33	-	-	3	1.00	-	-	-	-	-	-	1	0.33	2	0.67	2	0.67	1	0.33	15	1.51
7	*A. chevalieri*	-	-	-	-	-	-	2	0.67	1	0.33	2	0.67	-	-	-	-	3	1.00	2	0.67	-	-	1	0.33	11	1.11
8	*A. clavatoflavus*	2	0.67	3	1.00	-	-	-	-	4	1.33	1	0.33	-	-	2	0.67	3	1.00	-	-	1	0.33	-	-	16	1.61
9	*A. duricaulis*	1	0.33	2	0.67	1	0.33	3	1.00	2	0.67	-	-	-	-	-	-	1	0.33	2	0.67	2	0.67	1	0.33	15	1.51
10	*A. elegans*	3	1.00	3	1.00	2	0.67	1	0.33	-	-	-	-	-	-	2	0.67	2	0.67	1	0.33	1	0.33	1	0.33	16	1.61
11	*A. fumigatus*	5	1.67	-	-	-	-	2	0.67	3	1.00	2	0.67	-	-	-	-	-	-	-	-	2	0.67	-	-	14	1.41
12	*A. humicola*	3	1.00	-	-	2	0.67	-	-	-	-	-	-	1	0.33	2	0.67	3	1.00	2	0.67	1	0.33	2	0.67	16	1.61
13	*A. luchuensis*	3	1.00	1	0.33	1	0.33	2	0.67	-	-	-	-	-	-	2	0.67	2	0.67	3	1.00	-	-	2	0.67	16	1.61
14	*A. luteoniger*	2	0.67	4	1.33	-	-	-	-	-	-	3	1.00	2	0.67	1	0.33	-	-	-	-	-	-	3	1.00	15	1.51
15	*A. melleus*	-	-	3	1.00	2	0.67	4	1.33	-	-	-	-	-	-	1	0.33	-	-	1	0.33	2	0.67	-	-	13	1.31

