

BLUE GREEN ALGAE (CYANOBACTERIA) FROM ANJANI DAM OF JALGAON DISTRICT MAHARASHTRA

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ABSTRACT

The present communication deals with the taxonomic enumeration of 26 taxa of filamentous blue green algal members explored from Anjani dam of Erandol Tahsil of Jalgaon district, Maharashtra. These taxa are represented by *Kamptonema*, *Microcoleus*, *Oscillatoria*, *Phormidium*, *Planktothrix*, *Tapinothrix* genera of filamentous cyanophycean members. All the 26 taxa and their morphological description with line diagrams are given

Keywords: *Fresh water, blue green algae, cyanobacteria, Anjani dam, Jalgaon, India*

INTRODUCTION

Cyanobacteria or blue green algae are prokaryotes that have no membrane bound organelles, including chloroplasts and are most ancient and morphologically distinct group of Gram negative, photosynthetic and nitrogen fixing algae on earth. They contribute significantly as primary colonizer to the almost all the known ecosystems and grows in various climatic conditions such as freshwater, marine, hot springs, polar deserts, epilithic, epipelagic, epiphytic, endophytic, halophytic and thermophilic conditions and created oxygenic atmosphere on planet earth. Cyanobacteria are primary producers in all habitats, contributing 80% oxygen to the atmosphere. Their thallus morphology ranges from unicellular to colonial forms, as well as multicellular filamentous forms with uniseriate trichomes.

The literature survey reveals that significant amount of work has been done on the taxonomy of the blue green algae from Maharashtra by several workers like Kamat (1962, 1963), Thomas and Gonzalves (1965), Barhate and Tarar (1983), Bhoge and Ragothaman (1986), Mahajan (1986, 1989) Mahajan and Mahajan (1988), Deore and Patil (1999), Kumawat and Jawale (2006), Patil (2013), Beherepatil and Deore (2014), Kamble and Karande (2014), Jain (2015), Patil and Patil (2015), Shejul and Sawant (2019), Jasiwal and Gavit (2019), Mhaske and Talwankar (2020), Patil *et.al* (2021), Patil and Basarkar (2021), Yadav (2021) Dhande (2023). The present investigation aims to explore and document the diversity of filamentous blue green algae from Anjani dam of Jalgaon district.

MATERIALS AND METHODS

Anjani dam is located near the Palasdal village (20° 4' North latitude and 75° 19' East longitude) situated on Anjani river in the Erandol Tahsil of Jalgaon district, Maharashtra. The algal samples collections were made monthly early in the morning between 7.00 to 09.00 am for two years from different sites of Anjani dam. All the collected samples were studied fresh as far as possible and later preserved in 4 % formalin for further studies. Camera lucida drawings were made with the help of mirror type of camera lucida. The identification of taxa was made by the following the monograph of Desikachary (1959), Prasad and Srivastava (1992), Anagnostidis and Komárek (1988), Anagnostidis (2001), Komárek and Anagnostidis (2005), Das and Adhikary (2014) and relevant research publications.

RESULT

(Taxonomic enumeration)

***Kamptonema chlorinum* (Kützing ex Gomont) Strunecký, Komárek & J.Smarda Pl.1, Fig.1**

Synonyms: *Phormidium chlorinum* (Kutzing ex Gomont) Anagnostidis.

Strunecký O., Komárek Jiri and Smarda Jan, 2014, P. 204

Trichomes yellowish green; solitary, no sheath, trichomes straight, 6.0 µm in diameter, cross walls very slightly constricted, cells isodiametric, 4.8 µm long, apical cell broadly rounded.

Coll. No.292.

Kamptonema cortianum (Meneghini ex Gomont) Strunecký, Komárek & J.Smarda

Synonyms: *Oscillatoria cortiana* Meneghini ex Gomont

Pl.1, Fig.2

Strunecký O., Komárek Jiri and Smarda Jan, 2014, P. 203

Thallus dull blue-green; trichome slightly constricted at the cross-walls, 4.1 µm broad, gradually tapering at the ends, bent, not capitate, blue-green; cells 3.7 µm long, septa not granulated, end cell without calyptra.

