

Study of Varied Habitats and its Effect on Algal Diversity from Fergusson College, Pune

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Fergusson college campus is located in Pune City, Maharashtra, India. Founded in 1885 and run by Deccan Education Society spread across 109 acres of land which can be divided into two parts as FC campus and FC hill. FC campus consists of departmental gothic style old buildings as well as newly constructed buildings while FC hill lies towards the west of the main campus. Total (129) and (125) algal forms were observed from FC campus and FC hill respectively out of which (100) and (88) were identified up to generic level and (76) and (57) were identified up to species level respectively indicating high algal diversity presence due to its varied habitats available for its survival. At FC campus only three divisions of algae were reported as cyanophyta (90%) with the scarce presence of chlorophyta (8%) and bacillariophyta (2%) while at FC hill four divisions of algae were reported as cyanophyta (78%) followed by chlorophyta (16%) with the scarce presence of bacillariophyta (5%) and euglenophyta (1%) respectively. Even though cyanophyta was dominant, variation can be seen in cyanophyta coccoid and cyanophyta filamentous forms. At FC campus cyanophyta filamentous forms (62) dominated over cyanophyta coccoid forms (54) were as at FC hill, cyanophyta coccoid forms (52) dominates over cyanophyta filamentous forms (46). *Chroococcus*, *Microcystis*, *Gloeocapsa*, *Phormidium*, *Oscillatoria* was present abundantly while *Merismopedia*, *Lyngbya* and *Scytonema* were present optimally at both the sites. All these Cyanophytic members possess well-developed sheath around there cell/trichome which might help them withstand adverse environmental conditions.

Keywords: Algal Distribution; Cyanobacterial Allergenicity; Cyanophyta; Subaerial Algae; Terrestrial Algae.

Algal flora has been studied by several workers throughout the world. Rindi and Guiry (2003)¹ studied algae from the walls of Galway city, western Ireland. Alghanmi and Jawad (2017)² studied the biodiversity of cyanobacteria from agricultural fields from Al-Diwaniyah city and a total of (26) species were recorded by them, out of which *Oscillatoria* was dominant. Bernstein *et al*

(2011)³ performed a study to show cyanobacterial allergenicity.

The algal flora of India was studied by several workers. Sethi *et al.* (2012)⁴ collected different samples from the biological crust and subaerial habitat from the eastern region of India and reported (24) species of cyanobacteria and (6) species of microalgae. Satpati *et al.* (2013)⁵

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studied mangrove forest at Sundarban and recorded (32) species of algae. Datta and Keshri (2014)⁶ investigated soil and subaerial algae from village Burdwan, West Bengal, India and recorded (22) taxa of blue-green algae. Kharkongor and Ramanujam (2014)⁷ reported (85) taxa of algae collected from tree barks from forested areas of Meghalaya. Satpati and Pal (2016)⁸ recorded *Trentepohlia rigidula* from two very distinct

habitats like tree bark and cemented wall from West Bengal, India. Adhikary and Keshri (2015)⁹ studied cyanobacterial biofilms on the stone temple from Bhubaneshwar and reported (17) species of cyanobacteria while in monsoon additional 25 species of cyanobacteria were observed in the biofilms of these temples. Palanivel and Uma Rani (2016)¹⁰ studied two temple tanks from the suburb of Chennai where they found chlorophyceae was the dominant group at both the temple tanks. Dirborne and Ramanujam (2017)¹¹ studied algal flora from the pine forest and subtropical broadleaf forest from East Khasi Hills Dist. of Meghalaya with a comparative study on cyanobacteria and diatoms. Das and keshri (2017)^{12,13} studied algal diversity from Koch-Bihar a district from West Bengal situated at foothills of Eastern Himalayas from where they reported (11) taxa of coccoid cyanoprokaryotes belonging to (5) genera and (24) taxa of Oscillatoriales under cyanoprokaryotes.

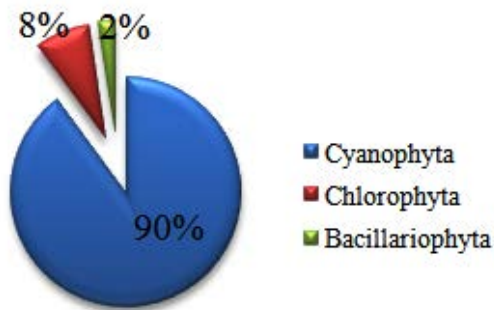


Fig. 1. Divisional Diversity at FC Campus

Similar work was carried out in different parts of Maharashtra by several workers. Pandkar