16	*A. nidulans*	-	-	-	-	3	1.00	-	-	-	-	2	0.67	1	0.33	2	0.67	1	0.33	-	-	-	-	-	-	9	0.91
17	*A. niger*	5	1.67	3	1.00	2	0.67	4	1.33	1	0.33	2	0.67	2	0.67	-	-	-	-	1	0.33	2	0.67	2	0.67	24	2.41
18	*A. oryzae var globosus*	-	-	-	-	-	-	-	-	3	1.00	1	0.33	-	-	2	0.67	2	0.67	2	0.67	-	-	-	-	10	1.01
19	*A. phoenicis*	-	-	3	1.00	2	0.67	2	0.67	1	0.33	-	-	-	-	-	-	1	0.33	2	0.67	1	0.33	2	0.67	14	1.41
20	*A. quadrilineatus*	2	0.67	-	-	-	-	-	-	2	0.67	1	0.33	-	-	-	-	3	1.00	2	0.67	-	-	1	0.33	11	1.11
21	*A. quercinus*	-	-	-	-	-	-	3	1.00	1	0.33	-	-	-	-	-	-	4	1.33	2	0.67	2	0.67	2	0.67	14	1.41
22	*A. restrictus*	2	0.67	2	0.67	-	-	3	1.00	-	-	-	-	2	0.67	3	1.00	-	-	-	-	2	0.67	1	0.33	15	1.51
23	*A. ruber*	-	-	-	-	2	0.67	2	0.67	-	-	3	1.00	2	0.67	-	-	-	-	-	-	2	0.67	-	-	11	1.11
24	*A. sachari*	2	0.67	1	0.33	2	0.67	-	-	-	-	4	1.33	-	-	3	1.00	2	0.67	-	-	2	0.67	1	0.33	17	1.71
25	*A. sparsus*	-	-	-	-	3	1.00	-	-	-	-	-	-	2	0.67	1	0.33	1	0.33	-	-	2	0.67	-	-	9	0.91
26	*A. ustus*	4	1.33	1	0.33	1	0.33	2	0.67	-	-	-	-	-	-	2	0.67	3	1.00	2	0.67	2	0.67	2	0.67	19	1.91
27	*A. versicolor*	3	1.00	2	0.67	-	-	5	1.67	2	0.67	3	1.00	1	0.33	-	-	-	-	3	1.00	-	-	-	-	19	1.91
28	*A. viridienutans*	-	-	-	-	3	1.00	-	-	-	-	2	0.67	1	0.33	1	0.33	-	-	-	-	2	0.67	1	0.33	10	1.01
29	*A. wentii*	-	-	2	0.67	1	0.33	-	-	-	-	3	1.00	3	1.00	-	-	2	0.67	2	0.67	2	0.67	2	0.67	17	1.71
30	*Cephalosporium* sp.	-	-	-	-	-	-	2	0.67	2	0.67	1	0.33	-	-	-	-	2	0.67	3	1.00	-	-	-	-	10	1.01
31	*Chloridium chlamydosporum*	1	0.33	2	0.67	3	1.00	-	-	3	1.00	-	-	-	-	-	-	-	-	2	0.67	2	0.67	1	0.33	14	1.41
32	*Curvularia geniculata*	-	-	-	-	-	-	2	0.67	2	0.67	-	-	-	-	1	0.33	-	-	3	1.00	3	1.00	2	0.67	13	1.31
33	*C. lunata*	2	0.67	2	0.67	-	-	-	-	2	0.67	1	0.33	3	1.00	4	1.33	-	-	-	-	2	0.67	1	0.33	17	1.71
34	*C. subulata*	-	-	-	-	-	-	2	0.67	1	0.33	1	0.33	1	0.33	-	-	-	-	-	-	3	1.00	-	-	8	0.80
35	*Fusarium moniliforme*	3	1.00	-	-	-	-	-	-	2	0.67	2	0.67	1	0.33	1	0.33	-	-	1	0.33	-	-	1	0.33	11	1.11
36	*F. neoceras*	-	-	3	1.00	2	0.67	-	-	-	-	-	-	2	0.67	2	0.67	-	-	-	-	1	0.33	1	0.33	11	1.11

