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Aeromycological Studies of Indoor Environment of Rural Healthcare Centre Sindewahi by Volumentric air sampler method in General Ward

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Introduction

Sindewahi Rural Healthcare Centre is located in India at latitude 20.283220 and longitude 79.6667600. The three seasons of this region's climate—summer, winter, and rainy season—are determined by factors including temperature, humidity, and rainfall.[1] From February to May, the summer season begins, with highs of 45 to 47 degrees Celsius. Rainfall often falls between June and September, while winter begins in October and lasts until January, with lows of 8 to 9 degrees Celsius.[2] Three distinct parts of the air were sampled in order to investigate the indoor aeromycoflora of the rural health care center. G.W., or general ward.[3]Regular air sampling was conducted twice a month for the two years in a row, from August 2014 to July 2016. Doctors at the Rural Healthcare Center Sindewahi visit the general ward from 9:00 am to 10:00 am and from 4:00 pm to 5:00 pm. They give admitted patients test recommendations and medication prescriptions.[4] Formaldehyde fumigation is the procedure used for sterilizing. Using a volumetric air sampler, air samples were routinely taken from sections G.W. of the rural health care center Sindewahi.

Latitude and Longitude Position of Rural Healthcare Centre Sindewahi

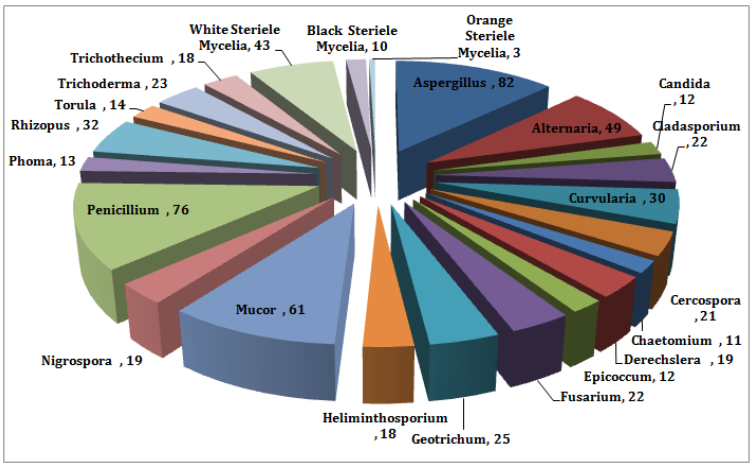
Results and Discussion

Volumetric Air Sampler Method

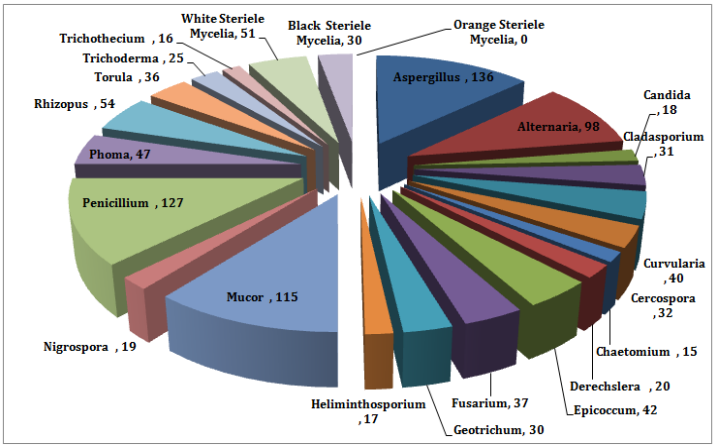
Indoor aeromycoflora in Rural Healthcare Centre Sindewahi

The concentration of indoor airborne fungal spores can be easily and conveniently studied using the air sampler method. The Hi media air sampler Mark II was utilized in this investigation to gather aerospora.[5]During the two-year study period, 38360 CFUs/M3 were captured at the rural healthcare center Sindewahi utilizing a Hi Media Air Sampler Mark II. A total of 16470 CFUs/M³ were reported throughout the first year (August 2014–July 2015), with 6600 of those CFUs/M3 being trapped in G.W.[6]