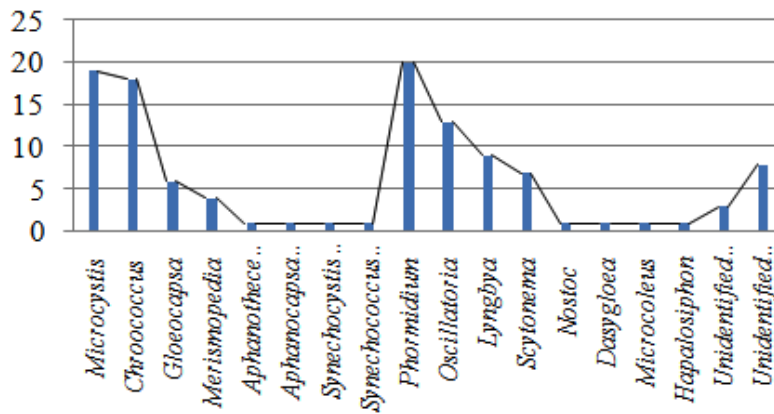


Fig. 2. Generic Diversity at FC Campus

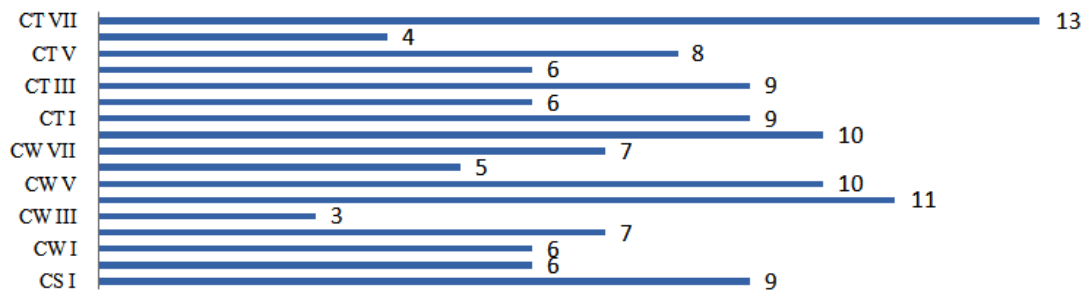


Fig. 3. Total Forms per Spot at FC Campus

Merismopedia was reported from (4) samples with *M. punctata* reported from (2) samples. Other coccoid forms recorded were *Aphanothece stagina*, *Aphanocapsa biformis*, *Synechocystis aquatilis* and *Synechococcus aeruginosus* from one sample each. Desmid (8) and diatoms (3) were scarce belonging to chlorophyta and bacillariophyta respectively. (Table 1)

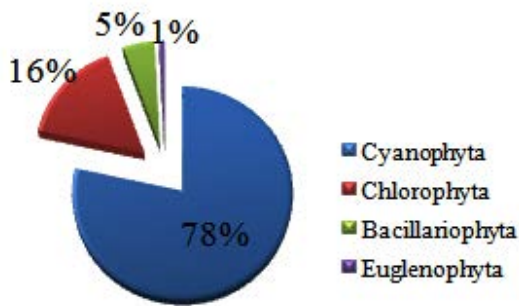


Fig. 4. Divisional Diversity at FC Hill

Total of 98 cyanophyta members were observed from 17 different spots from FC hill. Fig. 4 clearly showed the dominance of cyanophyta (78%) followed by chlorophyta (16%) while bacillariophyta (5%) and euglenophyta (1%) were scarcely recorded. Coccoid (52) forms were little more than filamentous (46) forms. Coccoid forms recorded showed the dominance of *Chroococcus* (26) with *C. minutus* (12) recorded from most of the samples. A second largest genus recorded from coccoid forms was *Microcystis* (18) were *M. aeruginosa* was identified up to species level from (1) sample only. Genus *Aphanocapsa* was recorded from (4) samples which were further identified up to species level as *A. grevillei*, *A. elachista*, *A. biformis* and *A. roeseana*. Other coccoid forms reported were *Gloeocapsa* (2) and *Gloeotheca rupesrtris* (1). (Table 2)

In filamentous forms, *Phormidium* (23) was dominant with *P. fragile* (7) recorded most of the time. *Scytonema* was reported from (5)

