APPENDIX – 1

QUESTIONNAIRE
QUESTIONNAIRE

PERSONAL DATA

Name: ________________________________

Address: ________________________________

Age: ___  Sex: F/M  Height: ___cm  Weight: ___kg

Occupation: ________________________________

Mode of transport:

   bus    2-wheeler    car    others

Whether person resident of Bangalore

   yes    no ,   duration __________

Habitat:  slum    urban    rural

Type of residency:

   flat    independent house    hut

Surroundings:
residential housesfew ornamental plants
roadside lines by avenue trees in industrial suburb

Home environment:

new old damp near water

Does the room contain:

heavy curtains heavy carpets furniture

Type of bed, pillow and linen used:

cotton cotton silk feather bedding foam

Whether any pet in the house. clarify

Economical status:

poor lower middle class middle class

upper middle class upper class
Nature of allergy if patient goes out of Bangalore:

- free of symptoms  feels better
- feels worse  no difference

**COMPLAINTS:**

Nasal blockage:  Nasal discharge:  yes  not
- Seasonal  chronic
- Consistency:  thick  watery

Sneezing
- coloured  bloodstained  crusty

Itching
- Nose
- Eyes
- Ears
- Palate
- Ocular
Loss of smell
Plugged ears
Poor concentration
Breathlessness

Loss of taste
Fatigue
Giddiness
Wheezing

Cough: yes no
dry productive

Colour: white green
light green grey
brownish with blood

Chest:
heaviness tightness

Time of occurrence of symptoms:
Season:
winter summer monsoon autumn

Month:
January
February
March
April
May
June
July
August
September
October
November
December

Weather:
sunny    cloudy    rainy

Day:

morning     afternoon     evening
night        midnight

Temperature:

cold       warm       hot

Where is the patient when symptom occurs:

outside in garden      at home
in the bedroom      at work

Occurrence of symptoms:

working days      weekends      all days

**FAMILY AND PERSONAL HISTORY**

The age at which symptoms began ____________

Type, occurrence and frequency (episodic, seasonal and perennial)

__________________________________________________________

Duration, severity of symptoms and diurnal variations

_________________________
Provoking factors: non specific triggers, cold air, exercise, barometric changes, stress, strain, pollutions and allergen at home or work environment

Past and present medication and their response

Eliciting drugs (provocative the symptoms)

History similar problem in blood relatives

Life style of the patient:

Smoking: yes not
Age when started smoking ________
Duration of smoke ________
Type of smoke ________
Age when left smoking ________

Consuming alcohol: yes no
occasional habitual
Age when started drinking  

Signature of the Patient
APPENDIX – 2

FUNGAL SPORE CALENDAR
OF BANGALORE
| TAXON          | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Cladosporium  | 29.80 | 20.82 | 15.35 | 11.12 | 78.55 | 28.56 | 36.06 | 8.93 | 39.14 | 27.12 | 33.74 | 35.64 |
| Periconia     | 19.19 | 13.11 | 9.05 | 10.13 | 8.68 | 8.24 | 7.84 | 8.00 | 7.84 | 8.00 | 13.24 | 24.56 |
| Smuts         | 22.35 | 14.63 | 8.55 | 7.31 | 4.05 | 6.96 | 7.58 | 6.42 | 4.85 | 7.11 | 18.32 | 22.30 |
| Nigrospora    | 11.82 | 10.21 | 6.84 | 9.05 | 5.40 | 6.89 | 4.90 | 3.34 | 4.59 | 4.59 | 6.56 | 12.88 |
| Ascosporites  | 1.59 | 1.74 | 2.79 | 8.86 | 3.76 | 4.14 | 7.27 | 10.74 | 7.18 | 14.25 | 5.84 | 2.59 |
| Basidiospores | 1.95 | 1.24 | 2.16 | 2.12 | 3.93 | 3.04 | 5.23 | 3.52 | 3.52 | 1.47 | 3.17 | 4.97 |
| Aspergillus   | 4.44 | 3.43 | 3.62 | 5.65 | 3.71 | 3.39 | 3.52 | 3.52 | 1.47 | 3.17 | 4.97 | 9.06 |

**Fungal Spore Calendar of Bangalore (2000-2002)**

- **Fair**: 1-25
- **Optimal**: 25-50
- **High**: 50-75
- **Very High**: 75-100
APPENDIX – 3
BANGALORE MOLD WATCH
(NEWSPAPER CLIPS)
The main objective of reporting atmospheric pollen and fungal spore spectrum in the form of Pollen and Mould Spore Watch is to give a total picture of airborne pollen and fungal spores causing allergies. These airborne bioaerosols are also called as allergens. Pollen shedding and liberation of mold spores depends on the nature of source plants and prevailing weather factors. Hence seasonal climatic changes are reflected in the pollen and fungal spore spectrum in the atmosphere.

Pollen Watch compiled for the last week, i.e., March 22-27 indicates that particular pollen spores occupied the first position in its contribution. However, these pollen has increased by 13.90% to 15.6% occupying second position. Large trees of Pterocarpus santalum and ngoula producing large golden coloured flowers are seen prominently in number of avenues in Bangalore city. These pollen is represented by 6.72% in the atmosphere. The other trees producing large allergenic pollen is on the decline and is represented this week only by 2.27%.

Mold Watch compiled for the last week shows predominance of Nigrospora (18.50%) followed by Alternaria (11.30%), other fungal spores represented by some 7.5% are Aspergillus, Helminthosporium, Sordaria, Tulas, Curvularia and Alternaria. Total mold spore count came down from earlier weeks 2.11 to 649.86 per cubic metre, 1.51 to 488.51 per cubic metre this week. Rise in the atmospheric temperature during past week may be one of the reasons for the decline of total fungal spore count.

*Compiled by Dr. Shripad N. Agashe, Ramaguru B.S. and Kshetraswami Muniakas, Aerobiology and Allergy Laboratory Department of Botany, Bangalore University, Bangalore-56*
There does not seem to be appreciable change in the pollen spectrum or fungal spore spectrum during the last week (April 11-17) compared to earlier week. Total pollen count is reduced to 202 reflecting the pollen density of 62.24 cubic metre.

*Parthenium hysterophorus* (21.30%) continued to dominate the pollen spectrum followed by pollen of *Poaceae* members (18.33%), *Cocos Nucifera* (coconut - 8.91%), *Peltophorium Pterocarpum* (6.94%) and *Moraceae* members (5.44%).

Trees of *Syzygium* sp. (producing violet fruits known as *Jambool* or *nerale haruru* in Kannada) are flowering profusely in this period, which is reflected in its pollen representation of 7.42%. *Delonix Regia* (Gulmohar) is another tree producing orange to red colour flowers blossoming throughout Bangalore. Though primarily Entomophilous their pollen is represented by 1.47% in the atmosphere.