Coll. No. :-251

Kamptonema jatorvense (Vouk) Strunecký, Komárek & J.Smarda

Synonyms: *Oscillatoria jatorvensis* Vouk

Pl.1, Fig.3

Strunecký O., Komárek Jiri and Smarda Jan, 2014, P. 204

Thallus pale to dark blue-green, free floating. Trichome long, straight, without constriction 4.2 µm broad, bent at the ends, not attenuated, not capitate. Terminal cell rounded or dome shape, apex slightly tapering without calyptra. Cells 4.2 µm broad, 2.1 µm long, cyanophycean granules distributed throughout cell.

Coll. No. :-135

Kamptonema okenii (C.Agardh ex Gomont) Strunecký, Komárek & J.Smarda

Synonyms: *Oscillatoria okenii* Agardh ex Gomont

Pl.1, Fig.4

Strunecký O., Komárek Jiri and Smarda Jan, 2014, P. 203

Thallus dull blue-green; trichomes straight, fragile distinctly constricted at the cross-walls. Trichome 4.5 µm broad, 1.5 µm long; end cells obtuse or sub conical not capitate, without calyptra.

Coll. No. :- 2114.

Microcoleus amoenus (Gomont) Strunecky, Komárek & J.R.Johansen

Synonyms: *Oscillatoria amoena* (Kutez.) Gomont

Pl.1, Fig.5

Strunecky, O., Komárek, J., Johansen, J., Lukesová, A. and Elster, J., 2013 P. 1176

Thallus more or less blue green; trichomes straight, slightly constricted at the cross walls, ends gradually attenuated, 4.6 µm broad, dull blue green; cells nearly as long as broad, 6.4 µm long, septa granulated. Terminal cell capitate, broadly conical with calyptra.

Coll. No. :-397

Microcoleus favosus (Gomont) Strunecky, Komárek & J.R.Johansen

Pl.1, Fig.6

Synonyms: *Phormidium favosum* (Bory) Gomont.

Strunecky, O., Komárek, J., Johansen, J., Lukesová, A. and Elster, J.P., 2013, P.1176

Thallus blue green, sheath absent, not constricted, cross walls coarsely granulated, slightly attenuated to the end, capitates, cells slightly longer than broad 9.3 µm broad and 3.0 µm long; apical cell capitate with obtuse conical, nearly hemispherical calyptras.

Coll. No.263.

Oscillatoria anguina Bory ex Gomont

Pl.1, Fig.7

Das S.K. and Adhikary S.P.2014, P.67, Pl.3, Fig.10.

Trichomes bright blue green or blackish green, 8.2 µm broad, straight, constricted at finely granulated cross walls, gradually attenuated at the ends, cells are 2.1µm long, apical cells obtusely button like flattened with thickened outer cell wall.

Coll. No. :-122

Oscillatoria annae Goor

Pl.1, Fig.8

Komárek J. and Anagnostidis K, 2005, P. 584, fig. 872

Filaments solitary, straight, yellowish blue green in colour; constricted at the cross-walls, cells 7.8 µm broad and 2.2 µm long, end cell rounded, calyptra absent.

Coll. No. :-2114

Oscillatoria margaritifera Kützing ex Gomont

Pl.1, Fig.9

Komárek J. and Anagnostidis K, 2005, P. 581, fig. 865

Trichome fragile, curved, constricted at cross walls, apices slightly bent and attenuated, cells 24.4 µm broad and 6.2 µm long, cross wall granulated end cell capitate with slightly convex calyptra.

Coll. No. :-122

Oscillatoria perornata Skuja

Pl.1, Fig.10

Komárek J. and Anagnostidis K, 2005, P. 586, fig. 873

Trichome, pale blue-green, erect or flexuous, apices briefly attenuated or curved; cells 6.7 µm broad and 1.8 µm long, distinctly constricted and granulated at the cross wall; apical cell hemispherical without calyptra.

Coll. No. :-315.

Oscillatoria princeps Vaucher ex Gomont

Pl.1, Fig.11

Komárek J. and Anagnostidis K, 2005, P. 590, fig. 883

Trichome mostly straight, not constricted at cross walls, slightly attenuated at the apices, occasionally with thin sheaths; cells 35.1 µm broad and 6.4 µm long; apical cell flatly rounded, slightly capitate, truncate, fragmented part containing two horns like structure.

Coll. No. :-165.

Oscillatoria princeps var. *pseudolimosa* Ghose

Pl.1, Fig.12

Desikachary T.V., 1959, P 210, Pl. 39, Fig.15

Thallus blue green; trichome straight, rigid and fragile, unconstricted at the cross-walls, cross-walls not granulated; cell 27.7 µm broad, 8.3 µm long, apical cells lightly convex, calyptra absent.