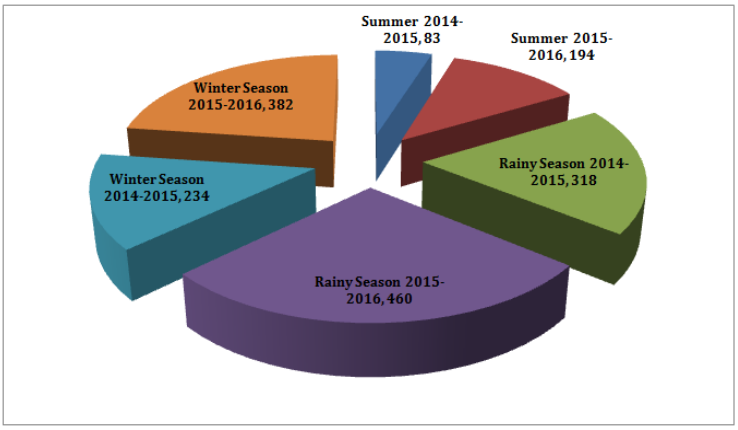
Seasonal change has an impact on indoor fungal spore densities. The rainy season had the highest CFUs/M³, followed by winter, while summer had the lowest. Between August 2014 and July 2015, there were 7765 CFUs/M³ (41.74%) during the rainy season, 5709 CFUs/M³ (34.60%) during the winter, and 2960 CFUs/M3 (17.97%) during the summer. July had the highest number of CFUs/M³, followed by August, September, October, November, December, January, June, February, March, and April. May had the lowest number of CFUs/M³.[7]A total of 21890 CFUs/M³ were reported throughout the second year of the study (August 2015–July 2016), of which 8360 CFUs/M3 were identified in G.W.[8] Seasonal change has an impact on the fungal spore concentration.



Total No of Fungal Colonies recorded in G.W. & their % contribution of total aeromycoflora for the year 2014-2015



Total No of Fungal Colonies recorded in G.W. & their % contribution of total aeromycoflora for the year 2015-2016



Seasonal Variations of C.F.U./M³ and no of colonies and their % Contribution in G. W. by Volumetric air sampler method for the year 2014-2015 & 2015-2016

The rainy season had the highest CFUs/M3, followed by winter, while summer had the lowest. Between August 2015 and July 2016, 8935 CFUs/M3 (40.81%) were observed during the rainy season, 7790 CFUs/M3 (35.58%) during the winter, and 5215 CFUs/M³ (23.82%) during the summer.[9] July had the highest number of CFUs/M³, followed by August, September, November, October, December, January, February, June, March, and April. May had the lowest number of CFUs/M³.[10]

Indoor aeromycoflora in General Ward (G.W.)

During the two-year study period (Aug. 2014–July 2016), a total of 14960 CFUs/M3 were recorded in the G.W. of the Rural Healthcare Center Sindewahi utilizing a Hi Media Air Sampler Mark II.[11]

There were 6600 CFUs/M3 in total throughout the first year (2014–2015). Seasonal change has an impact on the fungal spore concentration. The rainy season had the highest CFUs/M3, followed by winter, while summer had the lowest.[12] There were 3100 CFUs/M3 (46.96%) during the rainy season, 2300 CFUs/M3 (34.84%) during the winter, and 1200 CFUs/M3 (18.18%) during the summer. July had the highest CFUs/M3 at 1025, followed by August, September, October, November, December, January, June, February, March, and April, in that order, and May had the lowest at 175 CFUs/M3.[13]

A total of 8360 CFUs/M3 were obtained during the second year of the study (August 2015–July 2016), and seasonal variation had an impact on the fungal spore concentration.[14]

The rainy season had the highest CFUs/M3, followed by winter, while summer had the lowest. There were 3150 CFUs/M3 (37.67%) during the rainy season, 3055 CFUs/M3 (36.54%) during the winter, and 2155 CFUs/M3 (25.77%) during the summer. July had the most CFUs/M3, followed by August, September, October, November, June, December, January, February, March, and April, in that order, and May had the lowest CFUs/M3.[15] Talk about Using volumetric air sampling with a Hi Media Air Sampler Mark II, an aeromycological survey was carried out every two weeks for two years (Aug 2014–July 2016) from the indoor environment of the rural health care center Sindewahi, Chandrapur District. In order to sample aeromycoflora in an interior context,[16] Tilak (1982) proposed combining two distinct air sampling techniques, such as volumetric air sampling using the Hi Media Air Sampler Mark II.[5-17]

According to a two-year study conducted at the rural health care center Sindewahi between August 2014 and July 2016, 71 fungal species from 20 different fungal genera were recovered.[18] In addition, sterile mycelia that were white, black, and orange were isolated. Where as *Deuteromycotina* accounted for 66.39% of the fungal species, followed by *Phycomycotina* with 15.28% and *Ascomycotina* with 7.23% and 8 fungal species, respectively.[19] 11.09 percent sterile mycelium was found. According to the findings of Kotwal S.G. and Gosavi S.V. (2010), *Deuteromycotina* predominated in the indoor environment of the healthcare facility, followed by *Phycomycotina* and *Ascomycotina*.[20]

Rural Healthcare Centre Sindewahi					
Volumetric Air Sampler Method					
Seasonal Variations of C.F.U./M³ and no of colonies and their % Contribution in General ward (G. W.)					
Year August 2014- July 2016					
Season	Year	Total No of Colonies	% Contributions	Total No of C.F.U./M³	% Contributions
Summer	2014-2015	83	13.07	1200	18.18
	2015-2016	194	18.72	2155	25.77
Rainy Season	2014-2015	318	56.07	3100	46.96
	2015-2016	460	44.4	3150	37.67
Winter Season	2014-2015	234	36.85	2300	34.84
	2015-2016	382	36.87	3055	36.54
Total		1671		14960	

