



## **Incidences and Disparities in Airborne Bioparticles from Badnera Area**

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### **ABSTRACT**

The industrial growth and subsequent rise in the ease of transport have altered the course of many biological processes. The changing environment due to urbanization is facilitating the disturbances in the dispersion and distribution of the biological entities. Many of such bio-particles that are present in the air and propagated by the air have great influence on the life of the area. It is prerequisite that the sampling of such area should be done to prepare data about the forecasting of the bio-particles. Considering the societal significance of the study, a survey was conducted to trap and identify the airborne bioparticles present in the study area. Three types of bioparticles were found fungal spores, pollen grain and miscellaneous bioparticles. There was no spore-free period during the investigation period in the town. The aerospora of Badnera had peak period during September-October months followed by January. The pollen of *Parthenium hysterophorus* alone constituted 66.18% of the total annual pollen catch followed by *Gossypium hirsutum* (12.35 %), Grass (6.5%), *Cajanus cajan* (2.94 %), *Ricinus communis* (2.30 %), *Triticum astivum* (2.22 %) and others. The pollen grains for Poaceae, Verbenaceae, Asteraceae complex were encountered throughout period of investigation.

**Keywords:** Pollen Grains, Fungal Spores, Bioparticles, Airborne.

### **1. Introduction**

Aerobiology is nothing but the interdisciplinary science focused on the study of micro particles. Due to the study of Aerobiology we can make a better future in Medicine, Agriculture, Beekeeping, and Metrology and so on. The variability of pollen depends on plants behavior and environmental conditions<sup>1</sup>. The quantitative and qualitative study of pollen is depends upon biometeorology and aerobiology or we may called the seasonal change differentiate the quality and quantity of pollen<sup>2</sup>.

India has more than 25 percentage of the population known to suffer from major allergic problem<sup>3</sup>. There are some common types of allergic pollens like grasses, weeds and tree pollens etc<sup>4</sup>. These allergies like asthma, rhinitis, eczema and food allergies are spreading in developing world. Allergenic plants distributed in various regions depend on vegetation, climate and geography of that particular area. Pollen grains are well known causative agents for various disorders especially respiratory disorder. Considering these societal significance of the study, a survey was conducted to trap and identify the airborne bioparticles present in the study area.

### **2. Materials and Methods**

#### *Study Area and Sampling Sites*

Badnera, a study area, is situated about 11 km from Amravati Municipal Corporation and also near to the Old MIDC sector. Such habitat condition of Badnera, it is very likely to exhibit the seasonal incidence of the airborne allergens. Badnera town lies on the geographical coordinates of 20° 52' 0" N, 77° 44' 0" E., having a population around 44000, which is spread over an area of 19.93 square kilometers. In the study area, five different sampling sites were selected viz. Gandhi Vidyalyaya campus, Modi Hospital Campus, M. I. D. C. Campus, Juni basti and New basti. (Figure 1).

