

PREFACE

Atmospheric aerosols are the most important concern for the Anthropocene era due to their significant impact on human and animal health, agriculture and food security, cloud formation, and climate, along with many associated socio-economic issues. Bioaerosols are the major constituent of aerosols, which have biological origin. The major sources of bioaerosols may be natural and anthropogenic in nature. The natural sources of the bioaerosols include trees, plants, animals, soil and waterbodies, whereas the anthropogenic sources of the bioaerosols contain sewage, solid waste processing and dumpsites, waste treatment plants etc. Due to size range and nature, the bioaerosols can easily be inhaled through the human respiratory system and affect human health. Its size can make it able to transport over a few meters to thousands of kilometers via the mechanical action of wind. Bioaerosols can also take part in atmospheric processes like cloud formation and atmospheric dry and wet deposition.

The concentration and nature of the bioaerosols varied from place to place and season to season. Some of them are always common and found in each season for both indoor and outdoor sites. Environmental variables like temperature, relative humidity, solar radiation and wind speed affect the concentration of the bioaerosols. This may be due to the survivability of the microbes being optimum at the specific range of the environmental variables parameter, which also depends on the types of bioaerosols present in the environment.

Bioaerosols can be associated with various particulate matter (PM₁₀ and PM_{2.5}) in the atmosphere. There is a significant amount of microbes were found in the particulate matter. These have the tendency to multiply in the host and increase their number at a level, which can show some harmful health impacts. Some bacteria and fungi are very common in the ambient air. They are very prevalent to the health risks associated with humans. The thesis entitled “**Study of Bioaerosols at Middle Indo-Gangetic Plain in Indoor and Outdoor Environments**” comprises nine chapters and references.

Chapter 1 of the thesis contains the fundamentals of aerosols and bioaerosols, their size, sources and types. This chapter also presents the various effects of bioaerosols on humans and animals, agriculture and food security, cloud formation and climate, and various sustainable goals associated with bioaerosols.

Chapter 2 reviews the various national and international studies done on bioaerosols in various indoor and outdoor environments along with variable atmospheric conditions. This chapter includes a review of previous work where various methods and techniques were used for the collection and analysis of the samples. This chapter also discussed the selection of instrumentation for sample collection and analysis techniques. While going through the literature review, some research gaps were found, which shows that very little research was available on the bioaerosols in the Indo-Gangetic Plain and helps in outlining the objectives of the present work that were decided in this chapter.

The results and discussions of the various objectives were divided into five sections in different chapters as follows: the first section (**Chapter 3**) of it discussed the microbes present in the suspended particulate matter (SPM) for both PM₁₀ and PM_{2.5}, along with its association with meteorological parameters. The second section (**Chapter 4**), discussed the seasonal variation of the bioaerosols over the various outdoor sites. The third section (**Chapter 5**) extensively analyzes the bioaerosols emission from various anthropogenic sources along with the health survey and antibiotic resistance. The fourth section (**Chapter 6**) focuses on the bioaerosols study at various indoor sites, including animal and human-dominant places. The bioaerosols study at variable atmospheric conditions was discussed in the last section (**Chapter 7**), where foggy and non-foggy days were chosen for the purpose of analysis. **Chapter 8** contains the summary and future scope of the present work and the scope for future work in the area of bioaerosols. The list of references is given at the end of the thesis.