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Biodiversity of Aeromycoflora and Aerobio components from Vasai: Virar, suburban area, Palghar, MS, India

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Abstract
The present investigation is carried out in Vasai – Virar Municipal area, which has varied geographical structure. Climate is comparatively humid and temperature is variable. Extramural aerobiological research includes aero microbial survey at various places of Vasai, Nalasopara and Virar region. The aero mycological survey was carried out from June 2017 to May 2018 by using Petri-plate exposure method and Gravity slide sampling method. Total Twenty six fungi trapped from the air. This study is very important with respect to qualitative and quantitative information about the airborne fungi. The prevalence of dominant airspora was found to be correlation with the meteorological parameter like Temperature, Humidity and Humidity. The maximum mycoflora was registered during the monsoon period between Julys to October, which is gradually decreased during summer from March to June. The significant fungal spore type includes species of *Alternaria, Bispora, Aspergillus*, *Albugo, Chaetomium, Cladosporium, Curvularia, Epicoccum, Fusarium, Helminthosporium, Hypoxylon, Humicola, Mucor, Nigropsora, Pleospora, Periconia, Penicillium, Tetrapola, Torula, Smut, Rust* etc.

Keywords: Aeromyco flora, Aerobiocomponents, petriplate exposure. Gravity slide, sampling

1. Introduction
Air is a heterogeneous assemblage of physical, chemical, as well as biological compounds. Due to its easy transportability, air causes great variation in environment pollutants, but scanty attention has been paid to understand systematically biotic environmental pollutants by scientific community. The content of fungal spores of every taxon in air is characterized by a specific seasonal and diurnal cycle among other things; these cycles depend on climate and weather conditions on the accessibility of fresh substrates for the development of the fungus, circadian cycle of light and darkness, and other environmental hardly definable factors. The effect of all these factors is fairly complicated and difficult to investigate.
These pollutants enter into the human physiological system through exposed sites such as skin, nose, mouth and eyes and accordingly cause allergic diseases like allergic rhinitis, lungs bronchial asthma, conjunction etc. such air pollutants in the atmosphere produced at localized concentration at the sources where they are produced.
Doshi and Kulkarni (1981) [5] Ghai (1984), Subramanyam (1985) Iyer in 1987 Varghese (1988) [18], Patil in 1997, Deodhar in 1999, Kunhiraman in 2000, Nair (2002), Kelkar (2002) while Potti (2006) [13] studied vertical distribution of airspora at western suburbs of Mumbai its suburbs All these 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.
Aerobiological investigations were taken up in Vasai- Virar suburban area to find out the various fungal spore and other particulate matter constituents of the local air spora as well as the organic and inorganic impurities present there in.
Vasai - Virar is cosmopolitan city connected to Mumbai where all the people from India come, reside and prosper. Due to heavy increase in industrialization and job opportunities people are continuously migrating suburbs, which result in over population. This resulted into increase in high cost of living so large populations have compelled to stay in slum areas 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.
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 heavy traffic and wind flow, 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 exposure method and this work will help to understand the load of airborne hazardous bioparticulate matter and their sources.
The present investigation is expected to obtain some data about the qualitative and quantitative occurrences of fungal

spores are aeroallergens in the atmosphere of Vasai- Nalasopara-Virar in terms of their role as environmental biopollutants.

Objectives of the present studies were to carry out survey to determine bio-particulate matter such as fungal spores in different seasons at the different locations of Vasai, Nalasopara and Virar suburban area. Impact of airborne fungal spores including their release, dissemination, deposition and effect is of great significance to identify the health hazards and physiological disorders in living beings. Enlisting the offending air borne micro-allergens and evaluation of occurrence of toxic aerobiocomponents in Vasai-Virar environment. Study of this aspect is highly interdisciplinary in nature and has tremendous scope to find out diurnal and seasonal variation in load of fungal spores at the experimental site with relation to meteorological data.

The present investigation is expected to obtain some data about the qualitative and quantitative occurrence of fungal spores is aeroallergens in the atmosphere of Vasai - Virar in terms of their occurrence as environmental biopollutants.

Materials and methods

Petri-plate Exposure method

Sampling of air-spora was carried out for a continuous period of calendar year i.e., from June 2017 to May 2018 to study the selected sampling sites for better monitoring. Different locations in area like vegetable market, fish market, Flesh market, Bus depot, Railway stations, crowded places and dumping sites have been selected as sampling site. The samples of different locations were collected on sterile potato dextrose agar (PDA) nutrient medium in Petri plates composed of peeled potato (125 gm/l), dextrose (10 gm/l) and agar (10 gm/l) in distilled water with streptomycin.