37	*F. oxysporum*	4	1.33	-	-	-	-	-	-	1	0.33	2	0.67	-	-	-	-	3	1.00	-	-	2	0.67	2	0.67	14	1.41
38	*Gliomastix murorum*	-	-	-	-	1	0.33	1	0.33	3	1.00	-	-	-	-	-	-	2	0.67	1	0.33	1	0.33	1	0.33	10	1.01
39	*Helminthosporium nodulosum*	-	-	-	-	-	-	1	0.33	1	0.33	2	0.67	-	-	2	0.67	-	-	2	0.67	3	1.00	1	0.33	12	1.21
40	*H. oryzae*	3	1.00	1	0.33	-	-	-	-	-	-	-	-	2	0.67	2	0.67	2	0.67	1	0.33	-	-	-	-	11	1.11
41	*Helminthosporium* sp.	-	-	2	0.67	1	0.33	1	0.33	1	0.33	-	-	-	-	2	0.67	-	-	-	-	-	-	3	1.00	10	1.01
42	*Humicola* sp.	2	0.67	2	0.67	1	0.33	1	0.33	-	-	-	-	2	0.67	1	0.33	1	0.33	-	-	-	-	3	1.00	13	1.31
43	*Melanospora* sp.	-	-	4	1.33	2	0.67	2	0.67	-	-	-	-	1	0.33	1	0.33	2	0.67	-	-	-	-	1	0.33	13	1.31
44	*Metarhizium anisopliae*	4	1.33	-	-	-	-	-	-	-	-	2	0.67	-	-	2	0.67	1	0.33	1	0.33	-	-	-	-	10	1.01
45	*Neonectria ramulariae*	3	1.00	1	0.33	2	0.67	-	-	-	-	-	-	1	0.33	1	0.33	1	0.33	1	0.33	-	-	2	0.67	12	1.21
46	*Nigrospora sphaerica*	-	-	-	-	-	-	1	0.33	1	0.33	1	0.33	-	-	-	-	-	-	1	0.33	2	0.67	1	0.33	7	0.70
47	*Penicillium citrinum*	-	-	3	1.00	-	-	-	-	-	-	1	0.33	1	0.33	2	0.67	3	1.00	-	-	-	-	-	-	10	1.01
48	*P. cyaneum*	3	1.00	2	0.67	1	0.33	-	-	4	1.33	-	-	-	-	-	-	2	0.67	2	0.67	-	-	1	0.33	15	1.51
49	*P. decumbens*	2	0.67	4	1.33	-	-	2	0.67	1	0.33	1	0.33	2	0.67	-	-	3	1.00	-	-	-	-	2	0.67	17	1.71
50	*P. funiculosum*	-	-	-	-	-	-	3	1.00	-	-	-	-	1	0.33	2	0.67	-	-	2	0.67	2	0.67	2	0.67	12	1.21
51	*P. granulatum*	-	-	2	0.67	2	0.67	1	0.33	1	0.33	1	0.33	-	-	3	1.00	-	-	2	0.67	3	1.00	1	0.33	16	1.61
52	*P. herquei*	1	0.33	1	0.33	1	0.33	2	0.67	-	-	3	1.00	1	0.33	1	0.33	1	0.33	-	-	-	-	2	0.67	13	1.31
53	*P. javanicum*	-	-	-	-	-	-	2	0.67	-	-	1	0.33	1	0.33	-	-	-	-	4	1.33	2	0.67	2	0.67	12	1.21
54	*P. lanosum*	-	-	3	1.00	2	0.67	2	0.67	-	-	-	-	2	0.67	-	-	-	-	3	1.00	-	-	1	0.33	13	1.31
55	*P. nigricans*	2	0.67	-	-	4	1.33	1	0.33	1	0.33	-	-	-	-	2	0.67	2	0.67	1	0.33	1	0.33	-	-	14	1.41
56	*P. oxalicum*	-	-	-	-	-	-	3	1.00	-	-	-	-	1	0.33	1	0.33	1	0.33	-	-	-	-	2	0.67	8	0.80
57	*P. puberulum*	2	0.67	2	0.67	-	-	-	-	-	-	-	-	-	-	4	1.33	-	-	-	-	2	0.67	-	-	10	1.01

