2321-8045 Science Park Research Journal Vol-1, Issue-16, 7th November 2013

PRIMARY ARTICLE

# "Aeromycogical Survey Along Railway lines Of Western Suburban Region Of Mumbai"

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## ABSTRACT

Air samples were collected during were from July 2009 to June 2011 along railwaylines of western suburban region of Mumbai and examined for fungal spores Concurrently by using gravity slide and petriplate exposure technique,. of these 27 Fungal types recorded. The significant types includes *Alternaria, Aspergillus, Basidiospores, Bispora, Candida, Chaetomium, Cladosporium, Curvularia, Didymosphaeria, Epicoccum, Fusarium, Helminthosporium, Hypoxylon, Mucor, Mamniolla, Penicillium, Pithomyces, Trichonis,* etc.

**Keyword:** Aeromycology, Fungal Spores, Gravity Slide Method, Petriplate Exposure.

## INTRODUCTION:

Aerobiology is a scientific and multidisciplinary approach focused on the transport of microscopic organisms and biologically significant materials. It deals with the airborne particles of biological origin and their effect on living organisms. The term aerobiology came into existence since 1930 as a collective term for the studies of airospora like air-borne fungal spores. In India; aerobiology was initiated by the pioneering work of Cunningham in 1873.All investigations jointly confirm the fact that the atmosphere of Mumbai is predominating in biopollutants like fungal spores, pollen grains, and large amount of dust particles. While Thousands of peoples staying along the railway lines expose to bioparticles. This has resulted in the deposition of large amount of organic matter on open areas which created pollution of bioparticles in air which are toxic and creating allergies to the people. Due to unhygienic condition, uncleanliness along Railway lines and occurrence of all toxic particles like pollen grains, fungal spores present in air are allergic. Along the railway lines, a large number of populations residing in slum areas are directly exposed to such allergenic biopollutants.

Owing to their ubiquitous presence in nature, fungi as an allergen source is almost inevitable. Consequently, investigations of the environmental conditions of dwellings along the railway lines and the surrounding neighborhood must be an important part of allergy.

The present investigation deals, with the fungal components along the railway lines. In India there are no reports of work done elsewhere on these lines except Prasad (1968), Bombay.

An aerobiological survey carried out for the period of two year along railway lines of Western region of Mumbai had shown that *Alternaria, Aspergillus, Basidiospores, Bispora, Candida, Chaetomium, Cladosporium, Curvularia, Didymosphaeria, Epicoccum, Fusarium, Helminthosporium, Hypoxylon, Mucor, Mamniolla, Penicillium, Pithomyces, Trichonis,* etc.

While *Pithomyces*, Rust, *Smut* and *Torula* have already been tested for their allergenicity in India (Shivpuri, 1981) and other countries.

However it is essential to carry out extensive studied to trap, analyze and enlist the offending air-borne pollen /fungal spore allergens in different area of western railway line; because, the data thus obtained could be used for the effective treatment of respiratory allergic patients living there and travels daily.

Mumbai the Financial capital of India is cosmopolitan city where all the

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The Article Is Published On November 2013 Issue & Available At www.scienceparks.in

DOI: 10.9780/23218045/1162013/38

people from India come, reside and prosper. Due to heavy increase in industrialization, people are continuously migrating in Mumbai, which result in over population. This resulted into increase in high cost of living so large populations have compelled to stay in slum areas along the railway line with highly unhygienic condition. This has resulted in deposition of large amount of organic matter on open areas, which created pollution of the bioparticles in air, which are toxic, and creating allergies to the people, who are traveling in local trains.

Along the railway track it has been observed that large amount of organic waste and slum area day by day increasing which is source of many air borne particulate matter which are being lifted in the air due to the currents of air developed by running trains, While traveling through specific route in Mumbai, peoples are complaining about respiratory disorders such as asthma, rhinitis, sinus problems, running nose, sneezing, cough, bronchial asthma, etching of skin and other skin problems, reddening of eyes etc. To find out the cause of such illness it has been proposed to investigate the ambient air to which passengers are exposed. Hence, it is proposed to undertake the aerobiological studies with the help of gravity slide method and petriplates exposer method and this work will help to understand the load of airborne hazardous bioparticulate matter and their sources along the railway lines.