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 were collected and recorded periodically.

Gravity slide sampling

Glycerin jelly coated micro slides were exposed eight day in a month, continuously for the period of one year. The exposures were made on different locations.

Results and Discussion

Fig 1: Growth of Fungal Colonies on Petri plates.

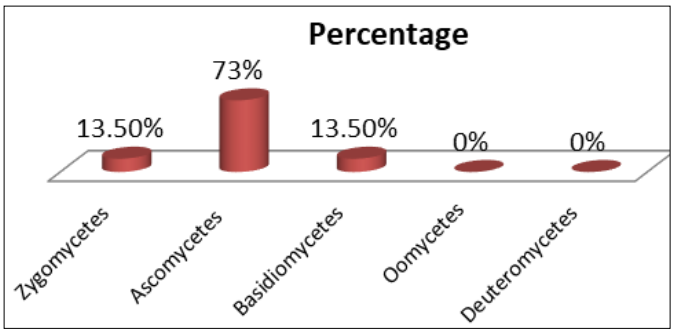

Fig 2

Fungal spores and their percentage

Table 1

Sr. No.	Fungal sps.	Percentage	Sr. No.	Fungal sps.	Percentage
1	*Alternaria sps*	18.05	12	*Mucor*	3.39
2	*Aspergillus*	10	13	*Nigrospora sps*	1.45
3	*Bispora sps,*	1.46	14	*Penicillium sps*	6.24
4	*Chaetomium sps*	1.3	15	*Periconia sps*	1.69
5	*Cladosporium sps*	1.5	16	*Pleospora sps*	0.28
6	*Cunnighamella sps*	0.71	17	*Rhizopus sps*	11.59
7	*Curvularia sps.*	14.5	18	*Rust sps*	3. 82
8	*Fusarium sps*	13.14	19	*Sclerospora sps*	0.69
9	*Helminthosporium sps*	4.06	20	*Smut spores*	2.9
10	*Humicola*	1.03	21	*Tetrapola*	0.79
11	*Hypoxylon*	1.4	22	*Torula sps.*	0.97