Coll. No. :-286.

Oscillatoria proboscidea Gomont

Pl.2, Fig.1

Prasad B.N. and Srivastava M.N. 1992, P. 69, Pl. 8 Fig.9

Trichomes single dark blue-green, flexuous or more or less erect, distinctly attenuated and slightly curved at the ends, not constricted at the cross walls, 22.2 µm in diameter; cells 1/4 to 1/6 times as long as broad, 8.3 µm long; end cells almost truncate, capitate with thick convex outer membrane.

Coll. No. :- 286.

Oscillatoria sancta Kützing ex Gomont

Pl.2, Fig.2

Komárek J. and Anagnostidis K, 2005, P. 594, fig. 890

Thallus dark blue green, mucilaginous sheath present, trichome more or less straight, constricted at cross walls, cells 14.2-15.0 µm broad and 2.2-4.1 µm long, end cell hemispherical and attenuated, slightly capitate with a thickened membrane.

Coll. Nos. :-154, 267.

Oscillatoria subbrevis Schmidle

Pl.2, Fig.3

Komárek J. and Anagnostidis K., 2005, P. 587, fig. 877

Trichome single, 3.0 µm broad nearly straight, not attenuated at the apices; cells 1.5 µm long, not granulated at the cross walls; end cell rounded, normal calyptra absent.

Coll. No. :- 399

Oscillatoria tenuis C. Agardh ex Gomont

Pl.2, Fig.4

Komárek J. and Anagnostidis K., 2005, P. 587, fig. 878

Thallus blue green or olive green, trichome straight, constriction not present at the cross-walls, cell 9.0 µm broad and 4.1 µm long, granule present uniformly.

Coll. No. :-395.

Oscillatoria vizagapatensis C.B.Rao

Pl.2, Fig.5

Prasad B.N. and Srivastava M.N. 1992, P. 16 Pl. 8, Fig.12

Trichome solitary pale blue-green uniformly broad, straight, not constricted at the cross walls. 11.2-18.5 μm in diameter; cells much shorter than broad, 1.8-3.7 μm long; end cells rounded, capitate forming a cap with thick outer membrane, cell wall thick, smooth.

Coll. Nos. :-262, 2114.

Phormidium articulatum (N.L.Gardner) Anagnostidis & Komárek **Pl.2, Fig.6**

Anagnostidis, K. and Komárek, J. 1988 P.404, Pl.2 Fig.13

Trichome thin, blue green solitary, sheath thin, 5.2 μm broad, unconstricted at the cross walls, not attenuated at the end, cells isodiametric, 3.3 μm long.

Coll. No.297

Phormidium granulatum (N.L.Gardner) Anagnostidis **Pl.2, Fig.7**

Anagnostidis, K., 2001, P.370

Trichomes solitary, slightly curved towards apex, cross walls not constricted cell isodiametric or broader than long; distinctly granulated cross-walls rounded cell apices, not attenuated, not capitate. Cell 3.3 μm broad and 1.5 μm long.

Coll. No.215.

Phormidium insulare (N.L.Gardner) P.A.C.Senna & Compère **Pl.2, Fig.8**

Synonyms: *Oscillatoria chalybea* (Mertens) Gomont var. *insulris* Gardner

Senna, P.A.C., Sousa, M.G.M. & Compère, P. 1998, P.81

Trichome straight as long as broad, end bends and sickle shaped, not constricted at the cross-walls; end cell obtuse, not capitate, without calyptra. Cell 14.8 μm broad, 4.6 μm long,

Coll. No. :-395

Phormidium irriguum (Kützing ex Gomont) Anagnostidis & Komárek **Pl.2, Fig.9**

Synonyms: *Oscillatoria irrigua* Kützing ex Gomont

Anagnostidis, K. and Komárek, J. 1988, P. 405

Thallus blackish blue-green, trichome light blue green, straight, not torulose, 5.6 μm dia., slightly attenuated, sub-capitate and straight. Cell quadrate, 12.3 μm dia 5.6 μm long. Apical cell with thick wall.

Coll. No. :-279

Phormidium schroeteri (Hansgirg) Anagnostidis **Pl.2, Fig.10**

Synonyms: *Oscillatoria brevis* (Kuetz) Gomont

Anagnostidis, K., 2001, P.371

Trichomes straight; not constricted at cross walls; ends briefly attenuated, apical cell rounded, conical in shape, calyptra absent. Cell 3.9 μm broad and 2.1 μm long.

