

A Case Study – Biogenic Allergens Present in the Atmosphere of Patna District of Bihar (India)

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Abstract: Aerobiological investigation and atmospheric sampling were carried out at Patna district for two successive years May 2010 to June 2012 by using volumetric Air sampler. In sampling process concentration of pollen and fungal spore was determined. A total of 100 airspora component recorded, 7 fungal spores and two pollen types were found in the atmosphere of Patna district. Fungal Spores causes different Allergic Reaction significance. *Chaetomium*, *Helminthosporium*, *Alternaria*, *Aspergillus*, *Cladosporium*, *Didymella* and *Epicoccum* were identified as aeroallergens. Result of this investigation would be helpful in the diagnosis and treatment of patient suffering from different aeroallergic problem.

Keywords: Investigation, biogenic, aeroallergens

1. Introduction

Basically pollutants of biological origin found in air having component like pollen grains, fungal spore, algal filament, hyphae fragments and several other microbiota. Many of these fungal and pollen grains causes many animal and plant diseases including Allergy. In animal generally respiratory, cardiovascular, gastrointestinal and dermatological disorder. The present summery indicate that two years investigation at Patna and mainly aeroallergens concentration and seasonal variation reported. Data of this study supposed to provide realistic information for formulation of new medicine in the diagnosis of allergy of this area.

2. Material and Methods

Air sampling collected for two successive years from May 2010 to June 2012 using electrical volumetric air sampler (Tilak and Kulkani -1970). On the basis of floristic diversity and anthropogenic interference two sampling places were selected. The first sampling place was **Saguna More**, having lesser human interference and dense vegetational cover. The second sampling place was **Mussallahpur Hat** represented a busy site but very less vegetation. Continuously electricity supply was ensuring by generator available at sampling station. The sample was protected from rain by asbestos was kept at a height of six meter from ground level. Parameter slide were prepared by process given by **Tilak and Vaseline** as adhesive changed every 8thday and study of slides was scanned using binocular research microscope with 10x and 45x eye piece objective combination. Over slide each segment of tape was 40cm in length and represented 12h catch. The tape further divided into six equal part marks by ink on slide. The spore counted were multiplied by conversion factor of the Samper (14) to get at the number/m³ of air.

3. Spore and Pollen Analysis

Spore and pollen analysis involves the identification by morphological feature of spore and pollen grains, observed during microscopic examination and comparison with slides. Some papers in this context were publishing for

identification of spore and pollen (text book of pollen analysis, 2nd edited by k.faeagri and J.Iverson Copenhagen 1966), (Neishtadt, M.I palinogiiav SSSR Muscov-1967). On the basis of color, shape, size, ornamentations Generic and specific count were made easy during sampling procedure. References slide of pollen grains collected and then estimate the total amount of pollen (Kannety2005). Haemocytometers, specialized slides with a grid, are also used to count sub sample (Kearns and Inouye -1993). Meteorological data collected from INDIAN METEOROLOGICAL DEPARTMENT PATNA. Average seasonal variation in meteorological parameter in 2010-2011 and 2011-2012.

Table1: Average seasonal variation recorded by Patna Meteorological department Patna.

Meteorological parameter	Summer		Rainy		Winter	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
Mean Temp	32.77	30.11	27.34	28.22	16.40	19.35
Rain fall	2.40	3.45	5.34	4.79	.65	.68
Humidity%	62.40	52.20	79.45	80.45	68.30	73.56

4. Result and Discussion

A total of 100 airspora component collected from two different location of same district having 9 fungal spore and two pollen types were identified as allergenic component. Yearly mean concentration and contribution to the total airspora presented in table2.

The fungal spore are microscopic biological and belong to Ascomycetes or Deuteromycetes. *Chaetomium* and *Penicillium* were only Ascomycetes member contributing lower percentage of allergenic airspora, *Chaetomium* causes mainly disease like brain abscess, peritonitis and onychomycosis. During 2010-11 and 1011-12 *Cladosporium* contribute higher concentration is about 66.83% and 68.53% while lowest concentration of *Penicillium* (0.15%) in 2011-12 and 0.36% in 2010-11 respectively. *Chaetomium* and *Penicillium* roughly equal contribution in 2010-11 and 2011-12.

Through two allergenic pollen types recorded in this investigation did not show accurate differences Grass pollen like Parthenium hysterophorus in 2011-12 exhibited higher concentration. In fact those accurate seasonal trends of variation in the occurrence of different fungal spore and pollen type can be investigated on the basis of long time aerobiological monitoring. The second estimation was average seasonal percentage contribution of individual spore. The average allergenic airspora component in 2010-11 and 2011-12 has been depicted in table 3. Fusarium was seen higher concentration in rainy season (**Marshall E-July 1998**), other worker also reported more conc. Of Fusarium reported in rainy season (**Pady and Kramer-1960**). A report have been clear indicate that Aspergillus, Curvularia, Penicillium and Helminthosporium incidence more in both the year of investigation (**Tilak and Bhalke-1978**). Among the all pollen type Parthenium having peak concentration during summer and less concentration during rainy and winter season. In 2010-11 and 2011-12, summer was favorable season for growth of Parthenium. Grasses being anemophilous exhibited more incidences in summer and winter season of both year but low incidence during rainy season. Alternaria exhibited more incidence rainy and winter season but low incidence during summer season. Ecological and phytogeographical conditions of an area have a pronounced effect on the composition of its airspora (**Babu, M-1983**). The seasonal growth depends upon seasonal variation in rain fall, temp, humidity etc. So airspora was influenced by the seasonal growth of vegetation, flowering period and micrometeorological condition. The changes in atmosphere, relative humidity might have been potential factors for the variable concentration of different bioallergans during the same season of the two years of study. Spore and pollen has already been established allergenic potential (**Hyde and Williams-1961**). The estimated data of seasonal variation and concentration can do a long way in assisting the allergologists to formulate their diagnosis and treatment strategy of allergy patients of this area.

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Table 2: Conc. and % of contribution of different spore in 2010-11 and 2011-12

Spore Type	Yearly Mean Concentration		% Contribution	
	2010-11	2011-12	2010-11	2011-12
1. Chaetomium	12236	7126	0.64	0.34
2. Helminthosporium	39816	35658	2.12	1.68
3. Alternaria	164654	208054	8.73	2.84
4. Aspergillus	57372	42476	3.04	2.01
5. Cladosporium	1260294	1449644	66.83	68.53
6. Parthenium	76398	70146	4.13	3.59
7. Fusarium	10752	9966	0.57	0.48

Table 3: Seasonal % contribution of allergenic component in 2010-11 and 2011-12

Spore Type	Summer		Rainy		Winter	
	2010-11	2011-12	2010-11	2011-12	2010-11	2011-12
1. Chaetomium	12.62	6.93	4.24	6.38	8.15	11.5
2. Helminthosporium	6.08	3.31	12.69	9.21	6.24	12.49
3. Alternaria	4.93	4.87	9.03	6.67	8.80	13.6
4. Aspergillus	6.17	3.22	9.54	13.74	8.75	8.04
5. Cladosporium	3.11	1.38	9.96	12.32	11.94	11.31
6. Parthenium	40.56	40.70	26.97	26.98	32.47	32.32
7. Fusarium	3.28	0.39	20.37	24.20	1.33	0.42