

— Short Communication

**AIRBORNE FUNGAL AND PTERIDOPHYTIC SPORES IN
CHITTAGONG UNIVERSITY CAMPUS, CHITTAGONG**

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Airborne spores, including fungi and pteridophyte, are the cause for environmental pollution and are sometimes injurious to plants and animals including human beings. These spores which are major component of the aeroallergens are found to be suspended in the air. They cause widespread upper respiratory tract and naso-bronchial allergy including asthma, hay fever, eye, skin and respiratory disorders. For proper diagnosis and treatment of respiratory allergy disorders due to airborne spores, the aerobotanical data (i.e. concentration, frequency and variations of airborne plant particles) of an area is a pre-requisite. In Bangladesh Badya (1989) and Badya and Pasha (1991) first initiated aeropalynological investigation in Chittagong. Spore concentration in a location varies from month to month and year to year and therefore, monitoring of seasonal variation of airborne spores is essential towards proper diagnosis and treatment of allergic disorders.

The Chittagong University Campus was selected as sampling area. The airborne spore survey of Chittagong University Campus area was carried out by Gregory's Sampler method (Gregory 1961). This sampler is grouped under the impaction using wind movement by vertical and inclined microscopic slide. From October 2006 to September 2007, two slides smeared with glycerine jelly, were placed in Gregory's Sampler at 10 m height from the ground level. With an interval of every twenty four hours, the slides were collected from the trap and covered with 18 x 18 mm cover glass. The covered areas were examined under microscope on collection or a few days afterwards. The trapped spores were studied on daily, monthly, seasonal and then yearly basis.

Airborne fungal spores survey: In all 13 types of airborne fungal spore, including some unidentified, had been counted and identified. A total of 4,449 spores was counted and was listed month-wise along with the percentage contribution of each to the total fungal spore. The result is presented in Table 1. Some of the identified spores are presented in Plate I.

Only the species of *Alternaria* and *Drechslera* occurred throughout the 12 months of survey. Spores of *Curvularia*, *Cladosporium*, *Mucor*, *Torula* and *Tetraploa* species also occurred throughout the year except a few months. *Penicillium* spp. spores occurred from April to July with a peak in April. *Mucor* spores were recorded in all the months except in July. Spore types of *Diplodia*, *Diplodina*, *Menispora* and *Mastigosporium*, were also

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recorded intermittently during the survey period. The newly reported fungal spores in the atmosphere of the Campus were *Diplodia*, *Diplodina*, *Mucor*, *Menispora*, *Mastigosporium*, *Torula* and *Tetraploa*.

Regarding the length of time present in the air the main but common fungal spore types were *Alternaria*, *Mucor*, *Tetraploa*, *Curvularia*, *Torula* and *Cladosporium*. In Table 1 the monthly variation of spore concentration is depicted where the highest spore catch was observed in June. The other peak incidence occurred during the month of February. In between these two months (June and February) of incidence, the other months also showed very high in comparison to rest of the years. The commonest fungal spores encountered were of the species of *Mucor* amounting to 16.57% of the total fungal spore count, followed by *Alternaria* (8.86%), *Penicillium* (7.15%), *Torula* (5.44%), *Menispora* (5.12%) and *Drechslera* (3.55%). The minimum incidence of fungal spore was *Diplodina* with an average of 1.75%. Many of the fungal spores were not possible to identify, which are classified into "unidentified type", with an average of 41.67% (Table 1).

Table 1. Monthly incidence of airborne fungal spores in Chittagong University Campus.

