SEASONAL DISTRIBUTION OF SOIL FUNGI FROM FOREST SOILS OF JALGAON DISTRICT, MAHARASHTRA

Gauri Rane [1] and R.V. Gandhe [2]

[1] Post Graduate Research Centre, Department of Botany, M.J.College, Jalgaon 425 002, India
[2] Post Graduate Research Centre, Department of Botany, Modern College, Pune, Maharashtra 411005, India
Email: [1] gaurirane64@gmail.com; [2] rvgandhe@hotmail.com

Abstract

Soil fungi were isolated from different soil types of Jalgaon district. Out of them two forest soils, Pal and Manudevi forests were selected for the studies. Total 53 and 52 species belonging to 21 and 24 genera of fungi were isolated from these soils respectively. Deuteromycotina members were dominant. Aspergillus was the dominant genus from both these soils. Each forest soil has unique mycoflora. Some of the species showed remarkable seasonal distribution from these soils. Maximum number of fungi were isolated from Pal forest soils during winter season, while maximum species were isolated from Manudevi forest soils during rainy season.

Keywords

Forest soils, soil Fungi, seasonal distribution

Soil is a rich habitat for the growth of microorganisms than other microbial habitats. Among these microorganisms, fungi are one of the dominant groups present in soil. Fungi live, multiply and die or disintegrate in the soil and thus they provide rich organic matter, which could be recycled as plant nutrition. Thus developed humus complex is a natural fertilizer mixed with soil and plays a very important role in the composition of soil.

An exhaustive work has been done on the taxonomy of forest soil fungi in India. Saksena (1955), Bakshi and Singh (1956), Saksena and Sarbhoy (1964), Shrivastava and Bhargava (1966), Deshpande and Deshpande (1966), Gangawane and Deshpande (1972), Kamal and Bhargava (1972, 1973), Manoharachary (1977), Madhusudan Rao and Manoharachary (1981), Manoharachary *et al.* (1989, 1990), Venugopal Rao *et al.* (1984), Reddy *et al.* (1987), Mohanty and Panda (1994) etc. have studied the soil fungi of different forests. Very little information is available regarding biodiversity and taxoecology of soil fungi of Jalgaon District. Hence the present investigation was undertaken for three years, 2001, 2002 and 2003

Study Area

Pal Forest: It is located in Raver Taluka and 95km away from Jalgaon city. The soil is pinkish-white in colour. It harbours deciduous type of forest, situated on the tableland in the hills of Satpuda dominated by plant *Hardwickia pinnata* Roxb.

Manudevi Forest: It is located in Yawal Taluka and 45km away from Jalgaon city. The soil is pink in colour. The locality has special importance because of a sacred place with a temple of "Manubai Devi" situated in this forest. This is also a part of Satpura hills where the forest is dominated by *Tectona grandis* L.

Methodology

Physical analysis of the soil like colour, texture, pH, salinity, maximum water holding capacity were studied. Chemical analysis included organic carbon, available nitrogen, available phosphorus, available potassium etc.

Soil samples were collected from both the forests, at the depth of 6in during all the three seasons - winter, summer and rainy season for the three years. These soil samples were collected in sterile bottles and were inoculated within 24 hours on nutrient media (Czapek Dox Agar and Lactose Yeast Extract Agar) by Dilution Plate Method (Waksman, 1916) and brought to pure culture for further studies.

The semipermanant slides were prepared for identification, which was done using relevant literature. Camera lucida drawings and photographs were taken.

Results

Pal forest soil

Fifty-three fungal species belonging to 21 genera were isolated from Pal forest soil (Table 1). Maximum diversity of fungi was observed during winter while minimum number of species was isolated during summer (Fig. 1). *Aspergillus* was the dominant genus represented by 18 species and a majority of them were isolated during winter.