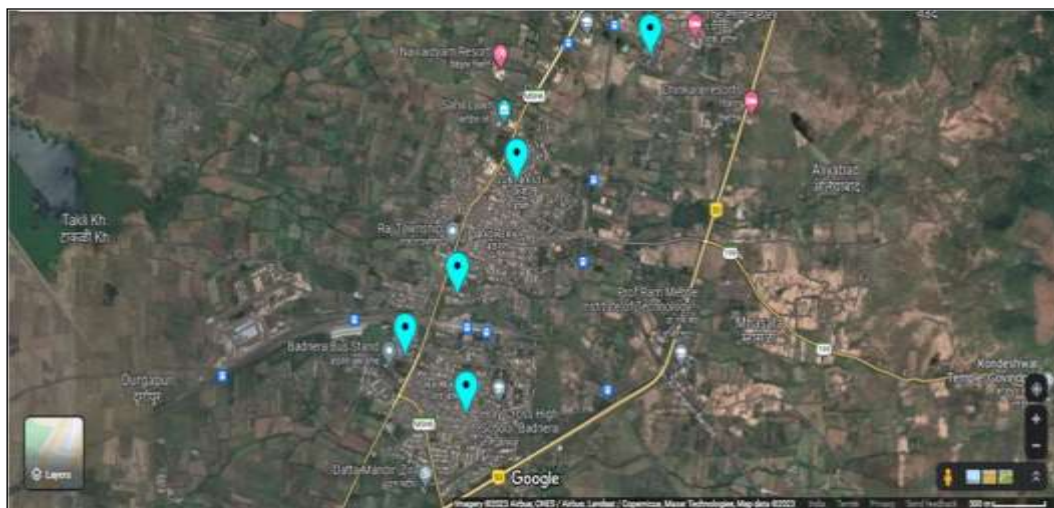


Figure 1: Map of Badnera showing five different sampling sites.

### Sampling Method

A Tilak air sampler was utilized for the aerobiological sampling. The sampler is a modified version of Burkard sampler for Indian weather conditions<sup>5</sup>. Five litres of air per minute are sucked through the projecting tube's mouth and impact on the translucent cello tape, which is 1.5 cm wide and fixed to the slowly spinning drum. The each portion on tape was mounted in glycerin jelly for the observation of aeroflora.

### Identification of Airborne Bioparticles

The morphological details of pollen grains were observed under digital microscope 'Labomed Model No. IVU 3100'. Pollen grains were identified with the help of available literature<sup>6-7</sup>.

## 3. Results and Discussion

The qualitative analysis of the aerospora revealed that 69 types of biocomponents belonging to pollen and spore types. Other types included the hyphal fragments, tracheidial elements, insect, insect wing, insect part, algal filaments and two other heterogeneous group viz. unidentified pollen and fungal spores. By Sampler Method pollen count during the year 2020-2021- and 2021-2022 was found to be 397.85 pollen/m<sup>3</sup> and 17366 pollen/m<sup>3</sup> at site I and IV, however, it was 346.88 pollen/m<sup>3</sup> and 10608 pollen/m<sup>3</sup> at site II and V and 274. Lastly the count was 14 pollen/m<sup>3</sup> at site III.

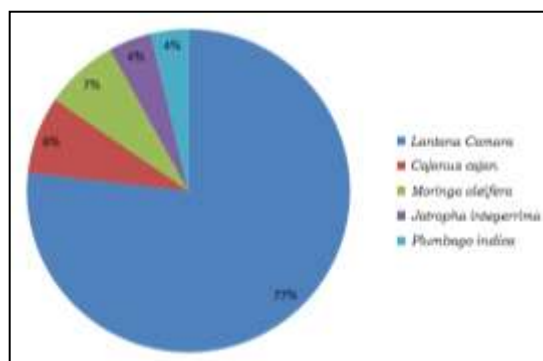


Figure 2: Dominant pollen types during 2020

The dominant pollen pollen gains observed by Tilak air sampler during 2020 are *Lantana camera* (1059), *Cajanus cajan* (107), *Moringa oleifera* (102), *Jatropha integerrima* (59) and *Plumbago indica* (52) (Figure 2). The dominant pollen pollen gains observed by Tilak air sampler during 2021 are *Cajanus cajan* (107), *Tridax procumbens* (107), Sweet acasia (105), *Citrus limon* (100) and *Datura metel* (107) (Figure 3). The dominant pollen pollen gains observed by Tilak air sampler during 2022 are *Gossypium hirsutum* (133), Grasses (1050), *Cajanus cajan* (107), *Moringa oleifera* (102), *Cicer arietinum* (90) (Figure 4).