The Mold Watch compiled for the same period mentioned above indicates the increase in total fungal spore count of 2.595 equivalent to density of 767.3 per cubic metre of air sampled. *Cladosporium* (12.78%), *Alternaria* (12.3%), *Smut spores* (11.58%), *Nigrospora* (11.4%), *Helminthosporium* (11.0%) are represented in descending order in their percentage representation in the Bangalore atmosphere.

The city received total rainfall of 61.6 mm during this week. The relative humidity was on higher side in this week. These two factors have possibly triggered the higher mold spore count. The ratio of pollen to fungal spores in the atmosphere this week works out to be 1:12.8.

Compiled by Dr. Shripad N. Agashe, Rangaswamy B.E. and Kesharvane Manekkal, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore - 560056.
The pollen and mold watch given here covers the period April 17-May 1. There has been a lot of fluctuation in the weather during the last fortnight. Hot days with temperature above 30°C were accompanied with relatively high humidity interspersed by mild rainfall. All these factors are responsible for day to day variations not only in the quality of pollen and spores in Bangalore atmosphere, but also total pollen count and density. Pollen spectrum during last fortnight as depicted in the pie chart shows sudden jump in the total pollen count to 496 indicating pollen density of 152.97 per cubic metre of air sampled.

Qualitatively Parthenium pollen occupy first position (22.99%) followed by grass pollen (16.74%), pollen of herbaceous plants like Mimosa pudica (sensitive plant or touch me not plant) and pollen of tree species such as Syzygium, Peltophorum and Cocos nucifera (coconut). Pollen of obnoxious thorny weed Amaranthus spinosus is represented by 3.42%. Pollen of avenue trees such as Delonix regia (Gulmohor) and Cassia are represented by a smaller percentage of 2%.

Mold spore monitoring indicates total spore count of 2,258 or density of 696 per cubic metre of air sampled. More than 10% each of fungal spore population is shared by Smut spores, Alternaria, Cladosporium, Nigrospora, Periconia and Helminthosporium. Unlike previous week, Smut spores (30.51%) top the list of mold spores in the Bangalore atmosphere.

Compiled by Dr Shripad N. Agashe, B. E. Rangaswamy and Khaidarova Mamlakatov Aerobiology and Allergy Lab, Department of Botany, Bangalore University, Bangalore-560 056. Email: shripad.agashe@vsnl.com
The atmospheric pollen and mold spore monitoring carried out during the last week (May 2 and 8) shows considerable qualitative and quantitative variation which is probably due to unusual weather conditions. Higher day temperatures ranging from 32 degree centigrade to 35 degree centigrade were followed by cooler evenings and nights. The rains ranged from sporadic to heavy downpour accompanied by thunder and thunderstorms.

Stormy conditions result in higher air turbulence which is responsible for rapid release and distribution of pollen and spores in the atmosphere. However, this condition has adverse effect on the deposition of pollen and spores on the ground and to some extent on the pollen trapping device.

Similar to last week, Parthenium hysterophorus (34.39%) and Poaceae members (17.30%) indicate top two positions in the percentage representation. Surprisingly, the pollen of Dehlon Regia (gulmohar) has shot up to (6.05%). However, this pollen is in full bloom all over the city. Another noteworthy feature is the fairly high percentage of Pongamia pollen (7.32%) which occupies third position in the pollen spectrum.

Pollen of herbaceous plants like Ricinus Communis (1.59%) and Amaranth chenopod (1.04%) have been reduced considerably in the atmosphere. Total pollen count for this week was 314 and the pollen density recorded was 96.9 cubic centimetre of the air sampled.

Mold spore watch compiled during the above mentioned period shows increase in total spore count to 2,457 reflecting density of 741.47 per cubic metre of air sampled. Smut spores which predominated last fortnight has given place to Cladosporium 17.22% and themselves occupied fifth position represented by 7.40% in the atmosphere. Periconia spores (15.81%) are the second predominant spores in the atmosphere. Other fungal spores represented by more than 3% in the fungal spore spectrum comprise Ascospores, Aspergillus and Torula.

Compiled by Dr Shripad N. Agashe, Rangaswamy B.E. and Khalidarova Mamlakatol, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore - 560056.
Aeropalynological survey of Bangalore carried out during the period May 22 to 28 by using Rotorod (Model - 40) impacting sampler indicates that there is not appreciable change in the pollen and mold spore scenario except for the fact that total pollen count has gone up from earlier week’s 207 to 247 (indicating a density of 76.22 per cubic meter of air sampled). In contrast, mold spore count has gone down from earlier week’s 1,792 to 1,671 (density of 513.1 per cubic metre of air sampled).

Poaceae member (Grass pollen) and Parthenium hysterophorus pollen have shifted their rank this week. Grass pollen are represented by 36.03 % and Parthenium hysterophorus pollen are represented by 22.67%. Surprisingly, the pollen of Morus alba occupy the third position in the air-borne pollen (8.09%). This is the plant which is important from the point of view of sericulture as the silkworms feed on the leaves of this plant. The pollen of Cocos nucifera has increased their percentage representation to 5.26%. The significant pollen in the atmosphere of other plants belong to Syzygium (4.04%), Mimosa pudica 3.23% (Touch me not plant) and Eucalyptus species (2.83%).

As regards the atmospheric mold spore scenario, Nigrospora spores are found to be the most predominant, represented by 17.80%. These spores are very easy to identify as they are pitch black in colour and spherical in shape ranging in size from 10-35 micron. Next in predominance are the smut spores (13.23%) followed by Cladosporium (12.14%), Periconia (11.89%), Alternaria (7.09%) and Helminthosporium (4.87%).

Compiled by Dr. Shripad N. Agashe, Rajani K.S and Khaidarova Mamlakatoi. Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore - 560056.
The pollen and mold spore monitoring carried out during November 1 to 5 shows the total pollen count for this period was 177, representing a pollen density of 54.15 per cubic metre of air sampler and the fungal spore count was 1287, representing density of 397.07 per cubic metre of air sampler.

Presently, the atmosphere is free from cloudy weather and there are bright, sunny days. If this trend continues, we can expect more pollen count.

This week’s pollen watch shows Poaceae members dominated (18.79%) in the air followed by Eucalyptus sp. (18.22%), Partenium hysterophorous (13.66%) and Casuarina equisetifolia (11.31%).

All the above plant’s pollen are allergenically important. Eucalyptus occupied second position, commonly known in Kannada as Nelageeri. Other types are Cocos nucifera (9.67%), Ricinus communis (4.54%), Amaranth chenopod (3.98%), Cassia sp. (3.41%), Citrus sp. (2.84%) and Spathodea complanulata (2.27%) respectively. Polygonum sp., Mimosapudica, Alternanthera sp. and Euphorbiaceae represented with less number.