Manudevi Forest soil

Totally, 52 species belonging to 24 genera were isolated from these soils (Table 2). Maximum diversity of fungi was observed during rainy season while minimum number of species were isolated during winter and summer seasons (Fig. 1). *Aspergillus* was the dominant genus represented by 12 species and a majority of them were isolated during rainy season.

Discussion

Chaudhary and Sachar (1934), Saksena (1955), Miller *et al.* (1957), Saksena and Sarbhaoy (1964) studied seasonal variation in forest soil fungi and pointed out seasonal changes in soil mycoflora and fungal population, which drastically differ from season to season in a particular soil. Tresner *et al.* (1954), Miller *et al.* (1957), Mishra (1966), Rama Rao (1969), Persiani *et al.* (1998) and many others also observed seasonal variations in forest soil mycoflora.

Dwivedi (1966) and Dkhar and Mishra (1987) discussed seasonal variations of fungal population in some soil types and concluded

Manuscript 1542; Received 31 March 2006; Revised received 17 June 2006; Finally accepted 31 July 2006; Date of publication 25 August 2006

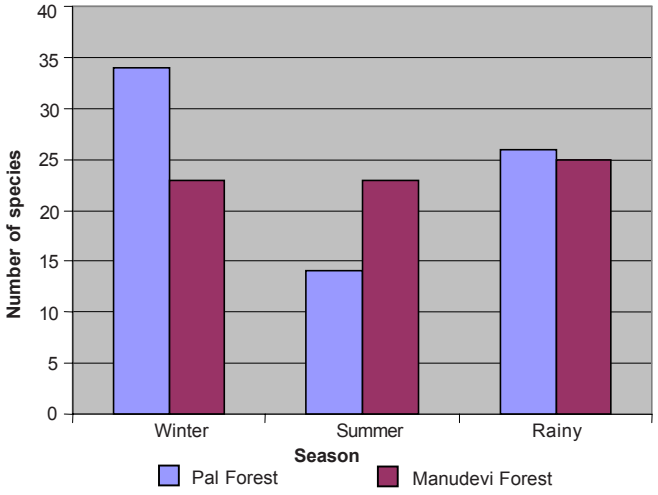

Figure 1. Seasonal distribution of fungal species

that the changes in soil,organic contents, water holding capacity, temperature and pH of respective season were the probable factors associated with fungal population. Similar results are obtained in the present investigation where some of the species appeared only sporadically after distinct seasonal interruption while other species were predominant in all seasons. These species were constant in their occurrence throughout the year and repeatedly isolated in all seasons. Many species therefore maintain seasonal rhythm in their occurrence and are treated under all seasonal species or constant species. Though several species were found to maintain their occurrence in all seasons, some species were also restricted in their occurrence in specific season because of suitable condition.

Dictyostelium mucoroides a member of the Myxomycotina appeared only during rainy season showing its tendency to develop in excess water condition. There was no earlier report by any other worker of its appearance during rainy season. These often remained in cysts during summer and dry condition, probably accumulation of decomposed or partly decomposed leaf litter is mostly suitable shelter for this slime mold.

From Members of the Zygomycotina, species of *Cunninghamella*, *Mucor* and *Rhizopus* were isolated from these soils but again they show their occurrence in all the three seasons. From members of the Ascomycotina a single genus *Chaetomium* was isolated during winter and rainy season.

Among all isolated species, the Deuteromycotina, cellulose decomposers, were dominant in both forest soils. *Aspergillus* was the most dominant genus and repeatedly isolated from both the soils in all seasons. It occurs on all sorts of organic debris. These observations in the present investigation are similar to Gangawane and Deshpande (1972), Reddy *et al.* (1987), Saksena *et al.* (1967), Manoharachary *et al.* (1990), etc. who have reported that Aspergilli occur more frequently than Penicillia in soils of warmer climate.

