



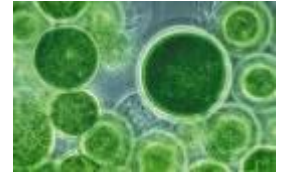


Aerobiology , Interdisciplinary Approach , Pollen and Air Survey



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Different Biocomponents in Air



Aerobiological Studies

I. Indoor Aerobiology

- Living Rooms
- Inside Buildings
- Cinema Hall
- Schools
- Warehouse Godowns
- Poultry Farms
- Hospital Wards

II. Outdoor Aerobiology

- Crop fields, gardens, Vegetable Markets
- Other open spaces



Why Air Sampling ?

- | | |
|---------------------|--|
| 1. Air Pollution | Measurement & Control |
| 2. Agriculture | Disease Forecasting of Crops |
| 3. Forestry | Save Timbers |
| 4. Human Diseases | Control Respiratory diseases & Allergy |
| 5. Outer Space | |
| 6. Animal Diseases | Control diseases of Farm Animals |
| 7. Biodeterioration | Prevent deterioration of books, Paintings, stored grains etc. |
| 8. Locust Movements | Save Crops from Pests |
| 9. Meteorological | Biological Indicators, Weather Forecastings |

Fields of Aerobiology

1. Botanical and Fungal Aerobiology

Deals with dispersal of microorganisms causing plant diseases, dispersion of pollen causing allergy, dispersion of seeds.

2. Medical Aerobiology

Influence of pollen, spores, mites and dust on human beings and animals, transmission of bacteria and viruses.

3. Technical or Industrial Aerobiology

Influence of air pollutants on outdoor & indoor environment

4. Experimental Aerobiology

Mathematical formulation, development of methods, instrumentation, and modeling of aerobiological systems.

SOME FACTS ABOUT POLLEN AND SPORES

- Pollen and spores are produced by plants in abundance.
- Most of these fall to the ground.
- Pollen and spores are preserved in anaerobic environments, such as bogs, lakes, fens, and the ocean floor.
- Pollen and spores in the atmosphere are mixed by atmospheric turbulence, resulting in a uniform pollen rain over a given area.
- The proportion of each pollen type in the pollen rain depends upon the abundance of its parent plants.



Aerobiology: An Interdisciplinary Science

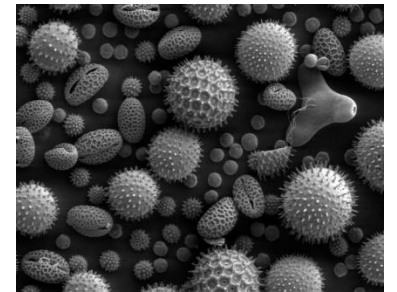
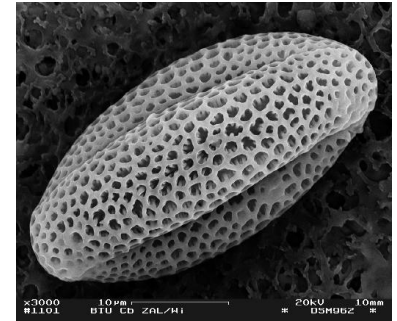
- * Palynology
- * Allergy & Other Human Diseases
- * Plant Pathology
- * Veterinary Science
- * Biodeterioration
- * Air Pollution
- * Melissopalynology
- * Forensic Science (Evidence in criminal investigations)
- * Meteorology
- * Gene-ecology & Phytogeography
- * Forestry
- * Defence Organizations
- * Air Monitoring
- * System Approach



(In-vitro germination, viability, storage etc.)

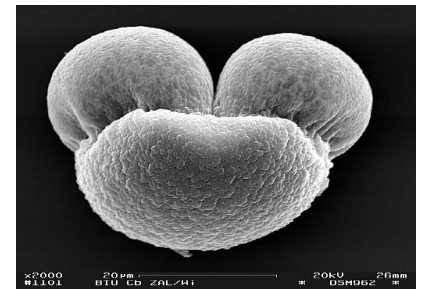
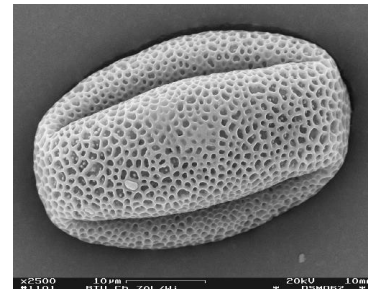
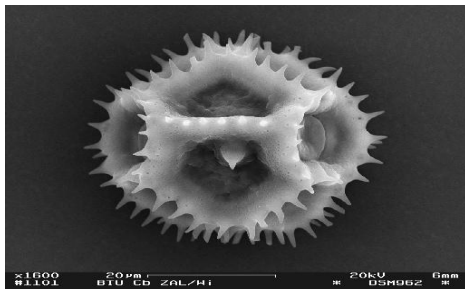
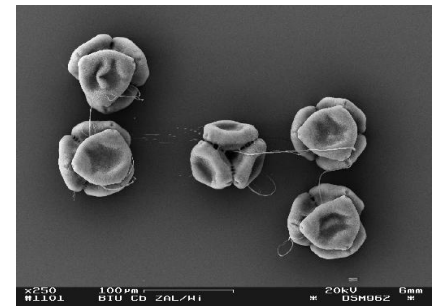
Pollen Size Range (~5-25 μm)

