Jr. of Industrial Pollution Control 30(2)(2014) pp 301-304

www.envirobiotechjournals.com

FUNGAL BIOPOLLUTANTS AND THE ENVIRONMENTAL CONDITIONS OF SARAIPALI, DIST. MAHASAMUND CHHATTISGARH, INDIA

SASHI KUMAR, MUKESH AHERWAR,* AND EESHWARI PRASAD CHELAK*

Govt. College Patthalgaon, Jashpur (C.G.), India
*Lt. R.V.B.S. Govt. College Saraipali, Mahasamund Chhattisgarh, India.

Key words :

(Received ..... February, 2014; accepted ....., 2014)

ABSTRACT

An exploration of airborne microbes was done using Rotorod air sampler. Altogether 27 fungal species belonging to 32 genera were isolated from study sites during different sampling periods. Among the various species encountered, *Rhizopus* and *Aspergillus* were the principal fungi with a contribution of (23%) followed by Mucor(10%) and *Alternaria* (8.5%) respectively. The study indicates that the incidence of air borne fungal spores of clinical significance show greater variation in response to the environmental conditions. The present study indicates a co-relationship between incidence of fungal biopollutants and the environmental conditions.

INTRODUCTION

Aerobiology is a scientific and multidisciplinary approach concerned with the source of micro-organisms, their release in the atmosphere, their dispersion, deposition and impact on plant, human and animal systems. Jacob (1951) defined aerobiology as the study of air spore comprising of air fungal spores, pollen grains and other micro-organisms which later on got elaborated to include dispersion of insect population, pollen grains, bacteria and viruses.

The interest in microbiology of atmosphere is nowadays mainly concerned with the organic, inorganic biologically significant components present in the atmosphere thus aerobiological studies have been categorized as –

1. The outdoor or Extramural Aerobiology
2. The indoor or Intramural Aerobiology

The investigations in Aeromycology are being carried out in different fractions.

i) To know the genera of aeromycoflora in relation to plant pathology which are helpful in disease forecasting of crops.

ii) To detect aero allergic fungal spores which have their impact on human health

iii) To investigate the microbial pollution of air inside the store rooms and godowns, that is responsible for the deterioration of stored materials.

The microflora of any habitat varies with host type, environmental condition and relations among them.

***Corresponding authors:**

Thus, the diversity of microflora differs from time to time and place to place. Accordingly, their impact may also vary resulting disease development in surrounding plants, deterioration of materials, fungal disorders and allergic responses to inhabitants in the form of skin sensitivity and hypersensitivity in sensitive individuals (Ganguly, 1992; Raha & Bhattacharya, 1992; Singh *et al*., 1992; Singh & Dorycanta, 1992;Tilak, 1998; Begum & Ahmed, 2006; Verma & Khare, 2009). Their continuous occurrence and recurrence at any site also provide required data to build up prediction models for forecasting epidemics (Rao, 1993).

Saraipali is a town located in the Mahasamund district of Chhattisgarh. The town of Saraipali also functions as a Nagar Panchayat in the district. The district of Mahasamund occupies the central eastern region of Chhattisgarh. Mahasamund district is bordered by Raigarh district in the north east and on the eastern part by Orissa. Raipur borders Mahasamund district from the rest of the sides. The geographical location of Saraipali is 21 degree 19 min north latitude and 83 degree east longitude. The average altitude of the city is 247 meter. The population of Saraipali Town is about 30192 for 7 km radius. The present investigation was undertaken with a view to identify the prevalence of airborne fungal spores in the environment of Different Localities of Saraipali and to study the variation in concentration of spores found at these locations.

A systematic aeromycological survey of ten sites in the Saraipali for sporal diversity and number was carried out during August 2012 to January 2013. A total of 27 genera of fungi having 32 species were recorded during the study period.

An important aspect of the experiment was to study the variation in incidence of spores at selected ten sites. By such measurement an attempt was made to find a suitable reason behind higher incidence of aeromycoflora in the Saraipali and around and thus the condition favourable for optimum growth of mycoflora could be established. Aero mycological data may be useful in terms of community health management and environment point of view.

MATERIALS AND METHODS

The equipment used for the present aerobiological investigations was Rotorod air sampler designed by Perkin (1957) and modified by Hamilton *et al.* (1959).

Sampling Rate

The sampling rate is the volume of air swept over by the collecting surface per unit time. The volume of air can be calculated on the basis of dimensions as described by Tilak (1982).

2 (arms) x 0.159 cm x 6 cm x 8 x 2300 x 10-3

Sampling surface

The Rotorod air sampler the collecting arms are made up of brass having 0.159cm cross sectional area. It is square in shape and slightly bent inwards. The vertical arms are 6 cm long and 4 cm from the axis The cello tape is cut into four equal pieces, each about 1.5 cm long and were fitted on the vertical arms of the sampler.

The cellophane tape was coated with adhesive white petroleum jelly and edges of the tape were trimmed to the width of the rod with the help of a sharp razor blade. Each cellophane tape is mounted on a glass slide with glycerin jelly used as mountant.