Table 1. Seasonal variation in soil fungi of Pal forest

	Fungus species	Winter	Summer	Rainy
1.	*Alternaria alternata* (Fr.) Keissler	+	-	-
2.	*Aspergillus atropurpureus* Zimmerman	-	-	+
3.	*A. awamori* Nakazava	+	+	-
4.	*A. candidus* Link	+	+	-
5.	*A. carneus* (Van Tigh.) Blochwit	-	+	-
6.	*A effusus* Tiraboschi	+	-	-
7.	*A. flavipes* (Bain & Sart.) Thom & Church	+	-	+
8.	*A. fumigatus* Fresinius	+	-	-
9.	*A. micro-virido-citrinus* Costatin & Lucet	-	-	+
10.	*A. miyakoensis* Nakazava	+	-	-
11.	*A. niger* var. *schiemanni* (Schiem)	-	+	-
12.	*A. niveus* Blochwitz	-	-	+
13.	*A. oryzae* (Ahlburg) Cohn	+	-	+
14.	*A. panamensis* Raper & Thom	-	-	+
15.	*A. sulphureus* (Fresinius) Thom & Church	+	-	+
16.	*A. sydowi* (Bain & Sart) Thom & Church	-	-	+
17.	*A. terreus* Thom	+	-	-
18.	*A. terreus* var. *aureus* Thom & Raper	+	-	-
19.	*A. versicolor* (Vuillemin)Tiraboschi	-	+	+
20.	*Chaetomium fusisporale* Rai & Mukerjee	+	-	-
21.	*Chaetophoma* sp.	+	-	-
22.	*Cladosporium cladosporioides* (Fresen) de Vries	-	+	+
23.	*C. oxysporum* Berk. & Curt.	+	-	+
24.	*C. sphaerospermum* Penz	-	-	+
25.	*Cunninghamella blakesleeana* Lendner	+	-	-
26.	*Curvularia brachyspora* Boedijn	-	-	+
27.	*C. pallascens* Boedijn	+	-	+
28.	*Dictyostelium mucoroides* Bref.	-	-	+
29.	*Fusarium dimerum* Penzig	-	+	-
30.	*Gliocladium penicillioides* Corda	-	+	-
31.	*Macrophomina phaseolina* (Tassi) Goid.	-	+	-
32.	*Mucor racemosus* Fresinius	+	+	+
33.	*Myrothecium roridum* Tode ex Fries	+	-	+
34.	*Penicillium charlesii* Smith	+	-	-
35.	*P. citrinum* Thom	+	-	+
36.	*P. cyaneum* (B. & S.) Biourge	+	-	-
37.	*P. frequentans* Westling	+	-	-
38.	*P. multicolor* Grigorieva-Maniolva & Poradielova	-	-	+
39.	*P. purpurrescens* (Sopp.)	+	-	-
40.	*Phoma fimeti* Brun.	+	-	-
41.	*P. fuckeli* Sacc.	-	-	+
42.	*P. leveillei* Boerema & Bolton	-	-	+
43.	*P. medicaginis* var. *pinodella* (L.K. Jones) Boerema apu Boerema Dorenbosch& Leffring	+	-	-
44.	*Rhizopus artocarpi* Raciborski	+	-	-
45.	*R. nigricans* Ehrenb.	+	-	+
46.	*Sclerotium rolfsii* Sacc.	+	-	-
47.	*Setodochium* sp.	-	-	+
48.	*Torula herbarum* f. *quarternella* Sacc.	+	-	-
49.	*Trichoderma viridae* Pers.ex.Fries	+	+	+
50.	*Verticillium luteo album* (Link ex Fries) Subram.	+	-	-
51.	Sterile mycelium Brown	+	+	+
52.	Sterile mycelium White	+	+	+
53.	Sterile mycelium Yellow	+	+	-
	Total	**34**	**14**	**26**

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Table 2. Seasonal variation in soil fungi of Manudevi forest