58	*P. purpurogenum*	-	-	-	-	-	-	-	-	-	-	3	1.00	2	0.67	2	0.67	1	0.33	2	0.67	4	1.33	-	-	14	1.41
59	*P. purpurascens*	-	-	4	1.33	2	0.67	1	0.33	1	0.33	-	-	-	-	-	-	-	-	2	0.67	-	-	-	-	10	1.01
60	*P. restrictum*	1	0.33	1	0.33	5	1.67	-	-	-	-	-	-	-	-	-	-	1	0.33	1	0.33	2	0.67	2	0.67	13	1.31
61	*P. roqueforti*	-	-	-	-	2	0.67	-	-	-	-	3	1.00	2	0.67	1	0.33	1	0.33	2	0.67	2	0.67	-	-	13	1.31
62	*P. rubrum*	3	1.00	-	-	-	-	-	-	2	0.67	-	-	-	-	4	1.33	-	-	1	0.33	-	-	-	-	10	1.01
63	*P. turbatum*	1	0.33	2	0.67	1	0.33	-	-	-	-	-	-	2	0.67	-	-	-	-	4	1.33	-	-	2	0.67	12	1.21
64	*Rhizoctonia solani*	-	-	2	0.67	1	0.33	-	-	4	1.33	2	0.67	1	0.33	-	-	-	-	1	0.33	-	-	-	-	11	1.11
65	*Rhizopus* sp.	-	-	-	-	3	1.00	1	0.33	1	0.33	-	-	-	-	-	-	2	0.67	4	1.33	2	0.67	-	-	13	1.31
66	*Torula herbarum*	1	0.33	1	0.33	-	-	-	-	2	0.67	3	1.00	-	-	4	1.33	-	-	-	-	-	-	2	0.67	13	1.31
67	*Trichocladium* sp.	-	-	-	-	2	0.67	3	1.00	-	-	-	-	-	-	-	-	-	-	-	-	2	0.67	3	1.00	10	1.01
68	*Trichoderma hamatum*	1	0.33	2	0.67	1	0.33	1	0.33	3	1.00	1	0.33	2	0.67	-	-	1	0.33	2	0.67	2	0.67	-	-	16	1.61
69	*T. harzianum*	2	0.67	5	1.67	2	0.67	3	1.00	2	0.67	1	0.33	-	-	-	-	2	0.67	1	0.33	1	0.33	1	0.33	20	2.01
70	*T. koeningi*	-	-	3	1.00	-	-	2	0.67	-	-	-	-	1	0.33	2	0.67	-	-	4	1.33	-	-	-	-	12	1.21
71	*T. viride*	2	0.67	-	-	-	-	3	1.00	-	-	1	0.33	2	0.67	1	0.33	2	0.67	3	1.00	2	0.67	-	-	16	1.61
72	*Trichosphaeria pilosa*	1	0.33	1	0.33	-	-	-	-	2	0.67	-	-	-	-	2	0.67	-	-	-	-	-	-	-	-	6	0.60
73	*Truncatella truncata*	2	0.67	-	-	-	-	3	1.00	-	-	1	0.33	1	0.33	-	-	-	-	-	-	-	-	3	1.00	10	1.01
74	*Ulocladium consortiale*	3	1.00	-	-	-	-	-	-	-	-	2	0.67	-	-	-	-	1	0.33	2	0.67	2	0.67	2	0.67	12	1.21
75	*Verticillium chlamydosporium*	-	-	2	0.67	1	0.33	1	0.33	-	-	2	0.67	-	-	2	0.67	2	0.67	-	-	1	0.33	4	1.33	15	1.51
76	*Verticillium* sp.	2	0.67	-	-	-	-	-	-	3	1.00	1	0.33	-	-	-	-	2	0.67	3	1.00	-	-	-	-	11	1.11
		95	32	98	33	82	27	86	29	76	25	77	26	60	20	82	27	78	26	92	31	84	28	84	28	994	100

TNC – Total Number of Colonies; MD – Mean Density

Table.3 Percentage frequency and frequency class of different species of fungi recorded at coffee field of Perumparai, Dindigul Dt. (n=12)

S. No.	Name of the organisms	No. of months in which the fungus occurred	Percentage frequency	Frequency class
1	*Absidia repens*	7	58	F
2	*Acrophialophora fusispora*	9	75	F
3	*Aspergillus alliaceus*	6	50	O
4	*A. avenaceous*	7	58	F
5	*A. brevipes*	7	58	F
6	*A. cervinus*	7	58	F
7	*A. chevalieri*	6	50	O
8	*A. clavatoflavus*	7	58	F
9	*A. duricaulis*	9	75	F
10	*A. elegans*	9	75	F
11	*A. fumigatus*	5	42	O
12	*A. humicola*	8	67	F
13	*A. luchuensis*	8	67	F
14	*A. luteoniger*	6	50	O
15	*A. melleus*	6	50	O
16	*A. nidulans*	5	42	O
17	*A. niger*	10	83	C
18	*A. oryzae var globosus*	5	42	O
19	*A. phoenicis*	8	67	F
20	*A. quadrilineatus*	6	50	O
21	*A. quercinus*	6	50	O
22	*A. restrictus*	7	58	F
23	*A. ruber*	5	42	O
24	*A. sachari*	8	67	F
25	*A. sparsus*	5	42	O
26	*A. ustus*	9	75	F
27	*A. versicolor*	7	58	F
28	*A. viridienutans*	6	50	O
29	*A. wentii*	8	67	F
30	*Cephalosporium* sp.	5	42	O
31	*Chloridium chlamydosporum*	7	58	F
32	*Curvularia geniculata*	6	50	O
33	*C. lunata*	8	67	F
34	*C. subulata*	5	42	O
35	*Fusarium moniliforme*	7	58	F
36	*F. neoceras*	6	50	O
37	*F. oxysporum*	6	50	O