Uncleanliness along railway line and occurrence of all toxic particles like pollen grains, fungal spores are present in air, which are allergic. The data obtained could be of great importance in the treatment of respiratory allergies in people who are regularly traveling in suburban trains.

## Materials And Methods:

The following methodologies of air-spora were carried out for a continuous period of two calendar year i.e., from July 2009 to June 2011.

## Gravity slide sampling :

Glycerin jelly coated microslides were exposed eight day in a month, continuously for the period of two years. The exposures were made on different stations of western railway.

The exposed slides from gravity slide samplings and glycerin jelly coated cellotapes after volumetric sampling were periodically scanned under the microscope. Their characteristic morphological features identified the trapped air borne fungal spores.

## Petri-plate culture method:

Petriplates containing potato-dextrose agar medium with streptomycin for culturable fungi were exposed for 5 minutes at all the sampling sites ie. from Churchgate to Virar (a to i). The fungal colonies thus developed on petriplates were identified and quantified after 5-7 days of exposure. Records on the daily data of rainfall, relative humidity, temperature and wind velocity during the period of investigation .

## Results and Discussion -

During present study the on the sampling of air spora revealed the predominance of fungal spores using gravity slide sampling and by culture plate exposure several species are identified e.g. *Penicillium, Aspergillus, Cladosporium, Mucor, Rhizopus, Fusarium, Helminthosporium, Alternaria, Curvularia* etc. out of these *Alternaria, Aspergillus, Cladosporium, Fusarium and Penicillium* were present more or less throughout they have been reported from many parts of world.

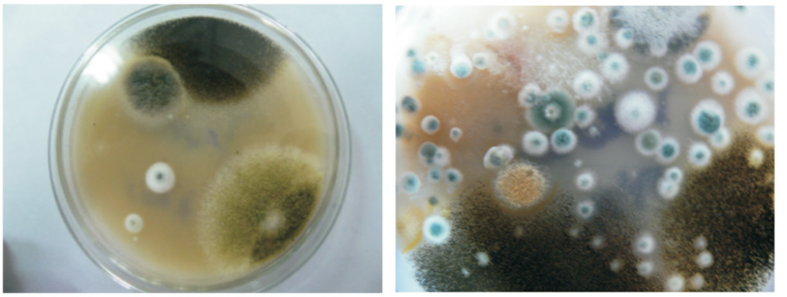


Fig- Growth of fungal colonies on petriplates.

There is a variation in the concentration of airborne fungal spore which may be hourly, daily or seasonal. The occurrence and prevalence of these spores is related to their production and meteorological parameter like rainfall, relative humidity, temperature and wind velocity etc. and the available plants and plant debris that act as a host or substrate for the most commonly encountered fungi e.g. *Alternaria, Curvularia, Cladosporium, Fusarium*, usually during the rainy period. The atmospheric fungal population decreases due to washing off by rain, however it gradually increases again after the rain have stopped. by the culture plate method, rainy season was found to contribute highest followed by summer and by the visual counting method, summer was observed to constitute maximum followed by rainy season. This difference may be attributed to the rain, which largely affected the trappings by the visual counting method because they leave the atmosphere clean for a long duration.

In general the concentration is maximum during hot summer months, however it can be said that there is no spore free season. Though most of the spore types exhibit seasonal variation in the concentration, seasonal periodicity of aeromycospora is related with the vegetation, organic dead contents and weather conditions like temperature, wind velocity, heavy rainfall, and low relative humidity reduced the spora concentration. Spore of *Alternaria, Cladosporium, Curvularia, and Aspergillus* does not exhibit marked seasonal variation and are present more or less all they around this may be due to their wide host range.

most of the airborne spores prevalent in the atmosphere is small in size, the production is enormous and poses simple structure for e.g. *Mucor, Penicillium, Cladosporium* etc. due to specialized liberation mechanism some spores are dispersed in the air as aggregate of several spores of single dispersal units, such dispersal unit are typical of *Cladosporium, Alternaria, Penicillium* etc. the larger sized spores usually have less cellular contents as compared to their volume besides possessing empty spaces.