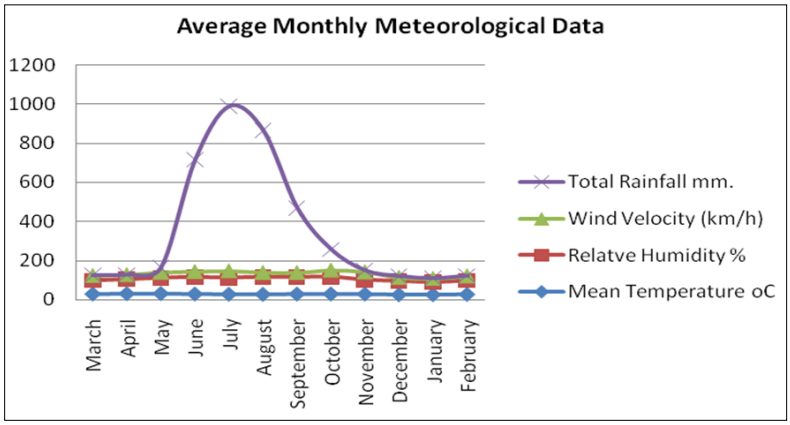

Fig 3

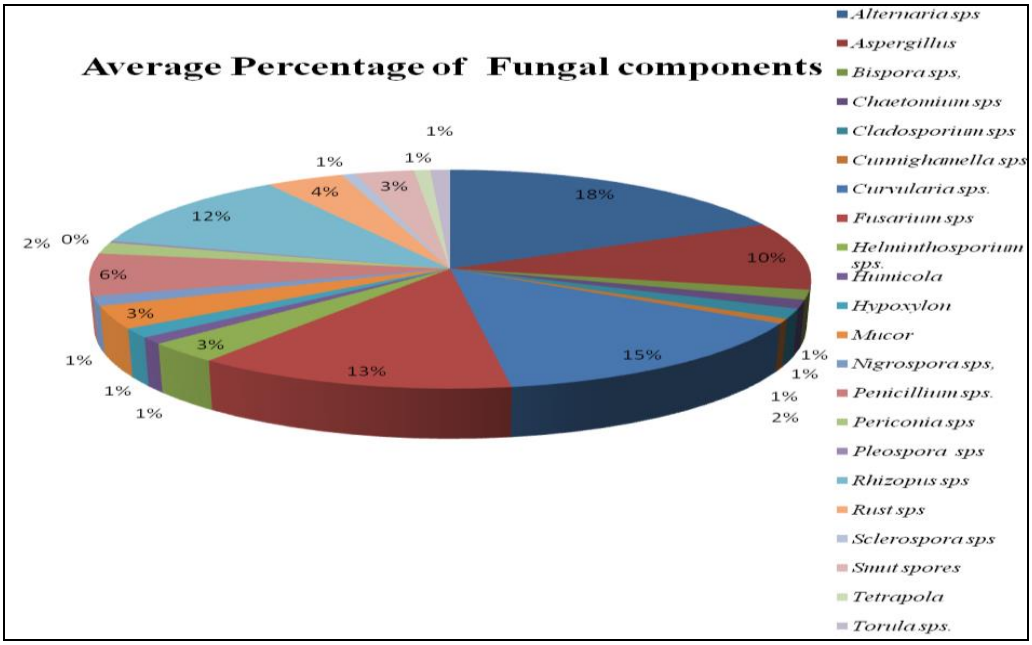

Fig 4

The sites have dense population and with many multi-storied buildings, slum areas, dumping grounds, marshy places due to which it had become essential to analyses of air-spora rather than the customary "above the ground level" survey. There was not much difference in the composition of the air-spora at all the site.

The air-spora components mainly consisted of fungal spores and other particulate matter. The fungal spores also showed a fluctuating trend of incidence. Among all the total isolates Ascomycetes dominated by16 genera, followed by zygomycetes three genera with three genera from basidiomycetes. The Dominant Ascomycetes genera included *Alternaria, Aspergillus, Bispora, Chetomium, Cladosporium, Curvularia, Fusarium, Helminthosporium, Hypoxylon, Humicola, Niropsora, Penicillium, Periconia, Pleospora, Tetrapola, Torula* etc contributed 73 % of the total colony count, while Basidiomycetes like *Sclerospora*, rust and smut spores contributed 13.5% and Zygomycetes like *Mucor, Rhizophus* and *Cunninghamella* 13.5 % of the total count, while Deuteromycetes and Oomycetes are in negligible amount and not encountered in catchae may be due to lack of the lack of favorable environmental condition necessary for their growth and development

The results of the present study showed similarity to other studies carried out in the city, both intramural and extramural, by previous workers. Mumbai and its Western suburbs have a hot and humid climate. The humid weather and wet substrate after the rains, favors 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 airospora but it also promotes the growth and sporulation in fungi. (Karmer *et al.*1960).

By using gravity slide sampling it was observed that among the "other types" recorded at all the three heights were dried plant parts viz. trichomes, epidermal peelings, fibers, heterocyst, insects parts etc. which were frequency in the atmosphere during the winter and summer months. During the post-monsoon month's mites, insect parts including scales, wings, eggs, larvae etc. made their presence felt in the trappings.

There was a higher incidence of air-spora showing a peak during the windy months. It is deduced that the velocity and direction of wind play an important role in carrying the air-borne, fungal spores as also other microbial components to greater heights.

The salient feature of this investigation, highlighting the major findings, conclusions Other biotic matter like trachoma', epidermal hairs, fibers, insect wings, insect eggs etc. trapped in the atmosphere frequently during winter and summer months, during post-monsoon month's insect parts, protozoan cysts, etc. made their presence felt in the trapping. Studies over different sites have contributed in understanding the components of air spore; it was also observed that fungal spores showed a marked correlation with the weather condition. An interesting observation made was the presence of fragmented algal forms like *Anabaena, Chlorococcum, Nostoc* also accounting for the other types of air-spora. Their presence could be corroborated to the water collected in pools and ditches due to large number of building construction activities going on in these localities.

Conclusion

From the investigation it is concluded that fungal population growth is closely linked with season climatic condition, rain & humidity these aspects play an important role in the concentration of fungal spore and amongst the recorded fungal spores *Alternaria* followed by *Carvularia, Fusarium* and *Rhizopus* was dominant contribution of Aeromycoflora. On being analyzed, during study the samplings have shown specific fungal spores dominating the airspora at the sites over others and micro bio particulate. Among the fungal spores there are substantial species belonging to the bio deteriorating 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, which occupied the third position among the total airborne micro-bio particulate. And as this study has recorded several, fungal spore types and pollen grains, which are known to be allergenic.

For a vast city like Mumbai, Pune and their suburbs which is thickly inhibited, it is necessary to undertake extensive aerobiological survey to trap and enlist the offending bio-allergens in different seasons of various locations.

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