38	*Gliomastix murorum*	7	58	F
39	*Helminthosporium nodulosum*	7	58	F
40	*H. oryzae*	6	50	O
41	*Helminthosporium* sp.	6	50	O
42	*Humicola* sp.	8	67	F
43	*Melanospora* sp.	7	58	F
44	*Metarhizium anisopliae*	5	42	O
45	*Neonectria ramulariae*	8	67	F
46	*Nigrospora sphaerica*	6	50	O
47	*Penicillium citrinum*	5	42	O
48	*P. cyaneum*	7	58	F
49	*P. decumbens*	8	67	F
50	*P. funiculosum*	6	50	O
51	*P. granulatum*	9	75	F
52	*P. herquei*	9	75	F
53	*P. javanicum*	6	50	O
54	*P. lanosum*	6	50	O
55	*P. nigricans*	8	67	F
56	*P. oxalicum*	5	42	O
57	*P. puberulum*	4	33	O
58	*P. purpurogenum*	6	50	O
59	*P. purpurascens*	5	42	O
60	*P. restrictum*	7	58	F
61	*P. roqueforti*	7	58	F
62	*P. rubrum*	4	33	O
63	*P. turbatum*	6	50	O
64	*Rhizoctonia solani*	6	50	O
65	*Rhizopus* sp.	6	50	O
66	*Torula herbarum*	6	50	O
67	*Trichocladium* sp.	4	33	O
68	*Trichoderma hamatum*	10	83	C
69	*T. harzianum*	10	83	C
70	*T. koeningi*	5	42	O
71	*T. viride*	8	67	F
72	*Trichosphaeria pilosa*	4	33	O
73	*Truncatella truncata*	5	42	O
74	*Ulocladium consortiale*	6	50	O
75	*Verticillium chlamydosporium*	8	67	F
76	*Verticillium* sp.	5	42	O

R – Rare (0-25%); O – Occasional (26-50%); F – Frequent (51-75%); C – Common (76-100%)

Table.4 Physico – chemical characteristics of the soil samples collected from coffee field of Perumparai, Dindigul Dt.

S. No.	Name of the parameter	September 2013 to August 2014											
		September	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**
1	pH	7.12	6.96	6.85	7.22	6.82	6.96	7.08	7.16	6.82	6.75	6.82	6.59
2	EC (dsm^{-1})	0.29	0.32	0.27	0.19	0.33	0.28	0.24	0.26	0.21	0.25	0.20	0.22
3	Colour	Blackish	Blackish	Blackish	Blackish	Blackish	Blackish	Blackish	Blackish	Reddish	Reddish	Reddish	Reddish
4	Texture	Sandy	Sandy	Sandy Clay	Sandy Clay	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
5	Lime Status	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
6	Organic carbon	1.45	1.24	1.09	1.28	1.22	1.36	1.40	1.28	0.56	0.61	0.49	0.52
Available Macronutrients													
7	Nitrogen (%)	1.245	1.116	1.016	1.216	1.056	1.210	1.356	1.221	0.967	1.026	0.819	0.924
8	Phosphorus (%)	0.248	0.219	0.241	0.226	0.319	0.416	0.229	0.320	0.125	0.198	0.154	0.196
9	Potassium (%)	0.628	0.598	0.623	0.678	0.729	0.825	0.745	0.719	0.712	0.825	0.756	0.658
Available Micronutrients													
10	Zinc (ppm)	1.26	1.36	1.28	1.45	1.22	1.35	1.20	1.45	0.89	0.92	1.06	1.04
11	Copper (ppm)	0.89	0.95	0.82	1.06	0.79	1.06	1.09	1.12	0.62	0.58	0.64	0.49
12	Iron (ppm)	8.39	8.65	8.94	9.23	7.39	7.48	8.21	8.09	4.59	4.68	4.12	4.30
13	Manganese (ppm)	2.69	2.54	2.48	2.35	2.19	2.54	2.62	3.22	1.96	1.58	1.48	1.27
Soil Fractions													
14	Fine sand (%)	42.36	40.26	41.26	41.58	43.26	41.22	42.65	42.09	33.25	35.49	32.15	32.68
15	Coarse sand (%)	29.65	24.56	23.68	25.68	28.64	21.54	25.36	21.59	12.69	14.35	13.60	14.26
16	Silt (%)	16.25	11.69	12.65	11.54	14.52	12.62	12.08	11.67	18.36	17.26	18.26	14.69
17	Clay (%)	11.74	23.49	22.41	21.20	13.58	24.62	19.91	24.65	35.70	32.90	35.99	38.37
18	Cation Exchange Capacity (C.Mole proton $^{+}$/kg)	31.8	32.6	33.4	30.8	32.7	31.5	29.7	34.5	32.19	33.25	34.16	36.25
Exchangeable Bases (C. Mole Proton^{+} /kg)													
19	Calcium	16.8	17.1	17.6	16.9	15.3	14.8	16.2	16.2	15.69	16.25	17.29	18.62
20	Magnesium	15.7	16.2	16.4	13.6	13.2	14.2	12.6	13.8	12.68	13.65	12.68	13.25
21	Sodium	1.09	1.29	1.20	1.05	1.12	1.09	1.08	1.16	3.96	4.25	4.68	4.71
22	Potassium	0.19	0.21	0.22	0.17	0.22	0.18	0.19	0.21	0.09	0.16	0.14	0.19