With regard to the mold spore spectrum, Cladosporium occupies the first place with high percentage representation of (18.26%), followed by Periconia (11.96%), Nigrospora (8.54%), Helminthosporium (8.54%). Helminthosporium spores can be identified on the basis of their feature (conidia single, subhyline to brown, cylindrical, slightly curved, 5-6 pseudosepta, spore with basal scar size 2-7 micron) and Smut spore (8.15%). Other allergenically significant spores Aspergillus (7.22%) and Basidiospores (5.82%) represented by less than 8% in the fungal spore spectrum.

Dr Shripad N. Agashe, 
Rangaswamy B.E. and Khaidarova Mamlakatoi, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University 
Bangalore 560056
Bangalore is experiencing very pleasant climate with clear sky and sunny atmosphere. The nights are relatively cool but day temperature is fairly high. Relative humidity ranged from 53% to 63% last week. The reason for mentioning these facts is to emphasise the point that weather conditions of the last week are conducive to liberation of large amount of pollen from the source plants. The total pollen count has jumped to 718 reflecting density of 221.44 per cubic meter of air samples. Casuarina equisetifolia commonly called as a windbreaker or Australian pine is in full bloom. Pollen productivity of this plant is known to be 850 pollens per flower. This plant shows biannual flowering peak. One of them is in late October and November. This has reflected in the highest pollen count (33.02%) for this week. This is followed by Poaceae or Grasses (23.69%) occupying second position and Eucalyptus, (14.07%), occupying third position. *Parthenium* pollen count is considerably reduced. This fact might have given some relief to patients suffering from allergenicity of *Parthenium* pollen.

Mold spores have also surprisingly doubled in their total count i.e. from earlier week’s 1,287 to 2,213, equivalent to density of 397.07 to 682.87 per cubic metre of air sample respectively. This tremendous increase in the total mold spore count is mainly due to increase in their spores of Curvularia, Alternaria, Smuts spores and Cladosporium. In addition, new mold spores such as Bispora-0.18, Delitschia-0.60, Xylaria-0.39, Pleospora-0.04, Leptosphaeria-0.11, Uredospores-0.55, Epicoccum-0.37, Chaetomium-0.07, Geotrichum-0.25, Cerebella-0.23, Drechslera-0.02 encountered last week have contributed 3.67%. This trend in the increase of total mold spores has to be critically observed as some of these spores are known to cause allergy.

*Compiled by Dr Shripad N. Agashe, Rangaswamy B.E. and Khaidarova Mamlakatvi, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore.*
This week's pollen monitoring results indicate a reduction of total pollen count from earlier week's 718 to 441 equal to density of 135.99 per cubic metre of the air sampled. This perhaps is due to reduction of Casuarina pollen though it occupies fourth position (12.25%) among the atmospheric pollen. Grass pollen and Parthenium hysterophorus pollen are represented by equal pollen contribution (19.96%). There seems to be slight increase in the pollen of Eucalyptus SP (15.42%). Other significant contributor is Mimosa pudica (4.76%).

The climatic conditions prevailing this week have enhanced liberation and distribution of fungal spores. The city has received total of 5.2 mm rain fall during this week. The days without rainfall also experienced higher humidity (85%). Total mold spore count has raised from earlier week's 2,213 to 2,839 per cubic metre air sampled. With regard to types of fungal spores occurring in the atmosphere. Smut spores are most predominant (14.73%) followed by Periconia (11.65%) and Cladosporium (10.92%). Other fungal spore types which have contributed more than 4 per cent of total mold spore population are represented by Nigrospora (7.58%), Helmitiosporium (7.33%), Curvularia (6.22%), Alternaria (6.27%), Ascospores (4.84%) and Basidiospores (4.76%).

Compiled by Dr. Shirpad N. Agathe, Rangarwamy, B.E. and Khairarova Mamakato, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore.
Pollen monitoring carried out in the city air during the period November 20 to 28 indicates a slight decline in the total pollen count. Pollen density recorded for the period was 115.66 per cubic metre air sampled with total pollen count being 375.88%. The climate was fairly dry with sunny atmosphere and only total of 2.4-mm precipitation has been received during this period. Parthenium pollen (24.80%) has superceded Grass pollen (23.74%) in the Bangalore atmosphere this week. Other significant contributions to the atmosphere pollen flora are Eucalyptus (10.93%); Cocos nucifera (7.21%); Eucalyptus eucalyptus (5.33%) and Chromalinodactyllum (5.33%).

Eupatorium odoratum was the older name of Chromalinodactyllum which is known to be a notorious weed, bearing light violet colored flower heads belonging to the family Asteraceae that also includes Parthenium hysterophorus. It is possible that patients showing allergic reaction to Parthenium will also show cross reactivity with Chromalinodactyllum pollen, hence the allergy practitioners have to take this into consideration.

This week’s Mold Watch compiled on the basis of fungal spores captured from the Rotorod Sampler exposed to the atmosphere showed as many as 28 different types. However, the percentage representation of only 10 significant mold spores has been incorporated. Total fungal spore count is 3,687 indicating a density of 1,138.8 per cubic meter of air sampled. The ratio of pollen to mold spore works out to be 1:10. The top five fungal spores in the order of predominance are Cladosporium 18.32%; Penicillium 14.77%; Black spores 11.88%; Nigrospora 8.75%; and Helminthosporium 5.90%. Among the other significant mold spores Alternaria, Beauvaria and Curvularia are represented by 4.76%, 4.71%, and 4.11% respectively. Contribution of Aspergillus spores has increased to 3.19% as compared to last week’s 1.30%.

Compiled by Dr. Sharad N. Agarwa, Rangi Narayana B.E. and Kishore Arunachalee, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore.
The first week of New Year 2001 is marked by considerable increase in the Bangalore atmospheric pollen count of 278 equivalent to density of 85.77 per cubic metre of air sampled and decrease in the mold spore count. The ratio of the pollen and mold spores this week was 1:14, as compared to earlier week's 1:36.

Pollens monitoring this week shows that pollen of *Parietaria hysterophora* is most predominant (28.76%) and the second position in the order of abundance is occupied by the pollen of Peaaceae members or Grasses (25.53%). Surprisingly, the third position is occupied by *Cocos nucifera* or Coconut pollen (7.19%). Other significant contributors to the atmosphere are *Cassia* sp. (6.46%), *Eucalyptus* sp. (5.74%), *Ricinus communis* or Castor bean (5.03%). *Casuarina equisetifolia* (2.86%) and *Tabebuia* (2.15%) seem to be minor contributors to the atmospheric pollen flora.

Atmospheric mold spore monitoring carried out this week indicates comparatively unfavorable weather conditions with the total spore count having come down from 4,332 to 3,897 equivalent to density of 1,191.28 per cubic metre of air sampled. *Cladosporium* (22.66%) continues to dominate the atmosphere this week. This is followed by Smut spores (15.62%), *Periconia* (15.02%) and Nigrospora (10.41%). Besides these, there are several minor contributors such as *Alternaria* (7.14%), *Curvularia* (4.14%), *Helminthosporium* (3.15%), *Tricholoma* (2.90%), *Pithomyces* (2.33%) and *Aspergillus* (1.40%).