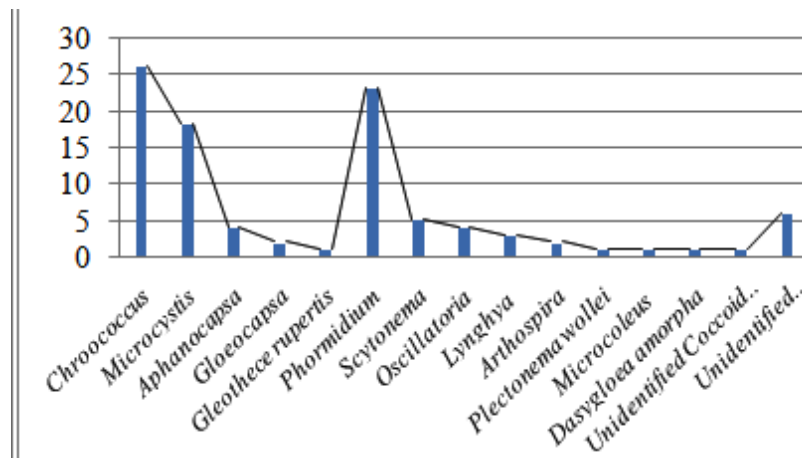


Fig. 5. Generic Diversity at FC Hill

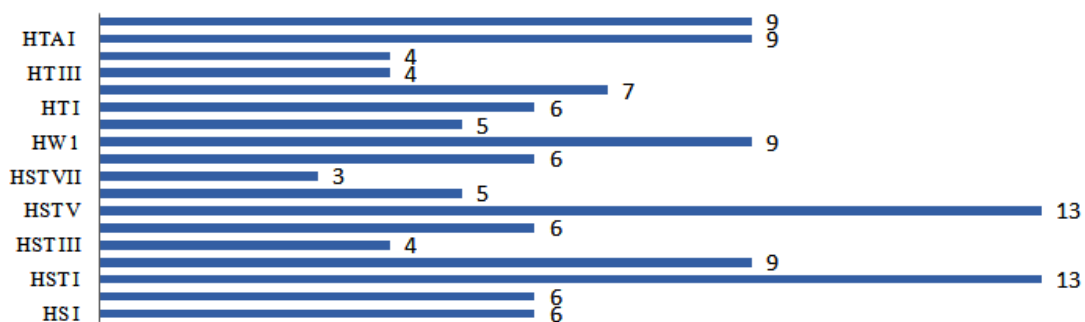


Fig. 6. Total Algal Forms per Spot at FC Hill

samples with *S. julianum* and *S. hofmanni* recorded from (1) sample each. *Oscillatoria* was reported from (4) samples with species like *O. princeps*, *O. vizagapatensis* and *O. acuta* reported from (1) sample each. *Lyngbya* (3), *Arthospira* (2) and *Microcoleus* were identified up to generic level while *Plectonema wollei* and *Dasygloea amorphia* were identified up to species level from (1) sample only. Desmid (18) and diatoms were reported from chlorophyta and bacillariophyta respectively. (Table 2)

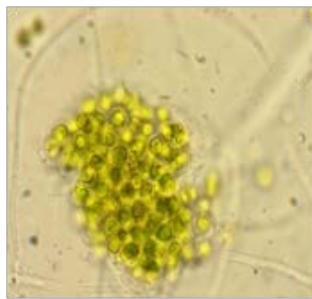
Total (116) and (98) cyanophytic members from FC campus and FC hill respectively showed species richness which also points towards various substratum are adding to its algal diversity. Upon comparison of Fig.3 and Fig.6, it has been observed that tree scraping, stone scraping, and wall scraping shows a majority of cyanophytic algal forms compare to soil and water samples. It can be due to undisturbed crevices of trees, stones, and walls while soil samples and tank water sample shows less algal forms which may due to destructive human activity.

From Fig.2 and Fig.5, it's quite clear that genera like *Chroococcus*, *Microcystis*, *Gloeocapsa*, *Phormidium*, *Oscillatoria* were present abundantly while *Merismopedia*, *Lyngbya* and *Scytonema* were present optimally at both the sites. All these cyanophytic members possess well-developed sheath around their cell/trichome which might help them withstand adverse environmental conditions. This finding correlates with Pandkar (2010, 2012)^{14,15}. Similar results were obtained by Sethi (2012)⁴, Karande (2012)²³. According to Sethi cyanobacteria were prominent in soil, building facades as well as on tree bark while green alga flourished only if sufficient moisture was available in the substratum while Karande stated that higher numbers of microalgae were reported from biofilms collected from the higher altitude. According to results obtained by Roy (2015)²⁴ on studies carried on East Kolkata Wetlands of West Bengal showed the presence of chlorophyte being dominant over cyanophyte but species like *Chroococcus*, *Merismopedia* and *Synechococcus* flourish throughout the year.

