

Fan Dust Samples-A New Approach to Aero-phycological Sampling

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Aero-algal sampling, using household ceiling fan, as an air sampler, was attempted for the first time. For this, air-born dust (along with bio-particles) adhering to the ceiling fan blades, was collected. Several such samples were collected during a span of five months, from five wide apart locations at and around Nagpur, Maharashtra. These samples, after processing, were screened microscopically for the presence of aero-algae. Out of fifteen samples, thus collected, 24 algal genera were recorded. Algal forms observed, are in accordance to previous such reports (using other air-samples), indicating potential of this cheap and versatile air sampler.

Key words: Ceiling Fan, Air-Sampler, Aero-Algae, Nagpur.

Origin of Aero-Biology probably dates back to 55 B.C when Lucretius, first observed the silvery dust particles dancing in a ray of sun-light. Since then, this important discipline of Biology and Environmental Science has progressed much. During this progress, various methods have been improvised and used for collection of air-born Bio-particules.

All such methods can be briefly summarized into four broad categories.

1. Gravity settling of air-born particles, either on a clean glass slide for direct observation, or on some nutrient medium, for culturing.

2. Impaction of air-born particles on an adhesive surface, either by moving collection surface against wind or by exposing such surface to wind currents.
3. Trapping particles by passing air through some liquid medium.
4. Filtration- Collection of particles from air current (mostly created by suction) by passing air through some filter medium (such as paper, cellulose or glass fibers etc).

Some of the air-samplers used so far, includes, Glass plates and Wind tunnel Salisburry, (1866), Rotarod Air-Sampler, Herrington et.al. (1959), Wind wane type Sampler- "Aeroscope" Lakhanpal and Nair (1958), Tilak Sampler, Tilak and Kulkarni (1970), Verticle Cylinder, Parshwanath and Ramalingam (1979), Anderson Sampler, Cyclone Type Sampler, Burkard Spore Trap, Reuter Centrifugal Sampler, Casella Split Sampler, FAO Split Sampler and Sartorium Filter Sampler, Stationary and Mobile agarised plate and High volume Air Sampler- HVAS-9000C. Some of the more advanced, motorized and electronically equipped samplers are Active Count Sampler, Air-borne Particle Counters, Spin- air Sampler, Sartorium Air-port MDTs, Sampling by electrostatic charging

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of air-borne particles, High Volume air Sampler and Personal samplers.

Some of the material used as samples, include Sea-Dust Ehrenberg (1852), Rain Water, Karnik (1962), House Dust- Bernstein and Safferman, (1970), Building Walls and other sub aerial surface scrapings, Herrold Schlishting,(1975), Dust stormes , Folger *et.al.* (1967), Snow and Rain, Kawai (1984), Tree Leaves , Pal and Santra (1986) Foot Wear Dust, Food Dust, Leaf Dust, Bed Dust, Nasal Secretion and Spider Webs and Earthworm Castings , Craigh *et.al.* (2002).

MATERIAL AND METHODS

In spite of various types of samplers, in numerated above, there is always a need for a cheap, affordable, versatile sampler, at least for the purpose of preliminary qualitative observations.

Every household, commercial or institutional building has one or more ceiling fans.

Blades of these fans, while revolving, collect a thick coat of air-borne dust, especially on the edges of the fan blades. Thus a ceiling fan like a rotarod sampler collects by impaction, air-born particles on its blades. In this method instead of an adhesive coated strip, air particles collect directly on fan blade, due to electrostatic charge developed on the blade edges (due to friction with air). This initial dust layers, thus collected, absorbs moisture from air, which further enhances their ability of collecting more air particles. This process, finally results, in a thick sticky layer of fan dust. Further, these fans, mostly being out of normal human reach, collect dust, purely of aerial origin and are less prone to contamination. Considering all this, a preliminary study was conducted to find out possibility of using fans, as air samplers.

Before collecting samples, these fans were washed well with soap solution and finally with alcohol, to avoid all possible residue- contaminants. Fans were then allowed normal use for a period varying from 10 to 30 days. This being only a qualitative study, factors like fan blade size, fan speed, actual duration of use etc. were not taken into consideration. Each sample was collected in a sterilized test tube with the help of clean drawing brush.

