V DISCUSSION

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The present investigation deals with the study of air spora of college library (Intramural study. The investigation was carried out by using "Rotorod Air Sampler" from 1st January 1987 to 30th January 1987 to 30th June 1987.

During this period of investigation total number of bipollutants trapped was 198185/m^3. The groupwise distribution of these biopollutants is as follows.

1. Phycomycetes spores (5920/m^3) contributing 2.987%.
2. Ascomycetes spores (3230/m^3) contributing 1.629%.
3. Basidiomycetes spores (88095/m^3) contributing 44.450%.
4. Deuteromycetes spores (97360/m^3) contributing 49.125%.
5. Other group spores (3580/m^3) contributing 1.806% to the total number of air spora.

Graphs of each spore type showing weekly variations, and Histograms showing monthly variations are given separately.

Air spora of college library is very rich in fungal spores. Their occurrence shows much fluctuations due to the the factors like storms, rainfall, high temperature, change in humidity. As well as parcels of new books, their packing materials etc. also transmittes large number of spores, which were introduced from different places.

It is observed that the concentrations of biopollutants varied, it is with low concentration in February, but in March

and April the percentage attands its highest peak. Generally after raining the concentrations decreses as the spores from atmosphere get wet, becomes heavy, and settled down or washed off, from the air. The heavy velocity of wind and storm also affect concentration of spore catches.

The high percentage of spores in the library have deteriorant effect on equipment, paintings and library materials in which the substrates and organisms interact. (Tilak and his associates 1972, 1975, 1977).

The biodeterioration includes mildewing or rotting, mechanical damage, staining or spoilage of materials. Some fungi destroy cellulose decomposing material leather and plastic material (Armitage 1949, Kowalik and Sadursha 1956).

So the analysis of the composition, seasonal variation and the concentration of various types of biodeteriorating microorganisms in the indoor air and the microflora during packing, storage and transit are gaining greater importance.

Phycomycete group was represented only by Sclerospora whose oospores were recorded. Their contribution was 2.987% to the total air spora, due to the occurrence of downy mildew diseases of Jawar (Hybrid variety CSH I, CSH 5, CSH 7) and Bajra which was present around the sampling site i.e. common cultivated crops around the library. First time reported the presence of sclerospora (0.036%) to the total air spora in 1978 by Mane over Bajara field at Vaijapur.

Patil and Kulkarni (1981) and Kulkarni and Kulkarni (1985) recorded 7.501% and 26.336% oospores of Sclerospora to the total air spora at Kolhapur respectively.

In present investigations the percentage was more as compared to earlier reports of Mane (1978). But it was less than that of Kulkarni and Kulkarni (1985) and Patil and Kulkarni (1981). This variation in percentage might be due to the surrounding vegetation and meteorological conditions.

The group Ascomycetes was represented by ascospore types. They were identified up to generic level. The total number of ascospores encounted was 3230/m^3 with 1.629% to the total number of air spora. The ascospores of the genus Meliola, Which is rare one, are also present in the library air, which might be carried from outer atmosphere.

This area is surrounded by different cultivated plants as well as Koyna forest. Occurrence of this genera in air spora of the library is probably due to their existance on the suitable hosts in this forest and which are transported by wind in the atmosphere of the library.

The presence of ascospores of other genera is dependent on the environmental factors like temperature, rainfall, and humidity. Meredith (1961) showed that the temperature and rainfall stimulates the development of reproductive structure

which are of prime importance in determinating the long term periodic fluctuations i.e. abnormal cycle of air spora.

The spores of Xylaria, Hysterium, Hypoxylon, Chaetomium were of common occurrence. Most of the above genera were reported by Patil and Kulkarni (1981) and Kulkarni and Kulkarni (1985) at Kolhapur. In general, ascospores were recorded throughout the investigation period.

Among the Basidiomycetes members, the spores of rust and smuts were trapeed during this investigation. The Uredospores of rust fungi, and smut spores are present in large concentration as compared to the other air spores.