| Sl No. | Name of fungi | Months with total spore count | | | | | | | | | | | | Total count | Total In % |
|----------------------|-----------------------|-------------------------------|-------------|-------------|-------------|--------------|--------------|-------------|--------------|--------------|-------------|-------------|-------------|-------------|------------|
| | | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sep | | |
| 1 | <i>Mucor</i> | 2 | 34 | 3 | 64 | 329 | 187 | 42 | 35 | 17 | - | 15 | 9 | 737 | 16.57 |
| 2 | <i>Alternaria</i> | 3 | 19 | 17 | 9 | 54 | 107 | 45 | 51 | 67 | 6 | 4 | 12 | 394 | 8.86 |
| 3 | <i>Cladosporium</i> | 13 | - | 7 | - | 5 | 9 | 5 | 7 | 17 | 8 | 19 | 7 | 97 | 2.18 |
| 4 | <i>Curvularia</i> | - | 9 | 2 | 6 | 8 | 4 | 4 | 2 | 32 | 2 | 8 | 3 | 80 | 1.80 |
| 5 | <i>Diplodia</i> | - | - | - | - | - | - | - | 7 | 40 | - | 21 | 24 | 92 | 2.07 |
| 6 | <i>Diplodina</i> | - | - | - | - | 4 | 7 | - | 8 | 24 | - | 15 | 20 | 78 | 1.75 |
| 7 | <i>Drechslera</i> | 5 | 25 | 16 | 20 | 21 | 11 | 5 | 12 | 15 | 3 | 18 | 7 | 158 | 3.55 |
| 8 | <i>Mastigosporium</i> | - | - | - | 2 | 38 | - | - | 8 | 26 | - | 5 | 13 | 92 | 2.07 |
| 9 | <i>Menispora</i> | - | - | - | 26 | 59 | 16 | - | 37 | - | 47 | 29 | 14 | 228 | 5.12 |
| 10 | <i>Penicillium</i> | - | - | - | - | - | - | 180 | 70 | 25 | 15 | 16 | 12 | 318 | 7.15 |
| 11 | <i>Tetraploa</i> | - | 5 | 2 | 4 | 12 | 17 | 7 | 6 | 16 | 2 | 5 | 3 | 79 | 1.78 |
| 12 | <i>Torula</i> | 4 | 13 | - | - | 13 | 36 | 24 | 21 | 59 | 17 | 38 | 17 | 242 | 5.44 |
| 13 | Unidentified | 61 | 28 | 45 | 86 | 225 | 160 | 128 | 232 | 676 | 114 | 53 | 46 | 1854 | 41.67 |
| Monthly total | | 88 | 133 | 92 | 217 | 768 | 554 | 440 | 496 | 1014 | 214 | 246 | 187 | 4449 | |
| Total in % | | 1.98 | 2.99 | 2.07 | 4.88 | 17.26 | 12.45 | 9.89 | 11.15 | 22.79 | 4.81 | 5.53 | 4.20 | | |

Badya (1989) reported only 5 genera of fungal spores from the same location, of which, *Alternaria* was the most abundant while *Mucor* was most abundant in the present study. In this study, least abundant fungal spore was *Diplodina*, while *Curvularia* was in previous study. A total of 5 fungal spores was common in both the surveys, while the spores of *Menispora*, *Diplodia*, *Diplodina*, *Mucor*, *Torula*, *Tetraploa* and *Mastigosporium* were found to be additional in this study.

Here, the frequency of spores of fungi was found maximum in the month of June and minimum in October, while in the previous survey by Badya (1989), the frequency of spores of fungi was found maximum in the month of July and minimum in February. This

difference may be due to variation of spore counting method along with the changes in fungal vegetation over time. Moreover, the presence of fungal spores in the air is greatly influenced by changing weather or climatic factors (Hjelmroos 1993).

A total of 1,854 fungal spores was unidentified in the present study, while in the previous study the unidentified fungal spore number was not taken into consideration.

Some fungal spores are reported to be allergenic. In this investigation the trapped allergenic fungal spores were *Alternaria*, *Mucor*, *Penicillium*, *Curvularia*, *Drechslera* and *Cladosporium*.

Airborne fungal spores are known to be responsible for the diverse human allergic disorders, particularly type-I and type-III allergic reactions. Fungal spores have clearly implicated in allergic asthma and adverse effect on symptomatic health, particularly among asthmatic patients. Here, in this study many other fungal spores were identified to be distinctly allergenic as reported by many workers (De Lara *et al.*, 1990, Rosas *et al.*, 1990). Further studies with these spores of fungi both identified and unidentified, will shed some light in this line of research in future.