Pollen size class	Length of longest axis
Very small grain (<i>sporae perminutae</i>)	< 10 μm
Small grains (Minutae)	10-25 μm
Medium sized grains (Mediae)	25-50 μm
Large grains (Magnae)	50-100 μm
Very large grains (Permagnae)	100-200 μm
Gigantic grains (Giganteae)	> 200 μm



Smallest pollen (5x 2.4 μm) *Myosotis palustris*

Largest pollen (> 200 μm) Cucurbitaceae



Gross Metabolites of Pollen (After Stanley, 1971)

Species	Carbohydrates	Proteins	Lipids	Ash
1. <i>Pinus radiata</i>	13.92	13.45	1.80	2.35
2. <i>P. sabiniana</i>	13.15	11.36	2.73	2.59
3. <i>Acacia auriculiformis</i>	3.20(soluble)	25.20	19.00	NR
4. <i>Eucalyptus citriodora</i>	1.75(Soluble)	7.80	25.00	NR
5. <i>Madhuca indica</i>	2.70(Soluble)	7.70	24.00	NR
6. <i>Typha latifolia</i>	17.78	18.90	1.16	3.70
7. <i>Zea mays</i>	36.59			

Minerals and trace elements as identified by Schuette & Remy (1932)

Mineral elements Trace elements

Potassium
Chlorine
Sulphur
Sodium
Calcium
Phosphorus
Magnesium
Silicon (as SiO₂)
Iron
Manganese
Copper

Chromium
Lithium
Nickel
Lead
Tin
Zinc
Osmium
Beryllium
Vanadium
Zirconium
Silver
Barium
Gallium
Bismuth
Gold
Germanium
Strontium

Total protein percent of pollen grains of different plants species (After Jain and Datta, 2000)

Name of plant species	% Protein
<i>Clerodendrum splendens</i>	37.46
<i>Ailanthus excelsa</i>	32.56
<i>Thespesia populnea</i>	29.66
<i>Cassia fistula</i>	35.73
<i>Prosopis julliflora</i>	32.66
<i>Ipomoea fistulosa</i>	28.83
<i>Argemone mexicana</i>	47.37
<i>Papever rhoeas</i>	40.55
<i>Althea rosea</i>	45.55

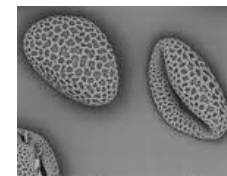
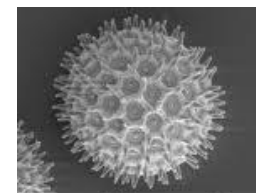
Seasonal Dominant Pollen Types in India

(After Bhattacharya *et al.*,2006)

Group Season

Pollen Types

- | | | |
|------|--------|---|
| I. | Autumn | <i>Cassia, Cocos, Eucalyptus, Trema</i>
and grasses |
| II. | Winter | <i>Borassus, Phoenix, Carica, Cassia</i>
<i>Casuarina, Croton, Eucalyptus, Cyperaceae</i>
and grasses |
| III. | Spring | <i>Acacia, Azadirachta, Bombax, Carica, Cassia</i>
<i>Casuarina, Amaranth-Cheno, Madhuca,</i>
<i>Mangifera, Ricinus, Phylanthus</i> & grasses |
| IV. | Summer | <i>Acacia, Areca, Borassus, Litchi, Amaranth-</i>
<i>chenopodiad</i> & grasses |
| V. | Rain | <i>Cassia, Amaranth-Chenopodiad,</i>
<i>Cyperaceae</i> and grasses |





AIR SAMPLERS



Sampling Principles

1. Sedimentation
2. Filtration
3. Centrifugal Sedimentation



Tilak Air Sampler



Mites Allergy



Mites are most potent intramural allergens found in the house dust. Mites are small microscopic animalcules usually smaller than half a millimeter in size but sometimes reaching up to one millimeter. Mites are usually colourless, whitish or ash coloured, sometimes brown to red Or dark in colour, oval egg shaped or elongate in shape. Mites are octopod arthropods of Arachnida group with jointed legs and Jointed body cover



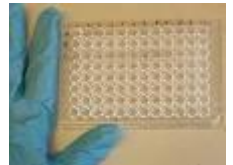
Allergy Test

a. Skin Test

1. Prick Test
2. Scratch Test
3. Intracutaneous Test

b. Provocation Test

c. ELISA / PRIST/ RAST Test



Allergic responses produced by algae

Allergic response	Organism
I.Dermatitis:	
Swimmers itch	<i>Lyngbya gracilis</i> <i>Microcoleus lyngbyaccus</i>
Dogger itch	<i>Anabenna sp.</i> <i>Fregilaria stritula</i>
Skin itch	<i>Cladophora sp.</i>
II.Respiratory:	
Hay fever	<i>Blue green algae bloom</i>
Nasobronchial	<i>Lyngbya major</i>
Tingui/ Timander fever	<i>Trichodesmium</i>