The smut spores (69315/m^3) were trapped during this investigation period, which contributes 34.914% to the total air spora. These spores stood first, in numberical series to the total catches.

Actually the smut spores (Chlamydospores) are included in only one category i.e. the smuts. High percentage of these spores indicates their abundance in the atmosphere of the library.

Karad city is located on the banks of Krishna and Koyna rivers, its agricultural potential is always lodged with sugarcane crops, which were grows continuously for one two or even for three annums as 1^{st} crop, 2^{nd} and 3^{rd} crop.

Generally the 2nd and 3rd sugarcane crops, known as ratoons were infected by smuts which produces smut spores in abundant quantity and spread in the air, producing allergenic effect, and polutes the air.

High concentration of smut spores were also reported by Ramalingam (1971) from Mysore. Disease incidence of smuts on various field crops like Bajara, Jawar, Sugarcane and Maize etc. In this region the occurrence of these spores in the air is in high concentration. Gregory (1973) pointed out that blowing away (deflation) occurs commonly with dry spored fungi, including moulds, smuts and rust Uredospores.

The spores are often present on an elevated sporophore, any stem or leaf pathogen carried away by the wind. Higher the wind speed, the more spores are carried away. Spore shedding in higher Basidiomycetes is less affected by humidity and wind speed. Smut spores are proved to be one of the pctential factor of allergenicity in cattle (Ivanov 1949) and it is worthwhile to study their atmospheric incidence in greater detail.

Another member of the Basidiomycetes is Uredospores, which is also present in large concentration (18775/m^3) and contributing 9.473% to the total air spora. This is correlated with the outbreak of the rust disease on plants like Jawar, Bajara etc. in this area.

The Teleutospores of puccinia are very rare in their occurrence which plays negligible role in concentration ($5/m^3$) as well as contribution (0.003%) to the total air spora.

The class Deuteromycetes was represented by 43 spore types. The conidia of deuteromycetes stood first in groupwise distribution of spores. They are present in highest concentration ($97360/m^3$) and also in contribution (49.125%) to the total air spora.

The genus Alternaria was stood first from Deuteromycetous group, and stood second to the total air spora. The genus Alternaria have the concentration $19590/m^3$, and contributes 9.884% to the total number of air spora. Among deuteromyces Alternaria stood first, which was followed by Nigrospora (7.725%), Helminthosporium (6.398%), Curvularia (5.908%), Epicoccum (5.419%), Cladosporium (3.009%), Clasterosporium (1.445%) and Phialophora (1.216%).

These were predominant spore types, which might be due to their wide host range, besides, their high saprophytic mode. The percentage of remaining spores from deuteromycetes is very low as compared to above dominant types.

Hyphal fragments, Algal fragments, Insect scales, Xylem fibers and Unidentified fungal spores were also trapped during investigation period. Hyphal fragments contributes

0.257%, Algal fragments contributes 0.113%, Unidentified spore group contributes 1.155%, Insect scale, contributes 0.302%, and Xylem fibers contributes 0.088% to the total air spora. Hyphal fragments were found to be viable and may from colonies by asexual reproduction.

Algal fragments especially from Cyanophycean group were recorded throughout the year, along with xylem fibers as sclerenchymatous, collenchymatous and parenchymatous cells.

In increase in the concentration of insect scales in the air was usually associated with humidity and high velocity of wind.

During this investigation, the smut spores, Alternaria, Uredospores, Nigrospora, Helminthosporium and Curvularia spores 80% fulfils the concentration as well as percentage contribution as (146380/m^3) and 79.721% to the total number of air spora.

Agarwal et al (1969) reported that the fungal spore concentration depends upon seasonal variations. According to Gregory (1973) and Meredith (1962) rapid changes in the humidity during early morning and early night hours, probably play significant role in releasing new conidia into the air. He further mentioned that human activity also responsible for discharge and release of spores.