Compiled by Dr Shripad N. Agashe, Rangeswarny B.E. and Khaiderava Mamlakat, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore.

In the pollen report that appeared on Dec 27, 2000, the pollen chart repeated as mold chart as well. The error is regretted.
Health & Science

POLLEN WATCH

Cocos nucifera and other Palms 32.44%
Parkinsonia hysterophora 15.30%
Ficus sp. 18.22%
Banyan 5.90%
Eucalyptus sp. 1.25%
Casuarina 2.70%
Others 1.50%

MOLD WATCH

Cladosporium 17.11%
Small spores 11.91%
Total 23.50%
Conidia 2.43%
Uredospores 8.74%
Ascospores 2.57%
Alternaria 8.13%
Others 22.71%

Pollen monitoring carried out in the Bangalore city during Jan 22 and 28 shows total pollen count 221 equal to a density of 64.42 per cubic metre of air sampled.

Cocos nucifera and other palms occupied first position again (32.44%) and last week’s dominated pollen type Parkinsonia hysterophora came to second position (22.55%) followed by Parkinsonia sp. (15.30%), Eucalyptus sp. (18.22%), and Banyan sp. (5.90%). The new pollen type appeared in the air sampled was Eucalyptus sp. with lesser number. The plant is an evergreen semi-erect parameric shrub, attached to their hosts by basidiomycetes with swollen and jointed nodes. The other types are Callistemon, Metrosos, Asteraceae and Acanthaceae members.

Atmospheric mold spore monitoring carried out this week indicates a decrease in the total fungal spore count from 4,432 to 3,868 with a density of 1,502.6 to 1,193.5 per cubic metre of air sampled.

Cladosporium continues to hold first position (17.11%) followed by Small spores (11.91%) and Powdery mildew (10.10%). Among the other significant mold spores are Uredospores (9.74%), Periconia (9.59%) and Necrospora (7.65%).

The ratio of pollen and mold spores this week is 1:1.7.

Compiled by Dr. Shripad N. Agaste, Rangaswamy B.E. and Krishna Trevor Madanakas, Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University, Bangalore.
Results of the atmospheric pollen monitoring conducted during the last fortnight (from Feb 11 to 25) in Bangalore have shown an increase in the number of pollen grains in the atmosphere. The highest concentration was recorded on Feb 21, with 579 grains per cubic meter, followed by Feb 22 and 23 with 519 and 491 grains per cubic meter, respectively. The lowest concentration was recorded on Feb 11 at 186 grains per cubic meter.

The predominant pollen types identified were Parthenium hysterophorus (27.8%), Cuscuta (12.1%), and Euphorbia (11.9%). Other significant pollen types included Ambrosia (9.2%), Malvaceae (7.4%), and Convolvulaceae (6.4%).

A notable decrease in the pollen count was observed over the last week, with a reduction of 19% compared to the previous week. This decline is attributed to the onset of the winter season, which reduces the number of flowering plants.

The pollen count for the current week shows a reduction in the number of allergenic pollen types, making it a favorable period for those with pollen allergies.

Compiled by Dr. Shastry N. Agarwal, Ranganayar B.E. and Kasthurba Medical College, Department of ENT, Bangalore University, Bangalore 560027.

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Pollen Watch

Chasmopitrium 14.1%
Smut spores 6.7%
Uredospores 8.8%
Periconia 9.7%
Mimosa 6.7%
Others 38.2%

Mold Watch

Omphalotus 12.9%
Smut spores 5.4%
Cheeseweed 6.6%
Alternaria 7.6%
Others 38.2%

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Aerosol Watch

Parthenium hysterophorus 27.8%
Cuscuta 12.1%
Euphorbia 11.9%
Ambrosia 9.2%
Malvaceae 7.4%
Convolvulaceae 6.4%
Others 38.2%

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The Times of India, Bangalore, Wednesday, March 7, 2001
BANGALORE: The pollen monitoring conducted using volumetric intermittent Roto-rod sampler in Bangalore atmosphere during this week indicates a higher total pollen count than the previous week. A total pollen count of 246 equivalent to a density of 75.91 per cubic metre of air sampled has been reported this week.

The increase in total pollen count is due to a slight turbulence in the air accompanied by higher temperatures during which pollen has better chance of distribution due to convection current. As mentioned earlier, dust particles are abundant in the atmosphere, which often get overwhelmed on the Roto-rod. Noteworthy futures of this week’s pollen monitoring are the pollen of Cocos nucifera and other palms (15.63%) occupying first position followed by pollen of Poaceae members (13.41%). Considerable reduction of pollen of Parthenium hysterophorus (10.97%) and Holopelta integrofolia (5.69) and good representation of Caesalpinia pulcherrima (6.90%).

In contrast to the atmospheric pollen, mold spores have shown a decline this week. The total count being 1,682 equivalent to a density of 529.04 per cubic metre air sampled. Mold spore monitoring this week shows qualitatively the mold spore scenario has not changed. Caudosporeum sp (16.70%) continues to hold position first followed by Smut spores (13.62%), Periconia sp (12.43%) and Nigrospore sp (11.37%).

Compiled by Dr. Shripad N. Agashe, Bangaroo B.E. and Khadiarao Manalakatki, Aerobiology & Allergy Laboratory, Department of Botany, Bangalore University, Bangalore- 560056.

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Pollen and fungal spore monitoring carried out during last week indicates a substantial reduction in the total pollen count and increase in the fungal spore count. A critical analysis of the results of pollen monitoring carried out during the last seven months gives an indication that whenever the atmospheric total pollen count goes up, the total fungal spore count comes down and vice-versa.

Total pollen count of last week came to 152, equal to a density of 46.90 per cubic metre of air sampled. Pollen of tree species dominated the pollen spectrum, with Syringa occupying the first position (15.72%). One of the species of Syringa, i.e., Syringa jambolana, is in full bloom and made a maximum contribution to the atmosphere. Though allergenically not very significant, the pollen of this species is favoured by honey bees, which results in the production of unifloral honey which branches as Syringa honey. As expected the pollen of Holopelta integrofolia is in the vogue disappearance and their representation in atmosphere was below 0.10.

The fungal or mold spore count shot up to 2,714 equal to a density of 837.24 per cubic metre of air sampled last week. Caudosporeum spores are constantly dominating the fungal spore spectrum accounting to 18.36% per cent. The second spore in the order of predominance is Nigrospora (12.12%), known for dark, dense, and circular spores. Next in the order of predominance are Uredo spores (10.9%), Smut spores (10.04%), Periconia (7.02%) and Alternaria (7.25%).

Basi spores of Ganoderma, commonly referred to as Bracket spores (19.5%), though small in number are encountered for the first time in the atmosphere last week.