Table.5 Correlation coefficient (r) values for various physico-chemical parameters and total fungal colonies of coffee field of Perumparai, Dindigul Dt.

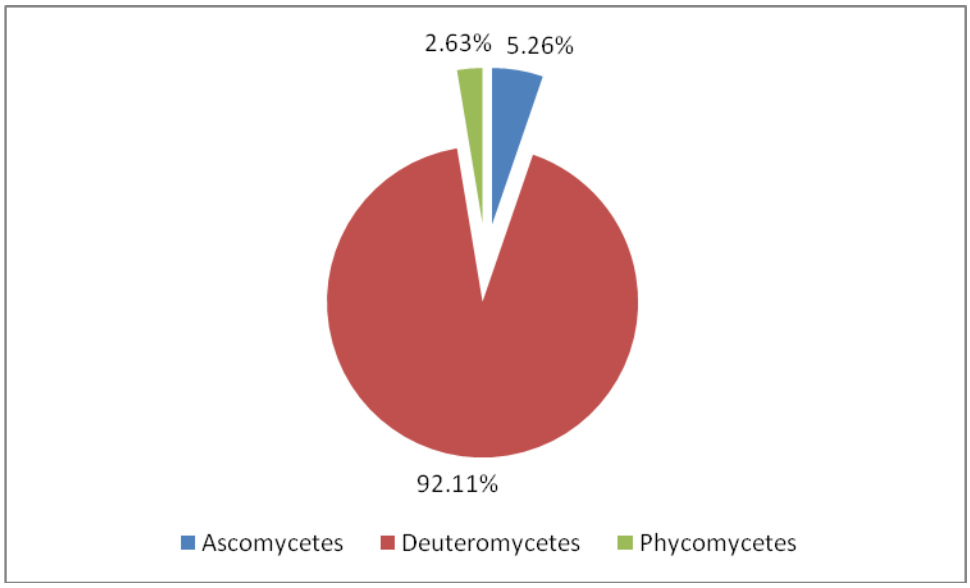
	PH	EC	OC	AN	AP	APO	AZ	AC	AI	AM	CE	Ca	Mg	Na	K	TNC
PH	1															
EC	0.649*	1														
OC	0.557	0.906**	1													
AN	0.778**	0.888**	0.869**	1												
AP	-0.187	-0.420	-0.476	-0.357	1											
APO	0.341	0.753**	0.523	0.602*	-0.311	1										
AZ	0.256	0.758**	0.549	0.502	-0.041	0.865**	1									
AC	0.446	0.855**	0.634*	0.597*	-0.424	0.874**	0.844**	1								
AI	0.442	0.787**	0.589*	0.580*	-0.214	0.785**	0.894**	0.843**	1							
AM	-0.073	-0.514	-0.408	-0.204	-0.137	-0.268	-0.603*	-0.533	-0.452	1						
CE	-0.323	-0.193	-0.039	-0.155	-0.623*	-0.084	-0.387	-0.132	-0.379	0.543	1					
Ca	0.571	0.623*	0.607*	0.697*	-0.618*	0.460	0.235	0.586*	0.427	0.007	0.250	1				
Mg	-0.555	-0.862**	-0.596*	-0.631*	0.259	-0.850**	-0.878**	-0.960**	-0.887**	0.580*	0.359	-0.477	1			
Na	0.669*	0.585*	0.394	0.556	-0.351	0.656*	0.431	0.649*	0.476	0.097	0.157	0.536	-0.637*	1		
K	0.188	0.182	0.375	0.436	-0.403	0.059	-0.241	-0.013	-0.118	0.353	0.375	0.585*	0.147	0.049	1	
TNC	0.040	0.692*	0.536	0.399	-0.136	0.750**	0.888**	0.764**	0.819**	-0.624*	-0.278	0.187	-0.748**	0.196	-0.045	1