Collecting Efficiency

The standard conversion factor for the Rotorod air sampler is 5. The conversion factor is constant irrespective of the location, season and weather, assuring trapping efficiency to be 85%.

Tilak (1989)- "With the help of the conversion factor , the spore concentration f the air can be easily estimated."

Sampling Method

Air spora was continuously studied for six months from August 2012 to January 2013.The sampling was done on every third day of every month from 10:00 hrs. to 13:00 hrs. at constant height above the ground level. The sampling was done for fifteen minutes every time.

Sampling Site

The trapping of various fungal spores and hyphal filaments was by installing the sampler at following sites in the Different Localities of Saraipali.

Site 1- Bus Stand Saraipali
Site 2- Govt.College Saraipali (New Building)
Site 3- Govt.College Saraipali (Old Building)
Site 4- Govt. Hospital Saraipali
Site 5- Botanical garden (Bhavarpur Road)
Site 6- Tehsil Office Saraipali
Site 7- Nagar Panchyat Saraipali
Site 8- New Market Saraipali
Site 9- Kutela School, Saraipali
Site 10- Ghanteshwari Temple, Saraipali

Identification

The identification of the trapped spores was mainly of microscopic character and in all possible cases count was made which was based on colour, shape, size and other diagnostic features of the spore.

RESULT AND DISCUSSION

During the period of present investigation an exploration of airborne microbes was done in the intramural and extramural atmosphere for a period of six months from August 2012 to January 2013using Rotorod air sampler. Altogether 27 fungal species belonging to 32 genera were isolated from study sites during different sampling periods (Table 1). The total fungal species increased from August to January both qualitatively and quantitatively. But overall the spore count exhibited seasonal fluctuations. It was higher in between October, November and December and exhibit decreasing trend till January. Maximum fungi were isolated in the month of October and November and least in the months of January. This is generally attributed to favorable conditions for growth during the periods. Maximum fungal species were found in the November and least in the months of January. Among the various species encountered, *Rhizopus* and *Aspergillus* were the principal fungi with a contribution of (23%) followed by Mucor (10%) and Alternaria (8.5%) respectively. Although the aeromycoflora was dominated by saprobe, the plant pathogenic and human allergic fungi was also encountered. The study indicates that the incidence of air borne fungal spores of clinical significance show greater variation in response to the environmental conditions. Some of the species of *Aspergillus* are known to cause aspergilloses. *Penicillium, Cladosporium* and *Curvularia* are also considered as important allergenic and mycotoxin producing fungi. The prevalence of these fungi in study site explores potential risk of allergy among residing people.

The present study indicates a co-relationship between incidence of fungal biopollutants and the environmental conditions responsible for their contribution.

Table 1. No. of spores per cubic meter of air

S.No.	Name of spore	Aug	Sept	Oct	Nov	Dec	Jan	Total
1.	*Alternaria*	11	07	15	19	13	05	70
2.	*Aspergillus*	10	05	22	27	15	02	81
3.	*Bispora*	02	03	09	15	04	-	33
4.	*Candida albicans*	-	02	-	01	-	-	03
5.	*Cercospora*	02	02	15	14	10	02	45
6.	*Cladosporium*	08	02	12	14	10	05	51
7.	*Claviceps*	02	05	-	06	05	01	19
8.	*Colletotricum*	06	05	12	15	14	06	58
9.	*Cunninghamella*	02	03	01	-	-	-	06
10.	*Curvularia*	05	01	06	04	05	02	23
11.	*Diplodia*	-	-	01	02	-	-	03
12.	*Drechslera*	02	-	-	03	04	01	10
13.	*Epicoccum*	-	-	05	05	02	04	16
14.	*Erisyphe*	-	02	09	09	04	-	24
15.	*Exosporium*	02	-	02	02	05	01	12
16.	*Fusarium*	05	05	04	09	08	04	35
17.	*Helminthosporium*	02	01	08	08	06	01	26
18.	*Mucor*	12	11	17	15	18	09	82
19.	*Penicillium*	04	04	-	-	-	-	08
20.	*Physarum*	03	02	01	01	03	01	11
21.	*Rhizopus*	21	23	25	21	15	19	124
22.	*Smuts*	04	06	05	07	01	01	24
23.	*Tetraploa*	-	-	01	06	05	01	13
24.	*Trichoderma*	02	01	-	-	-	01	04
25.	*Xylaria*	02	-	-	04	01	00	07
26.	Unidentified sp.	04	03	05	05	05	03	25
27.	Hyphal filaments	15	12	11	15	18	14	85