Compiled by Dr. Shripad N. Agashe, Bangaroo B.E. and Khadiarao Manalakatki, Aerobiology & Allergy Laboratory, Department of Botany, Bangalore University, Bangalore- 560056.
In addition to biological factors, weather factors are significant with regard to the occurrence and distribution of pollen and mold spores in the atmosphere. This is evidenced by this week's pollen and mold watch.

On account of fairly high temperatures reaching up to 35 degrees C and lower humidity of 31.2%, the total pollen count has gone up to 183 equal to density of 56.67 per cubic meter of air sampled. Qualitatively, there are some changes in the pollen spectrum. Pollen of Parthenium hysterophorus (13.10%) have increased the most this week, followed by Cucumis melo (51.20%) with a slight contribution (13.10%). Although Cucumis melo constitutes a significant plant the structure and arrangement of the stalks which stick out of the flower are favourable for disemination by air.

Syzygium and Grass pollen which were abundant last week have declined this week with their contribution of 7.10% and 8.18% respectively.

Other noteworthy feature of this week's pollen watch is appearance of Pteronispyris paniculata pollen (6.00%) and almost elimination pollen of Holoptelea integrifolia.

For the record, it's one year since we started compilation and publication of Mold Spore Watch in this column.

Mold spore spectrum this week shows some changes in the hierarchy of the representatives. Chrysosporium spores (14.44%) have been dethroned by Penicillium (15.32%) to occupy the second position. Other species are followed by Smart spores (11.90%), Aspergillus / Penicillium (7.31%), Alternaria (5.11%) and Cladosporium (5.40%). The noteworthy feature of mold spore spectrum is increase in the contribution of Epicoccum spores (2.92%) and Talaromyces spores (2.57%).

(Pollen watch compiled by Dr Shripad N. Agaste, Rangaswamy B.E. and Ksthaksar, Allergy Laboratory, Department of Botany, Bangalore University, Bangalore 560056)

Besides recording and analyzing atmospheric pollen and mold spores census, we are also keeping close watch on and recording various changes taking place in the weather factors particularly temperature, humidity and wind speed. Basically details of these weather parameters are collected from the Meteorological Centre, which is also the location for operating pollen and fungal spore monitoring devices, i.e. Rotorsampler. The idea of doing this is ultimately to exploit the possibility of establishing correlation between weather factors and pollens/fungal spores in the atmosphere. There has been steady rise in the maximum temperature and humidity during this week.

Surprisingly, both the pollen and fungal spore counts have come down this week. The total pollen count is 175 equal to a density of 52.77, whereas the total spore count is 1,588 with a density of 478.73 per cubic meter of air sampled.

A critical analysis of airborne pollens indicates that Parthenium hysterophorus continues to dominate the pollen spectrum and has increased in its contribution in the atmosphere (20.05%).

Increase in the counts also exhibited by Grass pollen, Poaceae members (11.10%), Capparaceae sps. (8.75%) and Penicillium paniculatum (6.42%) - common avenue trees.

Though as usual, the pollen of Anthericum erinaceum (2.91%), Cenchrus spinifolius (2.91%) and Musaenges caeruleus (2.33%) made their appearance in the atmosphere for the first time this season.

Monitoring of airborne mold spores during this week shows some changes in the order of predominance. Smart spores (16.57%) occupy the first position followed by Penicillium (13.98%), Chrysosporium sps. (13.15%), Myrothecium (13.09%) and Aspergillus penicillatum (13.31%).

Allergically important Basidiosporoses and Helminthosporinomyces are poorly represented in the atmosphere (1.20% and 1.07% respectively).

Compiled by Dr Shripad N. Agaste, Rangaswamy B.E. and Ksthaksar, Allergy Laboratory, Department of Botany, Bangalore University, Bangalore 560056
The high light of this week's pollen and mold spore monitoring results include considerable decrease in the total pollen count and increase in the total mold spore count. This trend appears to be quite logical as there is gradual increase in both maximum and minimum relative humidity. Maximum average humidity has risen to 70% per cent indicating possible approach to some rain fall.

Total pollen count this week has come down to 151, equivalent to a density of 46.59 per cubic metre or air sampled. A noticeable glance at the pollen spectrum shows the first position occupied by *Parthenium hysterophorum* (19.59%), followed by grass pollen or *Poaceae members* (10.24%), *Cocos nucifera* and other Palms (8.60%), *Artemisia* sp. (7.96%), *Petelotemia* pericarpum (5.94%), *Syzygium* sp. (5.64%).

Sapindaceae, commonly referred to as "nettle tree" widely cultivated as avenue trees in Bangalore. These trees are in full bloom at this time. The pollen of these trees and pollen of other species made a significant contribution (2.04%). The pollen of these trees are referred to as nettle, which constitute bunching of as many as 32 pollen grains in one unit.

The mold spore count has shot up to 2,563 with a density of 790.78 per cubic metre of air sampled. The increase in the mold spore count is definitely correlated to high humidity. The noteworthy feature of this week's mold spore spectrum is super abundance of *Aphthidiellum* and *Penicillium* spores accounting to 38.71% per cent of the mold spore population. Many allergy patients suffer from the inhalation of these spores, they are small in size and find their way to respiratory tract. Next in the order of dominance are the spores of *Nigrospora* (13.84%), *Santospora* sp. (10.32%), *Cadosporium* sp. (9.14%) and *Penicillium* (7.58%).

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**Pollen Watch**

- *Parthenium hysterophorum*: 19.59%
- *Poaceae members*: 10.24%
- *Cocos nucifera* and other Palms: 8.60%
- *Artemisia* sp.: 7.96%
- *Petelotemia* pericarpum: 5.94%
- *Syzygium* sp.: 5.64%
- Sapindaceae: 2.04%

**Mold Watch**

- *Aphthidiellum*: 38.71%
- *Penicillium*: 13.84%
- *Nigrospora*: 10.32%
- *Santospora* sp.: 9.14%
- *Cadosporium* sp.: 7.58%
OCTOBER 20, 2001

POLLEN WATCH
Total pollen count is 83 with density of 25.56 per cubic metre

MOLD WATCH
Total count of fungal spores is 3918 with density of 1208.21 per cubic metre

NOVEMBER 3, 2001

POLLEN WATCH
Total pollen count is 78 with density of 76.0 per cubic metre of air sampled

MOLD WATCH
Total fungal count is 532 with density of 97 per cubic metre of air sampled

DECEMBER 1, 2001

POLLEN WATCH
Total pollen count is 91 with density of 87.71 per cubic metre of air sampled

MOLD WATCH
Total fungal count is 322 with density of 5.17 per cubic metre of air sampled

DECEMBER 8, 2001

POLLEN WATCH
Total pollen count is 120 with density of 75.0 per cubic metre of air sampled

MOLD WATCH
Total fungal count is 272 with density of 156.10 per cubic metre of air sampled