TFC - Total Fungal Colony, EC - Electrical Conductivity, OC - Organic carbon, AN - Available Nitrogen, AP - Available Phosphorus, APO - Available Potassium, AZ - Available Zinc, AC - Available Copper, AI - Available Iron, AM – Available Manganese, CE - Cation Exchange Capacity, Ca – Calcium, Mg – Magnesium, Na – Sodium, K -Potassium

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Fig.1 Study site & collection of soil at Perumparai, Dindigul Dt.

Fig.2 Percentage of different classes of isolated soil fungi from coffee field



Recently, Pandey *et al.* (2014) accounted that *Aspergillus, Penicillium, Trichoderma* and *Fusarium* were most prevalent genera in 42 fungal isolates from traditional sugarcane field of central Uttar Pradesh.

The monthly variation, percentage contribution and percentage frequency of the mycoflora were analyzed (Table 2 & 3). The maximum percentage contribution of 2.41% was found with *Aspergillus niger* and the minimum of 0.60% was found with *Trichosphaeria pilosa.*

A. niger, Trichoderma hamatum and *T. harzianum* were the common one, which showed 83% frequency. Similarly Manimegalai *et al.* (2011) found *A. niger* as dominant fungi among fungi isolated from soil samples from paddy field of Thanjavur District, Tamilnadu. Kalaiselvi and Panneerselvam (2011) and Ishaq and Khann

(2011) also reported that *A. niger* was dominant fungal species isolated from agricultural field soil of Thanjavur Dt. and Ramgarh, India respectively. The ability of *A. niger* to dominate other fungal species could be linked to its high sporulating capacity.

In the present study, physico- chemical analysis of soil showed that pH range of soil conditions ranging from 6.59 to 7.22 (Table 4). Fungal diversity and distribution were correlated with physico – chemical properties of soil. Available potassium ($r=0.750$; $P<0.01$), available zinc ($r= 0.888$; $P<0.01$), available copper ($r= 0.764$; $P<0.01$), available iron ($r= 0.819$; $P<0.01$) and electrical conductivity ($r=0.692$; $P<0.05$) showed positive correlation (Table 5). The present study clearly exhibited that the physico – chemical parameters influenced the diversity and distribution of fungi in agricultural field. Correspondingly, Gaddeyya *et al.* (2012) reported that the diversity and distribution of soil fungi in the agricultural field are influenced by the physico-chemical properties of soil. Our findings established that the periodicity of occurrence of different fungal species fluctuated due to ecological and biological factors of the soil and enhanced the sufficient knowledge to the farmers for the conservation of soil properties, management of soil microbial diversity and the development of sustainable agro system

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