	Fungus species	Winter	Summer	Rainy
1.	*Absidia orchidis* (Vuillemin) Hagen	-	+	-
2.	*Aspergillus atropurpureus* Zimmerman	-	-	+
3.	*A. awamori* Nakazava	+	+	+
4.	*A. candidus* Link	-	-	+
5.	*A. flavipes* (Bain & Sart.) Thom & Church	+	-	-
6.	*A. humicola* Chaudhari & Sachar	+	+	-
7.	*A. luchuensis* Inui	+	+	-
8.	*A. niger* Van Tighem	-	+	-
9.	*A. niger* var. *schiemanni* (Schiem)	-	+	-
10.	*A. niveus* Blochwitz	+	-	+
11.	*A. oryzae* (Ahlburg) Cohn	-	-	+
12.	*A. terreus* Thom	-	-	+
13.	*A.versicolor* (Vuillemin)Tiraboschi	-	-	+
14.	*Chaetomium fusisporale* Rai & Mukerjee	+	-	-
15.	*Chaetomium* sp.	-	-	+
16.	*Cladosporium cladosporioides* (Fresen) de Vries	-	+	-
17.	*C. oxysporum* Berk. & Curt.	+	-	+
18.	*C. sphaerospermum* Penz.	-	-	+
19.	*Curvularia brachyspora* Boedijn	-	-	+
20.	*C. lunata* (Wakker) Boedijn	-	-	+
21.	*C. oryzae* Bugnicourt	+	+	+
22.	*C. pallascens* Boedijn	+	+	+
23.	*Fusarium dimerum* Penzig.	-	+	-
24.	*F. oxysporum* Schl.ex Fries	+	-	-
25.	*Gliocephalotrichum simplex* (J. Mayer) Wileyet Simmons	+	-	-
26.	*Gliocladium penicillioides* Corda	-	-	+
27.	*Humicola grisea* Traaen	-	+	+
28.	*Monilia sitophila* (Mont) Sacc.	-	+	-
29.	*Mucor racemosus* Fresinius	-	+	+
30.	*Mucor* sp.	-	+	-
31.	*Myrothecium roridum* Tode ex Fries	-	-	+
32.	*Penicillium citrinum* Thom	+	-	+
33.	*P. cyaneum* (B. & S.) Biourge	+	-	-
34.	*P. frequentans* Westling	+	-	-
35.	*P. multicolor* Grigorieva-Maniolva &Poradielova	-	+	+
36.	*P. purpurrescens* (Sopp.)	+	-	-
37.	*P. waksmani* Zaleski	-	+	-
38.	*Phoma glomerata* (Cda)Wollenw	+	+	-
39.	*P. leveillei* Boerema & Bolton	-	+	-
40.	*P. nebulosa* (Pers.ex F.S.Gray) Berk.	+	-	-
41.	*Phomopsis obscurans* (Ell.&Ev.)	-	-	+
42.	*Pyrenochaeta decipens* Marchal	+	-	-
43.	*Rhizoctonia solani* Kuhn	-	+	-
44.	*Rhizopus combodia* Vuillemin	-	+	+
45.	*Sclerotium oryzae* Catt.	+	-	-
46.	*Stachybotrys chartarum* (Ehrenb.) Hughes	+	-	-
47.	*Torula herbarum* f. *quaternella* Sacc.	+	-	+
48.	*Trichocladium asperum* Harz.	-	+	-
49.	*Trichoderma viridae Pers.ex.Fries*	+	+	-
50.	*Zygorhynchus vuillemini* Namyslowski	-	+	-
51.	Sterile mycelium Gray	-	-	+
52.	Sterile mycelium White	+	-	+
	Total	**23**	**23**	**25**

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ACKNOWLEDGEMENTS

The authors are grateful to the Principal and the Head of the Botany Department, M.J. College, Jalgaon, and Principal and the Head of the Botany Department, Modern College, Pune for extending their support. Gauri Rane acknowledges UGC for providing financial support.