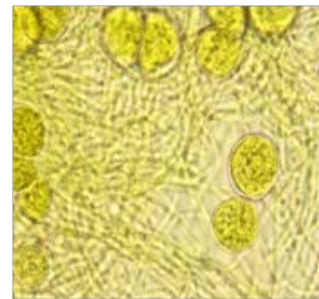
Microphotograph from FC Campus Cyanophytic Coccoid Forms



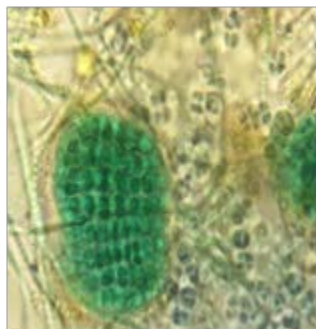
Microcystis robusta



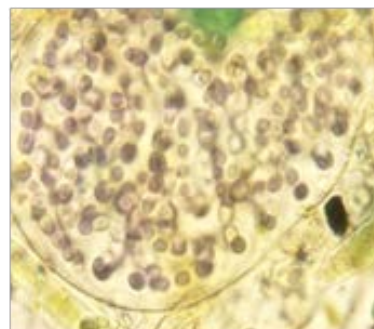
Chroococcus minor



Chroococcus turgidus

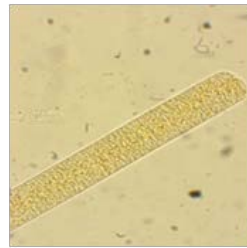


Merismopedia convolute

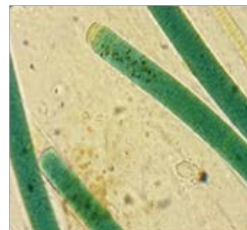
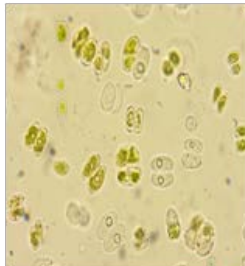
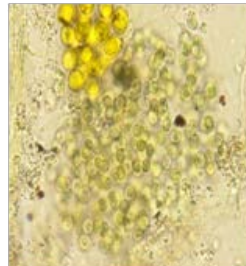
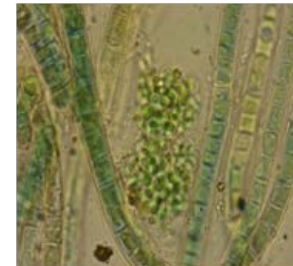
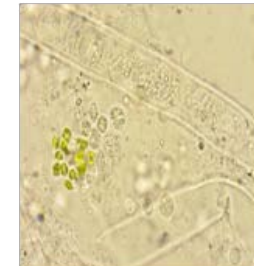
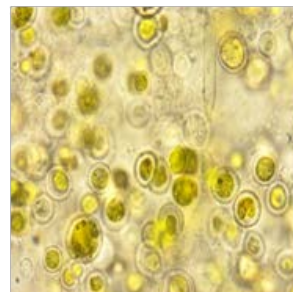


Gloeocapsa nigrescens

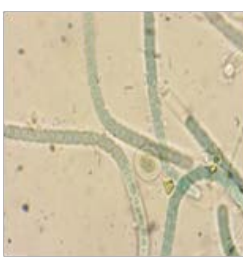
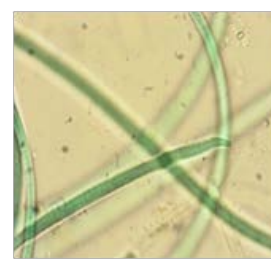
Cyanophytic Filamentous Forms

*Scytonema**Phormidium uncinatum**Oscillatoria limosa**Oscillatoria subbrevis**Phormidium ambiguum*

Haplosiphon

*Oscillatoria vizagapatensis**Plectonema*Microphotograph from FC Hill
Cyanophytic Coccoid Forms*Gloeotheca rupestris**Aphanocapsa biformis**Chroococcus various**Chroococcus minimus**Chroococcus
micrococcus**Chroococcus turgidus**Chroococcus minutus*

Cyanophytic Filamentous Forms

*Oscillatoria princeps**Plectonema**Phormidium ambiguum**Phormidium microtomum**Phormidium subfuscum**Scytonema**Microcoleus**Oscillatoria acuta***CONCLUSION**

Total 129 algal forms were observed from FC Campus and 125 algal forms were observed from FC Hill out of which 116 and 98 were cyanophyta members from FC Campus and FC hill respectively. Cyanophyta members were found to be dominant at both the places with the presence of chlorophyta, bacillariophyta and euglenophyta respectively. The dominance of cyanophyta members was due to the presence of well-developed sheath around them which helps them to withstand adverse environmental conditions.

The present algal taxonomic study will provide insight into how algal diversity changed over the past few years. Forms such as *Phormidium*, *Lyngbya*, *Scytonema*, *Microcystis* reported to be allergenic has been encountered. Presences of allergenic algae manifest medical threat to humans were this study will act as baseline data.

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