MONTH WISE AVERAGE TOTAL FUNGAL COLONIES
DEVELOPED ON PETRI PLATES

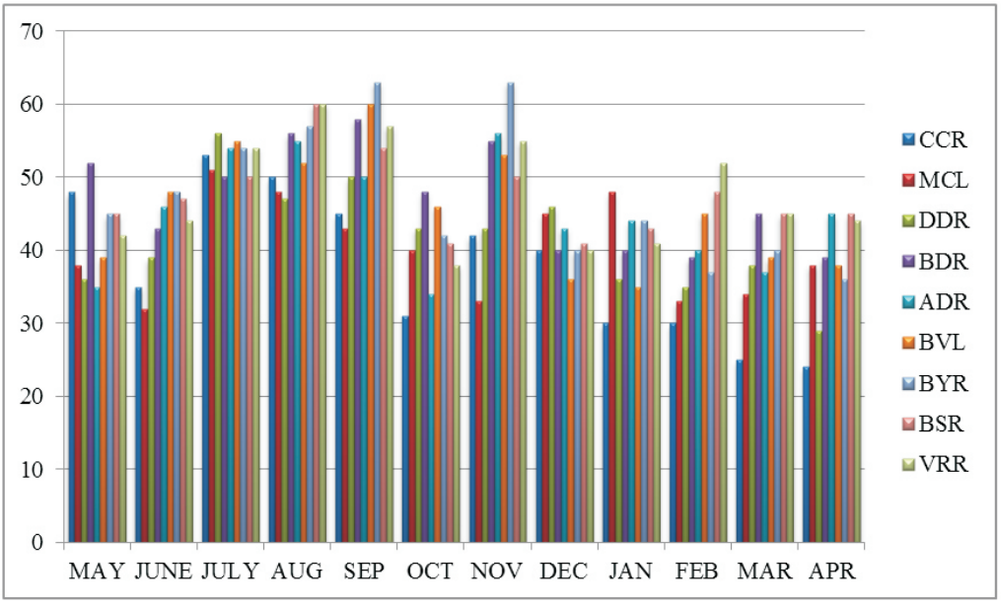
| MONTH | NAME OF THE SAMPLING SITES | | | | | | | | | MONTH WISE TOTAL COLONIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A. CCR | B MCL | C. DDR | D. BDR | E. ADR | F. BVL | G. BYR | H. BSR | I. VRR | |
| MAY | 48 | 38 | 36 | 52 | 35 | 39 | 45 | 45 | 42 | 356 |
| JUNE | 35 | 32 | 39 | 43 | 46 | 48 | 48 | 47 | 44 | 382 |
| JULY | 53 | 51 | 56 | 50 | 54 | 55 | 54 | 50 | 54 | 477 |
| AUG | 50 | 48 | 47 | 56 | 55 | 52 | 57 | 60 | 60 | 485 |
| SEP | 45 | 43 | 50 | 58 | 50 | 60 | 63 | 54 | 57 | 480 |
| OCT | 31 | 40 | 43 | 48 | 34 | 46 | 42 | 41 | 38 | 363 |
| NOV | 42 | 33 | 43 | 55 | 56 | 53 | 63 | 50 | 55 | 450 |
| DEC | 40 | 45 | 46 | 40 | 43 | 36 | 40 | 41 | 40 | 371 |
| JAN | 30 | 48 | 36 | 40 | 44 | 35 | 44 | 43 | 41 | 361 |
| FEB | 30 | 33 | 35 | 39 | 40 | 45 | 37 | 48 | 52 | 359 |
| MAR | 25 | 34 | 38 | 45 | 37 | 39 | 40 | 45 | 45 | 348 |
| APR | 24 | 38 | 29 | 39 | 45 | 38 | 36 | 45 | 44 | 338 |
| SITEWISE TOTAL COLONIES | 453 | 483 | 498 | 565 | 539 | 546 | 569 | 569 | 572 | 4770 |
| total control % | 10.52 | 9.87 | 9.57 | 8.44 | 8.44 | 8.73 | 8.38 | 8.38 | 8.33 | 100.00 |

Mumbai and its Western suburbs have a hot and humid climate. The humid weather and wet substrate after the rains, favours fungal growth. This is a reason for the higher rate of fungus spores in the month of July and August. Heavy rains washes away the airspora but it also promotes the growth and sporulation in fungi. (Karmer et al. 1960).