REFERENCES

Agarwal, M.K. and Shivpuri, D.N. 1974. Fungal spores,

Table 2. Site wise variation in spore concentration in %

S.No.	Name of spore	Site1	Site2	Site3	Site4	Site5	Site6	Site7	Site8	Site9	Site10
1.	*Alternaria*	09	07	05	15	14	24	11	06	04	05
2.	*Aspergillus*	13	15	06	21	16	11	07	02	07	02
3.	*Bispora*	15	16	02	18	09	20	11	02	06	01
4.	*Candida albicans*	15	18	04	21	06	22	08	00	06	00
5.	*Cercospora*	14	14	00	11	08	23	18	01	08	03
6.	*Cladosporium*	06	16	01	16	25	25	06	00	04	01
7.	*Claviceps*	08	10	01	18	09	29	10	02	08	00
8.	*Colletotricum*	10	10	03	09	16	27	13	04	04	04
9.	*Cunninghamella*	12	12	05	18	14	28	07	03	01	00
10.	*Curvularia*	11	10	01	19	16	24	09	05	02	00
11.	*Diplodia*	05	09	05	19	11	30	16	02	02	01
12.	*Drechslera*	06	05	01	19	08	32	17	05	05	02
13.	*Epicoccum*	05	09	02	13	05	38	22	01	05	01
14.	*Erisyphe*	09	05	01	20	19	23	12	05	05	01
15.	*Exosporium*	08	02	01	18	14	33	16	01	04	03
16.	*Fusarium*	11	04	01	20	19	28	14	01	02	00
17.	*Helminthosporium*	08	07	02	16	21	22	17	04	02	01
18.	*Mucor*	09	09	02	16	22	29	06	01	04	02
19	*Penicillium*	15	08	01	15	14	27	08	06	06	00
20.	*Physarum*	05	05	05	11	12	32	24	02	02	02
21.	*Rhizopus*	07	14	05	08	15	23	10	01	06	01
22.	*Smuts*	08	06	02	09	12	32	22	01	07	01
23.	*Tetraploa*	03	03	01	06	09	50	26	00	02	00
24.	*Trichoderma*	06	09	01	08	12	35	23	02	04	00
25.	*Xylaria*	03	05	00	14	15	40	19	03	01	00
26.	Unidentified sp.	09	08	03	25	19	20	09	04	01	02
27.	Hyphal filaments	10	07	02	21	08	27	16	05	01	03

their role in respiratory allergy. *Adv.in Pollen Res.* 1 : 78-128.

Barnett, H.L., Hunter, S. and Barry, B. 1972. *Illustrated Genera of Imperfect Fungi*. 3rd edn., Burgess Pub.

Begum, J. and Ahmed, K. 2006. Aeromycological study of fish, meat and vegetable market. *Nature Environ. Pollution Technol*. 5 (2) : 305-307.

Cunningham, D.D. 1873. *Microscopic Examination of Air, Govt*. Printer, Calcutta, pp. 58

Ellis, M.B. 1971. Dematiaceous hyphomycetes. Commonwealth Mycological Institute, Kew, England.

Gilman, J.C. 1959. *A Manual of Soil Fungi*. Oxford & IBH Pub. New Delhi.

Jacob, W.C. 1951. *Aerobiology*. In compendium of metrology, Amercan Meterological Society. Boston 1103-1111.

Jadhav, S.K. 1996. *Studies of aeromycoflora over rice field at Balodabazar, Raipur*. Ph.D. thesis, Pt.R.S. Uni. Raipur.

Rao, K.S.R. 1993. Alternaria leaf spot of sunflower II. Meteorological factors associated with diseaseincidence and atmospheric spore load. *Ind. J.Aerobiol*. 6 (1&2) : 45-48.

Sahu, K. 1998. *Aeromycological studies over wheatcrop at Raipur (MP)*, Ph.D. thesis Pt. Ravishankar Shukla Univ., Raipur.

Sawane, A. 2010. A survey of air borne Penicillium in different environment of Nagpur. *J. Ind. Bot. Soc*. 89 (I & II) : 149-154.

Singh, N.I. and Dorycanta, H. 1992. Aerobiology and crop diseases in Manipur VIII. Fungal aerospora over a maize field in Senapati district. *Ind. J. Aerobiol*. Special vol. 141-144.

Singh, L., Vats, P. and Chaudhary, R. 2006. Aeromycoflora over transit landfill of Abu Drain at Meerut. *Ad. Plant Sci.* 19 (1) : 147-153.

Singh, A.K. and Siddiqui, S.M. 2009. A comparative aeromycological study of unpolluted and polluted air localities. *J. Basic Appl. Mycol*. 8 (1&2) : 109-112.

Tilak, S.T. 1998. *Aerobiology* (biology of airborne organisms) Satyajeet Prakashan, Pune.

Tiwari, K.L. and Sahu, S. 1988. Studies on the leaf surface and air mycoflora of *Momordica charantia L.Plant Geobiose New Rep.* 7 : 135-139.

Tiwari, K.L., Jadhav, S.K. and Kunjam, S.R. 2006. Aeromycoflora of slum area of Raipur (CG) India. *Ad. Plant Sci*. 19 (2) : 387-390.

Verma, K. and Chile, S. 1992. Fungi in the medicalcollege of the Jabalpur city and the allergenic behaviour of some species. *J. Ind. Bot. Soc*. 71 : 247-249.

Verma KS and Khare D (2009) Aeromycoflora in the houses of allergic patients. J. Basic Appl. Mycol. 8 (I&II), 117-118.