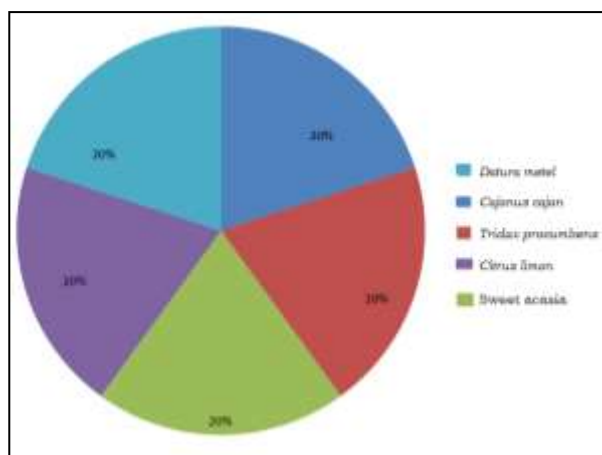


Figure 3: Dominant pollen types during 2021

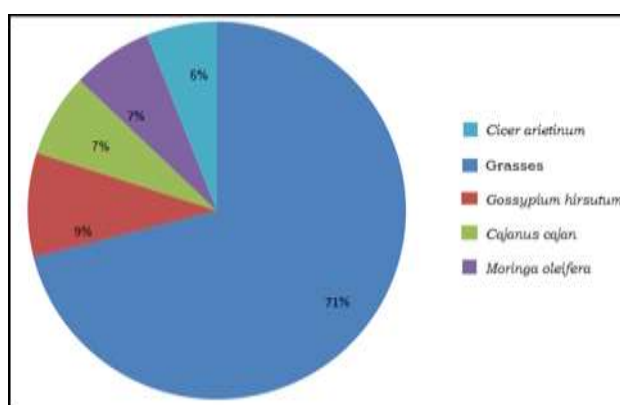


Figure 4: Dominant pollen types during 2022

In the observed aeroflora, the pollen of *Parthenium hysterophorus* alone constituted 66.18% of the total annual pollen catch followed by *Gossypium hirsutum* (12.35 %), Grass (6.5%), *Cajanus cajan* (2.94 %), *Ricinus communis* (2.30 %), *Triticum astivum* (2.22 %) and others. The pollen grains for Poaceae, Verbenaceae, Asteraceae complex were encountered throughout period of investigation. Dominance of these pollen types has been also reported by Chanda and Nandi<sup>8</sup> at Calcutta, Agashe and Abraham<sup>9</sup> at Bangalore, Bhat and Rajasahab<sup>10</sup> at Gulbarga and Narkhedkar et al.,<sup>11</sup> at Amravati.

Amongst the dominant pollen type *Plumbago indica* pollen was observed. Though the pollen was present in the atmosphere throughout the year, peak season were was between February to March and between September to November. Flowering occurs from September to November, while fruiting occurs from January to February. The pollen types Nettle spurges, *Parthenium hysterophorus* were caught in clumps while *Persicaria maculosa*, *Citrus limom*, *Datura metel*, *Gaillardia* occurs singly or in clumps at Badnera.

Sudha and Agashe<sup>12</sup> reported that *Parthenium hysterophorus* (37.96 %) were dominant in the air at Bangalore followed by Poaceae. The dominance of *Parthenium hysterophorus* pollen was found to be reported by Agashe and Mathew<sup>13</sup>, Singh and Mathur<sup>14</sup>. Earlier studies by Gaur and Kasana<sup>15</sup> at Modinagar has revealed the dominance of various pollen and fungal type in the atmosphere and recorded 24 types of pollen grains, 30 types of fungal spores. Hamilton<sup>16</sup> made a comparative study of airborne pollen and fungal spores at the urban and rural sites and found that the aerospora in the city was less than half of that of rural site. Davies<sup>17</sup>, Hyde<sup>18</sup> and Long and Kramer<sup>19</sup> have also made comparative studies of the aerospora and found that the ecology of a site affected the airspora. Subba Reddy<sup>20</sup> reported that the fungal spore and pollen catch was greater at rural site. Bajaj<sup>21</sup> and Gaur and Kasana<sup>11</sup> have also come to a similar conclusion.

