

ABUNDANCE OF AIRBORNE ALGAE IN THE ATMOSPHERE OF AURANGABAD CITY (M.S.)

Sunita V. Jawale¹ and Milind J. Jadhav^{2*}

¹Department of Botany Yeshwantrao Chavan College of Arts, Commerce and Science, Sillod, Dist. Aurangabad – 431 112 (M.S.) India.

²Department of Botany, Sir Sayyed College, Roshan Gate Area, Aurangabad – 431001. (M.S.)
(E-mail: jawalesunita71@gmail.com, dr.mjjadhav@gmail.com)

ABSTRACT

In present research work airborne algae in the atmosphere of Aurangabad city have been studied in detail. The experiments were conducted for two consecutive years i.e. from August 2014 to July 2016. A total of 97 air samples were obtained during study tenure. 76 airborne algal taxa under 31 genera belonging to Cyanophyceae, Chlorophyceae and Bacillariophyceae were cultured, identified and recorded. Cyanophyceae members dominated airborne algal flora. Among Cyanophyceae *Aphanothece*, *Phormidium*, *Gloeocapsa*, *Plectonema*, *Lyngbya*, *Chroococcus*, *Microcoleus*, *Myxosarcina*, *Nostoc*, *Scytonema* and *Gloeothece* were dominant. *Gloeocystis*, *Chlorella*, *Trebouxia* and *Chlorococcum* were dominant in Chlorophyceae. Among Bacillariophyceae *Nitzschia*, *Cymbella* and *Hantzschia* were abundant. Unicellular, colonial and filamentous aeroalgal forms were recorded throughout the study period. Algal cells contain protein in high concentration and it is of considerable importance with reference to allergic reactions in sensitive individuals.

KEYWORDS: Airborne algae, Atmosphere and Aurangabad.

INTRODUCTION

Airborne algae are one of the significant bio-component of atmosphere. It remains viable in the atmosphere in the form of spores and filaments. The relevance of fungal spores and pollen grains present in the atmosphere with allergic diseases has been well established. Except few reports, very rare attention has been paid towards airborne algae, although Indian climate is most suitable for algae to become airborne and subsequent spread through air. Therefore, it has been decided to work on diversity and abundance of airborne algae in the atmosphere of Aurangabad City of Maharashtra. Culture plate exposure with impaction technique was employed to isolate and culture airborne algae from the atmosphere of Aurangabad City.

MATERIALS AND METHODS

In order to study the diversity and abundance of airborne algae in the atmosphere of Aurangabad city, one site, college campus of Sir Sayyed College, which is located in densely populated area has been selected. The air samples were collected by using petriplates containing agarized Bold's basal medium. Petriplates were exposed on college terrace which is 45 feet above the ground level. The duration of exposure was normally of two hours. The frequency of exposure was once in a week. The experiments were conducted for two consecutive years i.e. from August 2014 to July 2016. Exposed petriplates were incubated under the tubelights having 1000 to 1500 lux capacity in algal culture chamber. Liquid nutrient medium was poured into the plates at the time of keeping those for incubation and frequently supplemented with the same. This encouraged the growth of algal organisms, besides avoiding drying. Upon visualizing the growth as discrete colony forming units (CFU), they were picked up and identified under research microscope.

RESULTS AND DISCUSSION

Presence of algal spores and filaments in the atmosphere has been known from long time (Overeem, 1937; Ramalingam 1971 and Ramalingam and Parshwnath 1979). During present study a total of 97 air samples were obtained spanning two years i.e. from August 2014 to July 2016. Algal forms belonged to Chlorophyceae, Bacillariophyceae and Cyanophyceae were cultured, identified and recorded. 76 taxa of airborne algae under 31 genera were isolated from the atmosphere of Aurangabad city, of these 9 taxa under 7 genera belonged to Chlorophyceae, 4 taxa under 4 genera belonged to Bacillariophyceae and 63 taxa under 20 genera belonged to Cyanophyceae (Table 1 and 2). Cyanophycean algal forms were found dominant; it is conformity with the earlier reports (Balkrishnan and Gunale, 1980, Jadhav and Chavan, 2007 and Jadhav and Quazi, 2010). Patil and Patil (2014), also reported highest concentration of Cyanophycean members in the extramural environment of Pune.

Table 1: Total number of airborne algal taxa and genera isolated from the atmosphere of Aurangabad city.

Sr. No.	Class	Taxa	Genera
1	Chlorophyceae	09	07
2	Bacillariophyceae	04	04
3	Cyanophyceae	63	20
Total		76	31

Table 2: Airborne algal taxa isolated and cultured from the atmosphere of Aurangabad city.

Chlorophyceae

Gloeocystis gigas, *Gloeocystis major*, *Tetraspora gelatinosa*, *Chlorococcum humicola*, *Trebouxia humicola*, *Chlorella vulgaris*, *Ankistrodesmus falcatus*, *Acinastrum hantzschii*, *Acinastrum hantzschii* var. *fluviatile*.

Bacillariophyceae

Pinnularia interrupta, *Cymbella aspera*, *Hantzschia* sp. *Nitzschia palea*.