DECEMBER 15, 2001

MOLD WATCH
Total fungal count is 372 with density of 118.77 per cubic metre of air sampled

DECEMBER 29, 2001

MOLD WATCH
Total fungal count is 372 with density of 118.77 per cubic metre of air sampled
MONITORING ENVIRONMENTAL BIOPOLLUTION AND ITS RELEVANCE IN PUBLIC HEALTH

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ABSTRACT: Environmental Biopollution includes mostly the emission of pollen grains produced by flowering plants and spores produced by various types of fungi. These bioparticles are very small and microscopic in nature. These pollen and spores occurring in the atmosphere are referred to as aerallergens, and produce allergic manifestations in sensitive human beings. Significant qualitative and quantitative variation occurred in aerallergens in the indoor and outdoor atmosphere. A total of 67 pollen types and 91 genera of fungal spores have been identified. From the allergy point of view pollen types such as Parthenium hysterophorus, Holoptelea integrifolia, Casuarina equisetifolia, Poaceae, Ricinus communis, Eucalyptus sp., and fungal spores like Cladosporium, Penicillium, Nigrospora, Smut spores Alternaria and Helminthosporium were found to be predominant types in the atmosphere. The above aspects will be discussed in the present paper using a model study carried out in Bangalore.

INTRODUCTION

Aerobiology is concerned with the character and behavior of a suspension of bioparticles in the atmosphere, viable or not whose transfer from one site to another is controlled by atmosphere. Airborne particles of biological origin are microorganisms which consist mainly of pollen grains, fungal spores (Fungi Imperfecti, Basidiomycetes, Ascomycetes, Phycomycetes) bacteria, viruses, algae, leaf hairs, small seeds, plant fragments, etc., which occur in varying concentration in the atmosphere depending on climatic factors, height from the ground level, location indoor and outdoor, altitude and proximity to large or small water bodies. When dispersed in air they are known as aerosols. Pollen from trees are perhaps the most common sources of aerallergens (Rai, 1994).

It has been proved substantially that environmental biopollution, both indoor and outdoor has significant role to play in human health hazards. Connection between the occurrence of airborne fungi and allergy symptoms has been convincingly established (Wadhwani, 1994).

The present paper deals with various aspects of monitoring indoor as well as outdoor environmental biopollution by using various aerobiological methods. The emphasis has been given in the biopollution monitoring being carried out in Bangalore for the past several years to identify and quantify airborne pollen and fungal spores on daily basis and to prepare weekly, seasonal and annual pollen/spore calendar (Agashe and Abraham 1989, 1991, Agashe and Vidya, 1999) at the Aerobiology and Allergy Lab, Department of Botany, Bangalore University.

METHODOLOGY

For effective diagnosis and treatment of pollen and fungal allergy, information on diurnal, seasonal and annual variations in the pollen and fungal spore types and their concentration is of paramount importance. Aerobiological sampling is, therefore, carried out to achieve this aim through various sampling devices available. Various methods are employed to sample airborne pollen and fungal spores both qualitatively and quantitatively. These sampling methods are used for indoor as well as outdoor.

Volumetric Rotororad Sampler (Model - 40)

It is intermittent power driven impacting sampler in which adhesive coated plastic rods suspended from the pivot rotate for a period of one minute. This is repeated every 10 min for a period of one day i.e. 24h. Airborne pollen, fungal spores and other particulate matter get impacted on the silicone grease coated rods. The rods are brought to the laboratory and mounted in the grooved plastic slide holder and thoroughly screened microscopically. Identification of pollen and spores is followed by quantitative analysis.

Andersen 2 - stage Sampler

The Andersen 2- stage Sampler was used to study the viable and culturable fungi present in the air.
It is provided with 2 sieve plates, each having 200 pores on it. Each sieve plate has holes of different size and is stacked one above the other in increasing order of pore size. The sampler takes 28.3 l/min of air through the opening at the top and impinges it successively onto the petriplates containing nutrient media, placed below each sieve. Finally air passes out after impacting on the last petriplates. The particles of similar dimensions are impinge on the same plate. The sampler is AC power driven.

RESULTS AND DISCUSSION

The results, presented here, are based on the aerobiological monitoring since 1973 by using different samplers for identification of outdoor and indoor environment.

One of the prerequisites of indoor and outdoor aerobiological studies is to investigate thoroughly local vegetation and immediate environment. Predominant types of pollen grains and fungal spores in the Bangalore atmosphere compiled recently indicates presence of several types of allergy causing pollen and fungal spores.

It has been revealed that quantitatively fungal spores dominated pollen grains. In fact the ratio of pollen to fungal spore goes up to 1:30 in certain seasons. Presence of pollen grains exhibited distinct seasonal fluctuations and their presence in the atmosphere was closely related to the flowering periods of particular plant species.

A total of 67 pollen types were identified from the spore trap catches. Among the 67 types of pollen grains which occurred in significant numbers and accounted for about 90% of the annual catches were pollen of Parthenium hysterophorus, Holoptelia integrifolia, Casuarina equisetifolia, Poaceae, Rhus communis, Eucalyptus sp., Amaranthus cruentus, Cocos nucifera, Peltophorum pterocarpum, Syzygium sp., Cassia sp., Mimosa pudica (Agashe and Soucadenin, 1994).

A classical example of importance of pollen count in the Bangalore atmosphere is seen in Holoptelia integrifolia. This plant is very high pollen producer though the flowering of plant takes place for a short duration from the month of January to beginning of March. During its peak flowering period atmosphere is dominantly dominated by pollen of this species though there are very few trees of this species growing in the city. The pollen of this tree cause respiratory disease in some individuals (Fig.1).

The weed pollen season could be demarcated between June and September. Among these the pollen of Parthenium hysterophorus were numerically most dominant. The other major pollen types were of Amaranthaceae, Poaceae members, Mimosa pudica and Chenopodiaceae (Agashe & Mathew, 1998).

The tree pollen formed the second major group in the atmosphere. The tree season starts from January reaching its peak concentration between February to April with the flowering of numerous trees. Peak pollen counts were recorded in September, which was mainly due to the flowering of Casuarina equisetifolia. Among numerous tree pollen regularly recorded, only few occurred in abundance such as Casuarina equisetifolia, Cocos nucifera, Cassia sp., Eucalyptus sp. and Peltophorum pterocarpum. The other common types occurring in lower concentration were Holoptelia integrifolia, Pongamia glabra, and Syzygium sp.
Pollen Watch

- Parthenium hysterophorus
- Poaceae members
- Cocos nucifera
- Casuarina equisetifolia
- Eucalyptus sp.
- Amaranth sp.