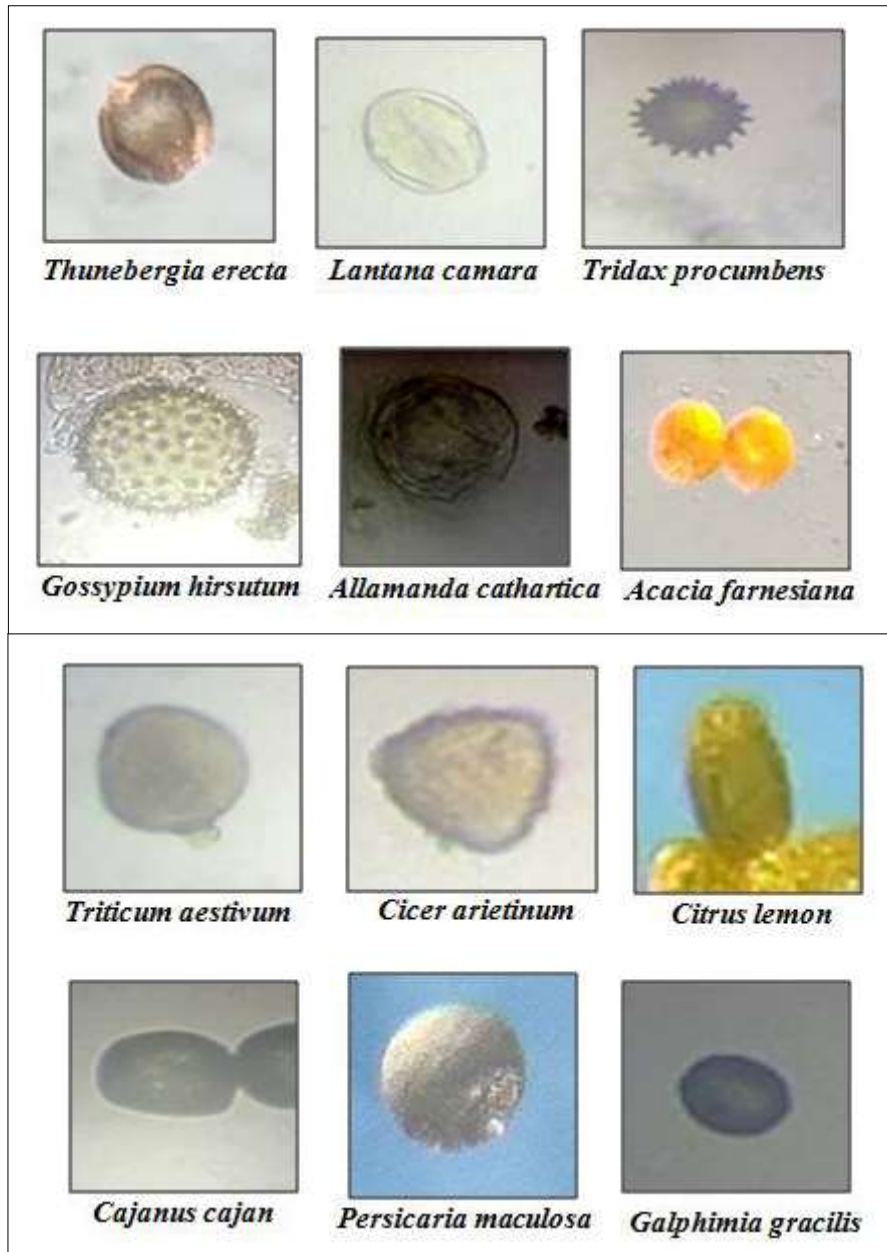


Figure 5: Some of the Pollen Types Observed as the Airborne Bioparticles

#### 4. Conclusion

Aerobiological investigations undertaken for consecutive years 2020 to 2022 found to be useful. A notable seasonal variation in aerospora reflects the role of climatological factors and seasonal flowering of local plants. Out of sampled pollen grains Asteraceae and Malvaceae was found to be dominant.

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