Cyanophyceae

Chorococcus coharens, *Chorococcus macrococcus*, *Chorococcus minor*, *Chorococcus minutus*, *Chorococcus turgidus*, *Gloeocapsa polydermatica*, *Gloeocapsa rupestris*, *Gloeotheca palea*, *Aphanocapsa roeseana*, *Aphanocapsa nidulans*, *Aphanothece saxicola*, *Merismopedia tenuissima*, *Chlorogloea microcestoides*, *Myxosarcina burmensis*, *Spirulina major*, *Oscillatoria claricentrosa*, *Oscillatoria obscura*, *Phormidium abronema*, *Phormidium africanum*, *Phormidium ambigum*, *Phormidium angustissimum*, *Phormidium anomala*, *Phormidium bohneri*, *Phormidium corium*, *Phormidium favosum*, *Phormidium foelarum*, *Phormidium fragile*, *Phormidium incrustatum*, *Phormidium jadinianum*, *Phormidium jenkelianum*, *Phormidium molle*, *Phormidium mucosum*, *Phormidium papyraceum*, *Phormidium subincrustatum*, *Phormidium tenue*, *Phormidium usterii*, *Phormidium valderianum*, *Lyngbya koshyapii*, *Lyngbya majuscula*, *Microcoleus acutissimus*, *Microcoleus sociatus*, *Microcoleus subtorulosus*, *Microcoleus vaginatus*, *Nostoc cummne*, *Nostoc linckia*, *Nostoc microscopicum*, *Nostoc punctiformae*, *Nostoc verrucosum*, *Anabaena sphaerica*, *Plectonema gracillimum*, *Plectonema hansgirgi*, *Plectonema nostocorum*, *Plectonema radiosum*, *Scytonema bohneri*, *Scytonema millei*, *Scytonema schmidtti*, *Scytonema stuposum*, *Scytonema varium*, *Calothrix breviararticulata*, *Calothrix geitonos*, *Hapalosiphon welwitschii*, *Stigonema hormoides*.

Table 3: Allergenic airborne algae isolated from the atmosphere of Aurangabad city.

Sr. No.	Allergenic airborne algae	Sr. No.	Allergenic airborne algae
1	<i>Chlorococcum humicola</i>	13	<i>Phormidium molle</i>
2	<i>Trebouxia humicola</i>	14	<i>Phormidium tenue</i>
3	<i>Chlorella vulgaris</i>	15	<i>Microcoleus acutissimus</i>
4	<i>Ankistrodesmus falcatus</i>	16	<i>Nostoc commune</i>
5	<i>Nitzschia palea</i>	17	<i>Nostoc linckia</i>
6	<i>Gloeocapsa rupestris</i>	18	<i>Nostoc muscorum</i>
7	<i>Gloeotheca palea</i>	19	<i>Nostoc punctiformae</i>
8	<i>Aphanothece nidulans</i>	20	<i>Plectonema gracillimum</i>
9	<i>Myxosarcina burmensis</i>	21	<i>Plectonema hansgirgi</i>
10	<i>Phormidium abronema</i>	22	<i>Scytonema bohneri</i>
11	<i>Phormidium fragile</i>	23	<i>Scytonema schmidtti</i>
12	<i>Phormidium jenkelianum</i>		

Airborne algae which were found dominant during present study were *Gloeocystis gigas*, *Gloeocystis major*, *Chlorococcum humicola*, *Trebouxia humicola*, *Chlorella vulgaris*, *Ankistrodesmus falcatus*, *Nitzschia palea*, *Chroococcus minor*, *Chroococcus minutus*, *Chroococcus turgidus*, *Gloeocapsa rupestris*, *Aphanothece nidulans*, *Aphanothece saxicola*, *Myxosarcina burmensis*, *Phormidium jenkelianum*, *Phormidium molle*, *Microcoleus acutissimus*, *Nostoc muscorum*, *Plectonema gracillimum* and *Scytonema bohneri*. Similar kind of observations were made by Jadhav and Quazi (2010) and Patil and Patil (2014). During present study unicellular, colonial and filamentous algal forms were cultured.

It is well known fact that algal cells contain protein in high concentration and it is of considerable importance with reference to allergic reactions in sensitive individuals. The airborne algal propagules have been considered to cause bronchial allergy in human beings. Hay fever, allergic asthma, allergic rhinitis, allergic cough and cold and dermatitis are other diseases caused by these organisms in sensitive individuals. During present study 23 airborne algal taxa were isolated and cultured from the atmosphere of Aurangabad city (Table 3), which have been reported allergenic to human being by earlier researchers (Goyal 1976; Agarwal *et. al.*, 1977, Mittal *et. al.*, 1979; Heise 1949, Mc Elhenney 1962, Schwimmer and Schwimmer, 1964; Bernsterin and Safferman 1966; Jadhav and Quazi 2010 and Dubey *et. al.*, 2010). Data of present study of especially on allergenic airborne algae will assist in clinical and therapeutic treatment of allergic diseases.

Hence it is concluded that atmosphere of Aurangabad City contains variety of airborne algae. Cyanophycean algal members are found dominant which is followed by Chlorophyceae and Bacillariophyceae. Airborne algal spores and filaments have potentiality in causation of allergic disease in human beings. The present findings have important health implications. This work will be helpful to the physicians and allergicians for effective and efficient mode of treatment of various allergic disorders in human beings.

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