Fig 2. Percentage of predominant types of pollen grains in the atmosphere at Bangalore

Analysis of the Rotorod Sampler revealed that peak of pollen in the atmosphere is achieved by Poaceae members 20.95% and Parthenium hysterophorus 20.37% (Fig.2). There are also other significant pollen types recorded such as Casuarina equisetifolia 10.52%, Cocos nucifera 12.94%, Eucalyptus sp. 10.42% and Amaranthchenopod 12%

According to Thommen's postulates (1931) which are accepted by agrobiologists and allergists, allergenic pollen in the atmosphere are really important in causing allergy symptoms if they are found in great abundance. It is obvious that the plants known for high pollen productivity are more significant for pollen allergy problems. In addition, it is necessary to know the relative abundance of the plants with high pollen productivity in the vegetation of the area under investigation.

Mold Watch

- Cladosporium
- Smut spores
- Penicillia
- Nigrospora
- Helminthosporium
- Aspergillus/Penicillium

Fig 3. Percentage of predominant types of fungal spores in the atmosphere.
A distinct seasonal periodicity was observed in the airborne fungal flora of Bangalore city with maximum during September / October to December/April. The spore concentration increased during cooler and humid conditions and is influenced by temperature, relative humidity and wind speed. Indirectly rainfall together with relative humidity results in prolific sporulation causing an increase in spore counts due to plenty of dead and decaying matter available (Agashe and Sudha, 1994).

Fungal spores are the main components of indoor air-polluta. The pollen trapped are restricted to grass and weeds. The results from preliminary studies on retrospective survey of allergy in a hospital among the population studied, depicted a predominance of Rhinitis followed by asthma, some being perennial and some seasonal (Agashe et al, 1997).

Allergy is a major cause of Bronchial Asthma. Allergic Rhinitis, Migraine, Urticaria, Eczema etc: (Singh and Malik, 1994). Usually spores cause no trouble to most of the people but they can be harmful by provoking allergic responses or infections (Verma and Chhle, 1994).

Abundance and types of fungal spores are influenced by weather factors, rainfall and precipitation accompanied by lower temperatures are very favorable for liberation of fungal spores. Fungal spores are also clinically very significant as some of them cause respiratory allergy (Agashe and Vidy, 2000).

CONCLUSIONS

- It can be concluded that pollen and fungal spores prevalent in Bangalore atmosphere are responsible for causing various types of allergies.
- It is absolutely necessary to carry out continuous atmospheric pollen/spores monitoring of environment.
- Pollen and fungal spores spectrum keeps changing in the atmosphere depending on several factors including weather factors. The awareness is to be created not only among the allergy sufferers but also for the diagnosis and treatment of pollen and fungal spores allergies.

REFERENCES

Agashe S.N. & Avasthi S.B. (1997), A survey of atmospheric pollen and fungal spores at two different sites in Bangalore, "Aerobiology" Fifth International Conference on Aerobiology Bangalore, 1994 (Editor S.N. Agashe), Pp 19-30


Chanda S. (1992), Aerobiology and inter and multidisciplinary approach, Indian Journal of Aerobiology, 11: 1-10


Thommen, A. (1931), Hay fever - In: Coca, Walser & Thommen (Eds.) Asthma & Hay fever in Theory & Practice, p 851.


Monitoring Environment for Airborne Pollen and its Significance in Public Health

Shripad N Agashe, Rangswamy B E & Khaidarova Mamlakatoi

Introduction

It has been noted for some years that although a large number of patients were sensitive to pollen grains and fungal spores, many of them also had seasonal allergic symptoms. These symptoms of hay fever or asthma were often severe and frequently sudden in occurrence. The timing of symptoms and close relationship with weaker changes suggested fungal spores as a cause. For instance, the importance of fungal spores as seasonal allergens has already indicated by Hyde (1960). The preliminary work has been carried out to identify and quantify airborne pollen and fungal spores on daily basis and to prepare weekly, seasonal and annual pollen/spore calendar in Aerobiology and Allergy Laboratory, Department of Botany, Bangalore University from the past two decades (Agashe and Elfadil, 1989).

Methodology

Aerobiological survey of pollen/spores monitoring is carried out by operating volumetric Rotorod Air Sampler (Model-40) (Fig. 1) installed at about 15 m above ground on the rooftop of the Meteorological Center located at Palace Road in the heart of Bangalore City.
Fig. 1: Rotord Sampler (Model-40)

Trailing edge: trailing edge of this head will move away from the reader (into the page) when the sampling head rotates clockwise.

Greased side of rod (faces the reader).

Leading edge (X marked to indicate) leading edge of this head will move toward the reader (out of the page) when the sampling head rotates clockwise.
Monitoring Environment for Airborne Pollen

It is intermittent power driven impacting sampler in which adhesive coated plastic rods suspended from the pivot rotate for a period of one min. This is repeated every 10 min for a period of one-day i.e., 24 hr. Airborne pollen, fungal spores and other particulate matter get impacted on the silicone grease coated rods. The rods are brought to the laboratory and mounted in the grooved plastic slide holder and thoroughly screened microscopically. Identification of pollen and fungal spores followed by quantitative analysis. Percentages of allergically significant pollen and fungal spores are determined and depicted in a pie diagram (Figs. 2a and 2b).

Results and Discussion

Aerobiological studies carried out so far has brought to light several facts, which are very useful from the point of creating awareness among the public about environmental biopollution. Predominant types of pollen grains and fungal spores in Bangalore

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**Fig. 2a: Percentage Representation of Pollen Grains in the Air**

**Fig. 2b: Percentage Representation of Fungal Spores in the Air**
Prospects and Problems of Environment

atmosphere compiled recently indicate several types of allergically significant pollen and fungal spores. Weed pollens of plant species encountered in the air includes *Amaranth chenopod*, *Chromolaena odorata*, *Mimosa pudica*, members of Poaceae and *Parthenium hysterophorus*; Shrubs: *Ricinus communis*. Trees like: *Caesalpinia pulcherima*, *Casuarina equisetifolia*, *Cocos nucifera*, *Eucalyptus globulus*, *Holoptelia integrifolia*, *Morus alba* and *Tabebuia* sp., (Agashe and Mathew, 1998). Poaceae members (20.95%) and *Parthenium hysterophorus* (20.3%) achieve peak of pollen in the atmosphere. There are also other significant types of pollen grains like *Cocos nucifera* (12.94%), *Casuarina equisetifolia* (10.52%), *Eucalyptus* (10.42%) and *Amaranth chenopod* (3.22%). A classical example of initiation of pollen count in Bangalore atmosphere is seen in *Holoptelia integrifolia*. This plant is very high pollen producer although the flowering takes place for a short duration from January to beginning of March (Fig. 3). During its peak flowering period atmosphere is dominated by pollen of this plant species although there are a few trees growing in the city. The pollen of this tree cause respiratory disease in some individuals. However, the representation of the above pollen differs from time to time depending on many factors.