Each sample, thus collected, was

macerated with dilute Hydrochloric Acid (reaction carried out till all effervesces died out) to dissolve calcium and magnesium carbonates of dust. Remaining acid was washed well with sterilized distilled water, using a centrifuge, (to prevent bio-particles, flowing out). Remaining material, thus collected was mounted on a clean glass slide with glycerin, for further microscopic examination.

Samples were collected during a span of five months, i.e. January (late winter) to May (summer). They were collected from five varied localities at and around Nagpur. All samples were collected after necessary permission of concerned authorities. These sample sites were as follows-

1. Student's canteen (semi intra mural sites) attached to a school (Baba-Nanak High School and Junior College) at Gangabai Ghat, a thickly populated commercial locality of Nagpur.
2. Bed-room (an intra-mural site) of a residential house at Bajaj Nagar, a residential locality of Nagpur.
3. Living room (intra-mural site) of a residential house at Pratap Nagar, a residential locality near city out-skirts.
4. Chemistry laboratory (an intra-mural site) of a college (S.K.Porwal Junior and Senior college for Science) at Kamptee, a small town about 30 Km. South-West of Nagpur and a semi-rural locality.
5. A school office (Bhalerao High School) at Saoner, a small agricultural village, 40Km. North-East of Nagpur, a rural locality.

RESULTS AND DISCUSSION

Out of fifteen samples, 517 algal fragments were recorded (Table 1). It is interesting to note that 2nd sample at Kamptee locality, although collected only after 10 days, recorded enough number of algal particules, indicating towards, and the efficiency of this method.

As usual, Cyanophycean forms were predominant, followed by Chlorophyta, Bacillariophyta and Euglenophyta. A total of about 34 algal species, distributed over 24 genera were identified, indicating diversity of algal forms (Table-2).

Various Cyanophycean genera recorded were *Phormidium*, *Oscillatoria*, *Chroococcus*, *Plectonema*, *Microcystis*, *Gloeothea*,

Microcoleus, *Spirulina*, *Gloeocapsa*, *Lyngbya*, *Scytonema*, *Merismopedia* and *Calothrix*. Chlorophycean forms were *Pandorina* and *Cosmarium*. Bacillariophycean forms include *Amphipora*, *Cymbella*, *Navicula*, *Nitzschia*, *Synedra*, *Pinnularia*, *Asterionella* and *Rhizosolenia*. Euglenophyceae was represented by *Euglena* only (Table 2).

Table 2. List of genera and species recorded

Genera	Species
CYANOPHYTA	
Calothrix	marchice
Chroococcus	minor
"	minutus
"	indicus
"	montanus
Gloeocapsa	rupestris
"	magma
Gloeothece	samoensis
Lyngbya	hieronymusii
Merismopedia	punctata
Microcoleus	acutissimus
Microcystis	stagnalis
Oscillatoria	subbrevis
"	annae
Phormidium	angustissimum
"	retzii
"	jadinianum
"	anomala
"	ambiguum
"	mucosum
Plectonema	dangeardii
Scytonema	tolypothricoides
Spirulina	laxissima
CHLOROPHYTA	
Cosmarium	sp.
Pandorina	sp.
BACILLARIOPHYTA	
Amphipora	sp.
Asterionella	sp.
Cymbella	sp.
Navicula	sp.
Nitzschia	sp.
Pinnularia	sp.
Rhizosolenia	sp.
Synedra	sp.
EUGLENOPHYTA	
Euglena	sp.

These results were found to be consistent with previous such findings. Several algal forms observed here were also reported in many such findings from Nagpur, Kamat and Harenkhedkar (1976), and also from other parts of India, Santra S.C (1987).

More algal forms were recorded from rural samples than that of urban ones, similar to previous such reports, Sharma et.al; (2006).

From the above observations and discussion, it is evident that ceiling fans can be used as cheap versatile air-samplers, especially for qualitative investigation.

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