The Aerobiological survey along railway line of western suburban area of Mumbai showed a number of similarities and few disparities compared to the other places. The present study is a survey of airborne fungal spores, pollen and airborne fungal spores, pollen grains, airborne biotic material like hyphal fragments, trichomes, insect parts, and other miscellaneous particles like fibers, scales etc. at the nine selected sites and also along railway lines of western region of

Mumbai.

MONTH WISE AVERAGE TOTAL FUNGAL COLONIES DEVELOPED ON PETRI PLATES .




The data presented here may serve the useful purpose of identifying the source, season, percentage contribution of aeroallergens in these regions.

A total of fungal genera was caught during (July 2009 to June 2011) shows the totals of various types of fungal spores caught during a year of investigation, the contribution to the total catch. 27 different types of fungal genera including fungal hyphae and other microbioperticulate matter were observed.

Observation had been the following made during the investigation.
1)*Cladosporium* spores dominated the count throughout the period of investigation. the spores of this genus dominated in all seasons.
2)*Aspergillus, Alternaria, Candida, Curvularia*, smut followed by *Cladosporium* in sequential order.
3)*Bispora, Chaetomium, Cunnighammella, Fusarium, Penicillium, Pithomyces* and *Rhizopus* spores contributed in a small way. The contribution of spores of other genera was very poor.
4)Total 11 fungal spores showed a peak in (summer).
5)The total 16 atmospheric spore countered in rainy month of August - 2010
6)Maximum spore count was found at Virar station.

## Conclusion

On being analysed, the samplings have shown fungal spores belonging to 27 specie dominating the airspora at the sites over pollen grains and other micro-bioparticulate. Among the fungal spores there are substantial species belonging to the biodeteriorating category. A significant observation made was the frequent presence of miscellaneous type like fibers, human particles like hairs, dust particles, hyphal fragments, epidermal hairs, protozoan cysts epidermal hairs, insect parts. Fungal spores *Cladosporium, Helminthosporium, Alternaria, Aspergillus, Curvularia*, and Smut spore, *Pithomyces* and *Chaetomium*.

However others need not be underestimated detailed clinical study of many pollen grains and fungal spores, is needed to prove that they are casual factor of hay fever and allergy.

The presence of biodeteriorating fungi at these sites, like *Alternaria, Aspergillus, Cladosporium, Epicoccum, Fusarium, Penicillium, Torula*, etc. account for both toxic and phototoxic biopollutants.

The fungal fragments are very common in air and these are capable of acting like spores. Identification of hyphal fragments up to generic level was rather difficult. Despite

best effort in many cases, accurate identification is difficult. The meteorological factors like rainfall, temperature relative humidity and high wind velocity, had their direct or indirect effects on the concentration of hyphal fragments in the air.