Atmospheric monitoring of mold spores showed that there are several predominant types of fugal spores viz., *Alternaria*, *Aspergillus*, *Cladosporium*, *Curvularia*, *Helminthosporium*, *Nigrospora*, *Penicillium*, *Periconia*, Smut spores, Ascospores and Basidiospores (Agashe and Vidya, 1999). Peak of mold spores in the atmosphere is achieved by spores of *Cladosporium* (19.88%) and Smut spores (12.16%), followed by other typical fungal spores, *Periconia* (11.72%), *Nigrospora* (9.02%), *Helminthosporium* (5.96%) and *Aspergillus/Penicillium* (4.37%). Fungal spores are ubiquitous and they are at least 1:30 time abundant than pollen in the atmosphere. Types and abundance of fungal spores

![Fig. 3: Pollen Representation of Holoptelia integrifolia](image-url)
are influenced by meteorological factors. Precipitation accompanied by low temperatures is highly favorable for liberation of fungal spores. Fungal spores are also clinically important as some of them cause respiratory allergy (Agashe and Vidya, 2000).

**Summary and Conclusions**

Our environment has great influence on public health. Atmosphere is loaded with essential and nonessential particles of biological and abiological origin. The particles of biological origin are often referred as bioparticles. Pollen grains released from the anthers of flowering plants and spores from lower plants constitute the airborne bioparticles. Among the spores, the fungal spores are most predominant in the atmosphere. The ratio of pollen/fungal spore goes up to 1:30 in certain seasons. Pollen grains referred as male gametophytes after their shedding from the source, float in air and perform essential function of pollination, which ultimately results into fruits and seed setting.

A large number of airborne pollen, which come in contact with eyes, nose, mouth and skin of susceptible/sensitive individuals and cause allergic manifestations. The allergy symptoms produced due to airborne pollen and fungal spores include, itching of nose, skin, watering of eyes, choking of nose and blocking of tracheal tubes resulting in asthma or breathlessness. The primary objective of an aerobiologist is to monitor air continuously for airborne pollen and spores and prepare a pollen calendar. Based on pollen calender the clinician or allergy specialist assesses allergenicity of airborne pollen and spores. On the basis of family history, atopy and skin prick tests with allergenic extracts from pollen and fungal spores will be performed. Once the offending allergen is established, the patient has to undergo immunotherapy, which involves desensitization of allergy patients to get relief from airborne allerginically significant pollen and fungal spores. For aeropalynological survey and assessment of allergenicity, continuous monitoring of atmospheric pollen and fungal spore is essential. The airborne pollen of *Parthenium hysterophorus*, *Holoptelia integrifolia* and *Casuarina equisetifolia* needs special attention in depicting the allergic response in human population.

It can be concluded that:

1. Pollen and fungal spores prevalent in Bangalore atmosphere are responsible for causing various types of allergies.
2. It is absolutely necessary to carry out continuous atmospheric pollen/spores monitoring of environment.

3. Pollen and fungal spores spectrum keeps changing in the atmosphere depending on several meteorological factors.

4. The awareness has to be created not only among the allergy sufferers, but also for the successful diagnosis and treatment of pollen/fungal spore allergies.

The above theme will be elaborated including protocol necessary for such investigation with specific reference to the studies carried out in Aerobiology and Palynology Laboratory, Department of Botany, Bangalore University, Bangalore.

References


APPENDIX – 6

NEWS ARTICLE
Break free from the mold

Sampad R. Agarva and Knialcovin Masukhov

The atmosphere is always full of organic and inorganic particles matter. Among the organic matter, bioparticles of biological origin form an important component of air. These bioparticles are predominated by pollen grains and mold spores which become airborne because of several natural processes & human activity and often prove hazardous to plants, animals and human beings in many ways.

Aerobiology is defined as the study of microorganisms of the atmosphere, which constitute an array of bioparticles materials such as pollen grains, fungal spores, bacteria, viruses, pathogen cells, virus fragments, insect scales, fragments of plants like trichomes, scales, fibers, etc. Generally the percentage of fungal spores in the air is approximately 10-40 times more than that of pollen grains. Many are pathogenic to human beings causing allergic symptoms like asthma.

What are the molds?

Scientifically speaking, molds are fungi. They belong to the plant kingdom and are eumycot- ic, heterotrophic, chitinophycytes organisms. There are about 3,000 to 40,000 known species of molds in the world. People have developed a highly distinctive biological organization system that can be regarded as an adaptation to life in the most common habitat, i.e., soil, water and air. They flourish in moist and warm conditions.

What are mold spores and how are they produced?

Functionally, mold spores can be considered as equivalent to seeds of higher plants. The mold sporulation takes place by means of vegetative, sexual and mixed methods. The most common method of vegetative reproduction is fragmentation. Asexual reproduction takes place by producing spores. The mold spores are very small in size, ranging from 2 millimeters to 20 millimeters, though majority of these fall in the size of 5-200 micrometers. Due to their minute size, they are not visible to the naked eye and are found abundantly floating in the air.

How do they get into air streams?

There are different mechanisms in which the mold spores get liberated from host plants, and because they are light and light they easily get into air and get carried by wind.

How are they monitored?

Mold spores and pollen grains are monitored by using a Moldspore Sampler (Model-40) which is installed on the roof of a meteorological center in the heart of Bangalore. Airborne mold spores get trapped on sticky adhesive coated rods which rotate intermittently.

How are different diseases caused by airborne mold spores in human beings and plants?

Mold spores enter through noses and mouths along with air when a person breathes and comes in contact with exposed part of the mucous. In sensitive individuals, mold spores produce allergic symptoms such as sneezing, itching of eyes, nose and skin, breathlessness, rashes, watering of eyes and running nose. Mold spores cause plant diseases namely: Wilt diseases of Cucurbits, Leaf spot of Paddy, Fruit rot, Wheat Rust, etc.

Why is a Mold Spore Watch necessary?

One of the important objectives of an aerobiologist is to compile a mold spore calendar and make it available to the citizens for their use in allergy diagnoses. Mold Spore Watch is of great assistance to allergologists as it helps in the detection of offending allergens. In addition to the skin tests which a citizen performs on the allergy patients to find out the reactions of allergens, it is necessary for doctors to understand thoroughly the environment in which the patient lives and the environmental bioparticles to which he is exposed.

It is, therefore, absolutely necessary to carry out the daily atmospheric monitoring of mold spores continuously. More important is the fact that the public at large and particularly the allergy sufferers should be made aware of the highlights of daily mold spore monitoring result through the mass media.

How are the mold spore monitoring results depicted?

A cursory glance at the mold spore chart, presented in the form of pie chart indicates the occurrence of allergenically significant mold spores in the atmosphere of Bangalore along with their relative percentage frequency.

These mold spore Watch are significant in indicating the variations in the mold spore composition at different times of the year.

It is intended to start publishing the first report on atmospheric mold spores from this month onwards.

(Prof. Agarva is the head of the Aerobiology and Allergy Laboratory, Dept of Pathology, Bangalore University, Bangalore; Khandelov is his student)