Airborne Pteridophytic spores survey : During the present study, 5 types of airborne pteridophytic spores were identified and counted (Plate I). Altogether four types of pteridophytic spores were identified upto genus/species level and the remaining was grouped into unidentified type (Table.2). The monthly incidence of airborne pteridophytic spores were recorded (Table 2). The highest incidence was observed in the month of February, followed by January, December and May. The lowest incidence was observed in October.

Table 2. Monthly incidence of airborne pteridophytic spores in Chittagong University Campus.

| SL No. | Name of Pteridophyte | Months with total spore count | | | | | | | | | | | | Total count | Total in % |
|----------------------|--------------------------------|-------------------------------|-------------|--------------|--------------|--------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|------------|
| | | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | | |
| 1 | <i>Christella dentata</i> | - | - | - | - | - | 3 | 5 | 51 | 28 | 15 | 6 | 8 | 116 | 17.63 |
| 2 | <i>Ophioglossum petiolatum</i> | - | - | - | - | - | - | 2 | 1 | 7 | 17 | 25 | 22 | 74 | 11.25 |
| 3 | <i>Pteris vittata</i> | 2 | 9 | 78 | 75 | 73 | 24 | - | - | 2 | - | 3 | 7 | 273 | 41.49 |
| 4 | <i>Selaginella</i> spp | - | - | 4 | 5 | - | - | - | - | - | - | - | - | 9 | 1.37 |
| 5 | Unidentified types | 2 | 5 | 3 | 14 | 51 | 25 | 11 | 28 | 12 | 5 | 16 | 14 | 186 | 28.27 |
| Monthly total | | 4 | 14 | 85 | 94 | 124 | 52 | 18 | 80 | 49 | 37 | 50 | 51 | 658 | |
| Total in % | | 0.61 | 2.13 | 12.92 | 14.29 | 18.84 | 7.90 | 2.74 | 12.16 | 7.45 | 5.62 | 7.60 | 7.75 | | |

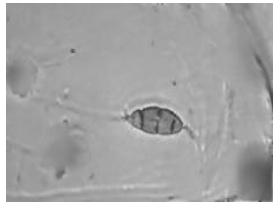
*Alternaria**Diplodina**Cladosporium**Mastigosporium**Curvularia**Diplodia**Drechslera**Torula**Christella dentata**Ophioglossum
petiolatum**Pteris vittata**Selaginella*

PLATE I. Trapped airborne fungal and pteridophytic spores.

A total of 658 pteridophytic spores were trapped during the survey. The maximum contribution was made by *Pteris vittata*, followed by *Christella dentata* and *Ophioglossum petiolatum*. The minimum contribution was made by *Selaginella* spp. A total of 186 spores remained unidentified.

All the identified pteridophytic spores occurred intermittently in the air of the location throughout the survey (Table 2). *Pteris vittata* was found as dominant spore type and occurred highest in the month of December, followed by January and February. In the previous study made at the same location, Badya (1989) reported 1319 pteridophytic spores. But, all the family/generic level identification was not made by him.

Here, maximum concentration of pteridophytic spores was observed in the month of February and minimum in October. In the previous survey (Badya 1989) maximum concentration was observed in the month of July and minimum in February. The difference may be due to changes in the spectrum of fern vegetation and variation of local climatic factors. This is the first report of generic/species level identification of airborne pteridophytic spores in Bangladesh so far.

In this study, 28.27% pteridophytic spores remained unidentified. If these spores could be identified, the spore types might further be increased to 8 to 10 types. So, it is apparent that the atmosphere of the location is also containing a remarkable amount of pteridophytic spores which, like fungi, also may be the causative of respiratory allergy of the local people.

It may be mentioned that a good number of reports are available mentioning seasonal variation of airborne fungal (Konger and Baruah 1958, Chakraverty 1974, Kulshrestha and Chauhan 2003, Arora and Jain 2003) and pteridophytic (Devi and Jamil 1979, Devi and Khare 1981)) spores and their allergenicity (Hausen and Schulz 1978, Geller-Bernstein *et al.* 1987, Bunnag *et al.* 1989, Kasprzyk *et al.* 2004). So, more extensive and intensive investigations and monitoring should be made on the aerobiology and allergenicity of the prevailing pteridophytic spores along with the fungal spores of Bangladesh for longer period of time.

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