Shanmuganathan and Arulprangasum (1966) have observed that if there is a continous rain of several hours duration, there is generally a drop in the daily catches. Hirst (1953) has shown that the spores of Cladosporium, Erysiphae, Alternaria and smuts, are mostly removed by prolonged rain and are replaced by 'damp air spora' (mainly Ascospores and some Basidiomycetes members).

Another factor affecting the spore load is the intensity of wind, high wind velocity, usually carries more spores than low wind velocity. Zoberi (1961) and Ingold (1963) have made a study of the take off of mould spores in relation to wind velocity and humidity. Dry spored types were found to be most effectively liberated at low relative humidity and wind speed.

Regarding disease development and spread it can be said that the plant diseases generally do not occur unless following requirements are fulfilled.

1. Presence of susceptible and sensitive host plant.
2. Presence of pathogen in the form of viable spore or vegetative and carrying agent like wind, water drop or any other transferring media.

The air borne pollen grains of many different types are allergic to sensitized persons and causes the distressing

symptoms on his health. There are also many fungi which are also air borne and capable of causing similar allergenic symptoms. According to Feinberg (1946) the fungi which are from Deuteromycetes are responsible for allergies in man and these members are particularly species of Alternaria, Phoma, Chaetomium, Cladosporium, Helminthosporium and Penicillium etc.

In regard to clinical implications of Alternaria Feinberg (1935-46) firstly demonstrated its importance as a cause of allergy. It was found to be commonest factor, in a series of about 68 patients, with cutaneous reaction to fungi. Durhaman (1937) have reported that Alternaria was the most abundant allergen in the central U.S.A.

Feinberg and Samsea-Jansen T.(1950) reported that mould spores are also allergic. Sinha and Johri (1971) while discussing the biopollutions have mentioned that organism itself modify their environment in its own turn modify the organisms. Bacteria, Fungi, Viruses and pollen grains many times causes pollutions in the air . These biological agents which causes pollution are known as biopollutants. In India there are about 90% counts of air borne biota belongs to fungi. In the present investigation, the biopollutants like Alternaria (9.884%), Penicillium (0.012%), Cladosporium (3.009%) Chaetomium (0.711%), Phoma (0.058%) contributes the common allergens .

Ramalingam (1971) in the general survey has reported about 68 types of air borne pollutants which are harmful to plants and animal health.

Hanson (1928) studied the role of fungal spores and he reported that these spores are etiological elements in hay fever and asthama. He says that the spores of Aspergillus and Penicillium spores in air causes asthma in man.

Frey, Cross and Durie (1963) states that the following fungal spores are allergic to man. These spores are arranged according to its allergic frequency.

1. Fusarium
2. Mucor
3. Chaetomium
4. Alternaria
5. Pullularia
6. Helminthosporium
7. Neurospora
8. Phoma
9. Penicillium
10. Cladosporium
11. Aspergillus
12. Pleospora
13. Stemophyllum
14. Epicoccum

Nilsby (1949) reported that the spores of mould fungi develop allergenic reactions in the same manner as pollens. They are smaller than pollens and therefore aboveto remain suspended freely in the air and entered in the bronchial system during respiration.

During this investigation, the total number of spore types recorded is sixtyone, out of these sixtyone types of spores, following are the common allergenic biopollutants, with their percentage contribution and spore concentration to the total air spora. These spores are allergenic, whose allergenic reactions are previously proved by many workers. (Frey, Cross and Durie (1962), Agarwal (1969), Nilsby (1949), Feinberg (1946) and Hanson (1928)).

Name of the spores	Concentration/m^3	% contribution to the total air spora.
1. Smut spores	69315	34.914
2. Alternaria	19590	9.884
3. Helminthosporium	12680	6.398
4. Curvularia	11710	5.908
5. Epicoccum	10740	5.419
6. Cladosporium	5965	3.009
7. Chaetomium	1410	0.711
8. Pleospora	675	0.340
9. Phoma	120	0.058
10. Penicillium	20	0.012