**References:-**

1)Alexander Roth, M. D, 1964, **Pollen and Mold Survey in Hawaii**, *Mycologia*. **26:2**
2)Agarwal, M. K, and Shivpuri D. N. 1969.**Studies on the allergenic fungal spores of the Delhi, India. Metropolitan area.** *Jour. of Allergy* **44**: (4).
3)Berneet, H. L. and Hunter, B. B. 1972. Illustrated genera of imperfect fungi. Burgess publishing co., Minneapolis, Minnesota.
4)Babu, M. **Aerobiology of Aurangabad**. 1981, *Proc. Nat. Conf. Env. Biol.*: 39- 41.
5)Bhivgade, S. W.,Chate,D.A. and Dhaware, A. S. 2009.The role of *Alternaria* as Biopollutant in Asthma. *Ind. Jour. of Aerobio*. **22(1&2)**:34-37.
6)Doshi, D. K., and Kulkarni A. R.1981. **Preliminary Survey of Aerobiology of Bombay**. *Proc. Nat. Conf. Env. Boil*: 97-104.
7)Dhawre, A. A. 1981. Aeromycology at Udgir-Ascospores. Proc. Nat. Conf. Env. Bio. : 55-57.
8)Bhivgade, S. W., Chate D. A. and Dhaware A. S. 2009.The role of *Alternaria* as biopollutant in Asthma. *Ind. J. of Aerobio. 22*(**1&2**), 34-37.
9)D'Silva, A. M. and Freitas, Y.M.1981.The role of the aerial mycoflora of Bombay in respiratory allergies. Proc. Nat. Conf. Environ. Bio. Aurangabad. 63-70.
10)Giri,S.K. 2012.Aeromycological survey in intramural environment of a college laborator. *Ind. Jour. of Aerobio*. **25(2)**:59-64.
11)Ghoshal, K. and Gupta S.2012.Biomonitoring of fungal spores of a river bank Suburban City, Konnagaar and its link and impact on health of local People. Ind. Jour. of Aerobio. 25(2):1-7.
12)Iyar, G. N. 1987.*Aerobiological Studies of Bombay*. Ph.D.Thesis,Mumbai University.
13)Kalakar, S.A. and Mothure, V. M.2011.Concentration of airborne Alternaria and Cladosporium spores in relation to meteorological conditions at Nagpur.*Ind.Jour. Aerobio*.**24 (1)**:12-18.
14)Kulkarni, D. K. and Kulkarni, U. K. 1982. Aeromycological survey of Kolhapur. *Jour. Environ. Biol.*, **6: (2)** 85 - 92.
15)Kunte, S. P. Magdum, J. A., and Kamble S.Y. 2002.Aerobiological studies of Varandha Ghat. Fifth Nat. Con. Of I. A. A. Pune. 69.
16)Lonkar, A. 2002. A page from history of *Parthenium hysterophorus* dermatitis. *Fifth Nat. Conf.of Ind.Acad. of Allergy. Pine*. 23-25.
17)Mandloi S, Mishra R. Verma R.2010.Study of viable fungal spores prevalence at different sites of Bhopal, Madhya Pradesh. *Ind. Jour. of Aerobio.*, 23(**2**):61-67.
18)Nair, P. K. K. 1963. Analysis of atmospheric pollens, fungal spores and other vegetable matter at Vellore, Madras State (India). *Ind.Jou.Med.* Res: **51**.
19)Potti Sankaran K. 2009. **Studies on the vertical distribution of air-spora at some of the residential areas in the western suburbs of Mumbai**. Ph.D. Thesis, Mumbai University.
20)Singh, A.B. and Dahia, P. 2008. Aerobiological Researches on Pollen and Fungi in India during the Last Fifty Years: An Overview. *Indian J Allergy Asthma Immunol.* **22(1)**: 27-38.
21)Subba Reddy, C.1974 .Volume incidence of air borne allergens. *Ind. J. Med. Res.*, **64**: 1190-1194.
22)Sreeramulu, T. and Ramalingam,R.1966. Two years study of air-spora of paddy fields near Visakapattanam. *Ind. J. Agril. Sci.* **36**: 112-132.
23)Srinivasulu, B.V. and Tilak, S.T.1967. **Air spora of Aurangabad**. *Ind. Jour.of Micro*. **7**:4.
24)Vittal, B. P. R. 1979. **A preliminary study of the atmospheric fungal flora of Madras**, *Kavka*; 7:79-82.
25)Varghese, P.2002.***Aerobiological Studies of Thane Area***. Ph. D. Thesis, Mumbai University.
26)Yeragi, S. S. 1988. ***Aerobiological Survey of Ambernath and Ulhasnagar***, Ph.D. Thesis, Mumbai University.

**Acknowledgement -** I am extremely thankful to Respected, Principal of Sathaye College Dr. (Mrs.) Kavita Rage and Dr. S.K.Potti, Head Department of Botany for providing necessary facilities in the Botany Department. Sathaye College, Vile-Parle (E) Mumbai.