Aspergillus were dominant having 659 colonies (14.08%) followed by *Penicillium* 570 colonies (12.18%), *Mucor* 458 colonies (9.79 %), *Alternaria* 432 colonies (9.23 %), *Rhizopus* 257colonies (5.49 %), *Curvularia* 179 colonies (3.82 %), *Cercospora* 157colonies (3.35 %) *Fusarium* 145 colonies (3.09%), *Phoma* 139 colonies (2.97%), *Epicoccum* 136 colonies (2.9%) *Geotrichum* 134 colonies (2.86%) *Torula* 125 colonies (2.62%), *Cladosporium* 123 colonies (2.62%), *Helminthosporium* 113 colonies (2.41%), *Trichoderma* 110 colonies (2.35%), *Nigrospora* 105 colonies (2.24 %), *Trichothecium* 89 colonies (1.90%) *Drechslera* 85colonies (1.81%),*Candida* 75 colonies (1.6 %), *Chaetomium* 68 colonies (1.47%). Along with these White sterile mycelia 366 colonies (7.82%), Black sterile mycelia 145 colonies (3.09%) and Orange sterile mycelia 8colonies (0.17%) was noted in two years investigation.[21] *Aspergillus, Penicillium* spores represent most abundant aeroallergens in the indoor air. *Aspergillus* was the basic component of the atmospheric mycoflora. Majumdar and Harzara (2005). In 1st year investigation By volumetric air sampler method total 16470 CFU's/M3 were recorded, out of which 6600 CFU's/M3 were trapped in G.W. In 2nd year of investigation (Aug2015- July 2016) By volumetric air sampler method total 21890 CFU's/M³ were recorded, out of which 8360 CFU's/M³ were isolated in G.W. The present finding was correlated to the result of study conducted at university hospital in Rotterdam, Netherlands.[22] Where the concentration of fungal spores was higher in indoor open area sections as compared to wards and operation theaters .by A.C Leenders et al. (1999) Seasonal Variation The monthly contribution of total colonies enumerated in GW of rural health care center Sindewahi, during 2014-2015 and 2015-2016 were illustrated in table4.4 and 4.5 respectively.[23] The colony counts in different months varied from 44-273 in first year of study, while it was from 77 to 382 in the second year of study period. The higher colony counts were observed in the month of July (273) followed by August (242) in 2014-2015. Also in the next year of investigation the maximum colony count were observed in month of July (382) followed by August (350). On the average percentage contribution of monthly colony counts to the total colony counts varied from 2.48% to 15.43% and 2.64%to 13.13% in both years respectively.[24] In the first year the highest colony counts was recorded in month of July (15.43%) followed by August (13.68%), September (12.88%), October (11.02%), November (99.83%), December (8.3%), January (6.89%), June (6.67%), February (5.25%), March (4.4%), April (3.1%) and

least was reported in May (2.48%) .In second year of investigation (2015-2016), the highest colony counts were recorded in month of July (13.13%) followed by August (12.03%), September (11.44%) October (10.69%), November (9.62%), December (8.62%), January (7.8%) June (7.52%), February (6.66%), March (5.77) April (4.02%) and least in May (2.64%).[25] When both the year of study was analyzed comparatively according to season wise by volumetric air sampler methods when used to analyze the seasonal variation of fungal colonies.[26] Rainy season was dominated over the other by contributing 41.74% with 7765CFUS/m3 in the year 2014-2015 and 40.81% with8935 CFUS/m3 in second year of investigation.[27]Winter season showed approximately similar contribution 34.6% with 5705 CFUS/m3 and 35.58% with 7790 CFUS/m3 in first and second year of investigation respectively. The summer season contribute least 17.97% with 2960CFUS/m3 in year 2014-2015, while it was 23.82%with 5215 CFUS/m3 in year 2015-2016. Maximum fungal colonies were recorded during rainy season because of favorable climate such as high rain fall with increasing humidity and moderate temperature which is good for growth and development of fungi.[28] And high temperature with decreasing humidity (dry condition) arrests the growth and development of fungi.[29] The correlation between fungal spore concentration and metrological parameter was reported by Sudharsanam S. and Srikanth P. (2008), Pandey (1992), Tilak and Vishwe (1975).[30]

Conclusions

The study conducted at the Rural Healthcare Centre Sindewahi in India analyzed the indoor aeromycoflora of the center using air sampling from August 2014 to July 2016. The air samples collected were used to collect aerospora, revealing 71 fungal species from 20 genera. The study found that the concentrations of indoor fungal spores were affected by seasonal variation, with maximum CFU's/M^3 recorded in the rainy season, followed by winter, and minimum in summer. The study highlights the importance of understanding the indoor aeromycoflora of rural healthcare centers to improve patient care and prevent disease spread.

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