Coll. No.:-122

Phormidium uncinatum Gomont **Pl.2, Fig.11**

Komárek J.and Anagnostidis K, 2005, P. 481, Fig. 719

Trichomes bright blue-green, straight or slightly bent. Cells cylindrical, distinctly shorter than wide, 7.5 μm broad and 2.2 μm long, cross walls granulated trichomes attenuated at the apices; end cell round or flattened conical capitate; sheath absent.

Coll. No.286.

Phormidium willei (N.L.Gardner) Anagnostidis & Komárek **Pl.2, Fig.12**

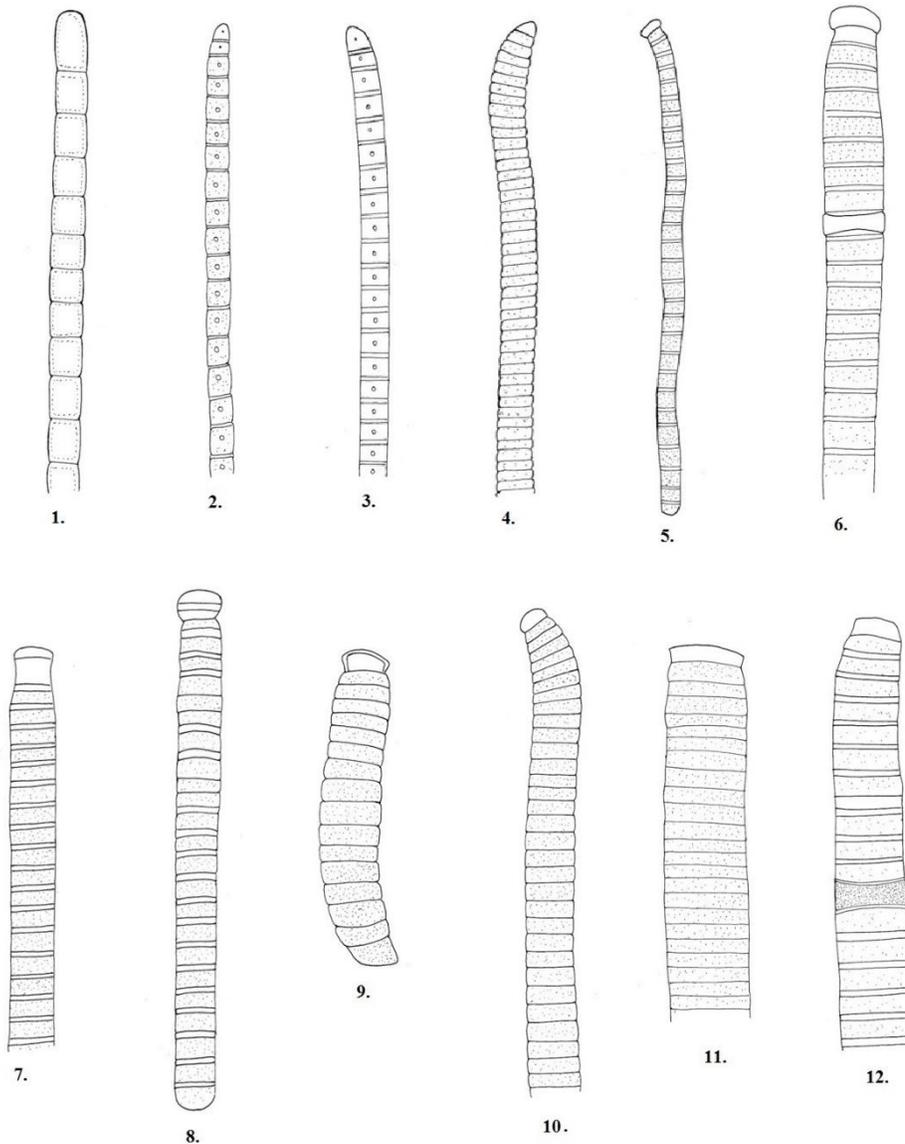
Synonyms: *Oscillatoria willei* Gardner em Drouet

Anagnostidis, K. and Komárek, J. 1988 P.406

Trichome bent at the ends, 2.2 μm broad, not constricted at cross walls, ends not attenuated cell 1.8 μm long, cell rounded without a thickened membrane.

Coll. No. :-2125.

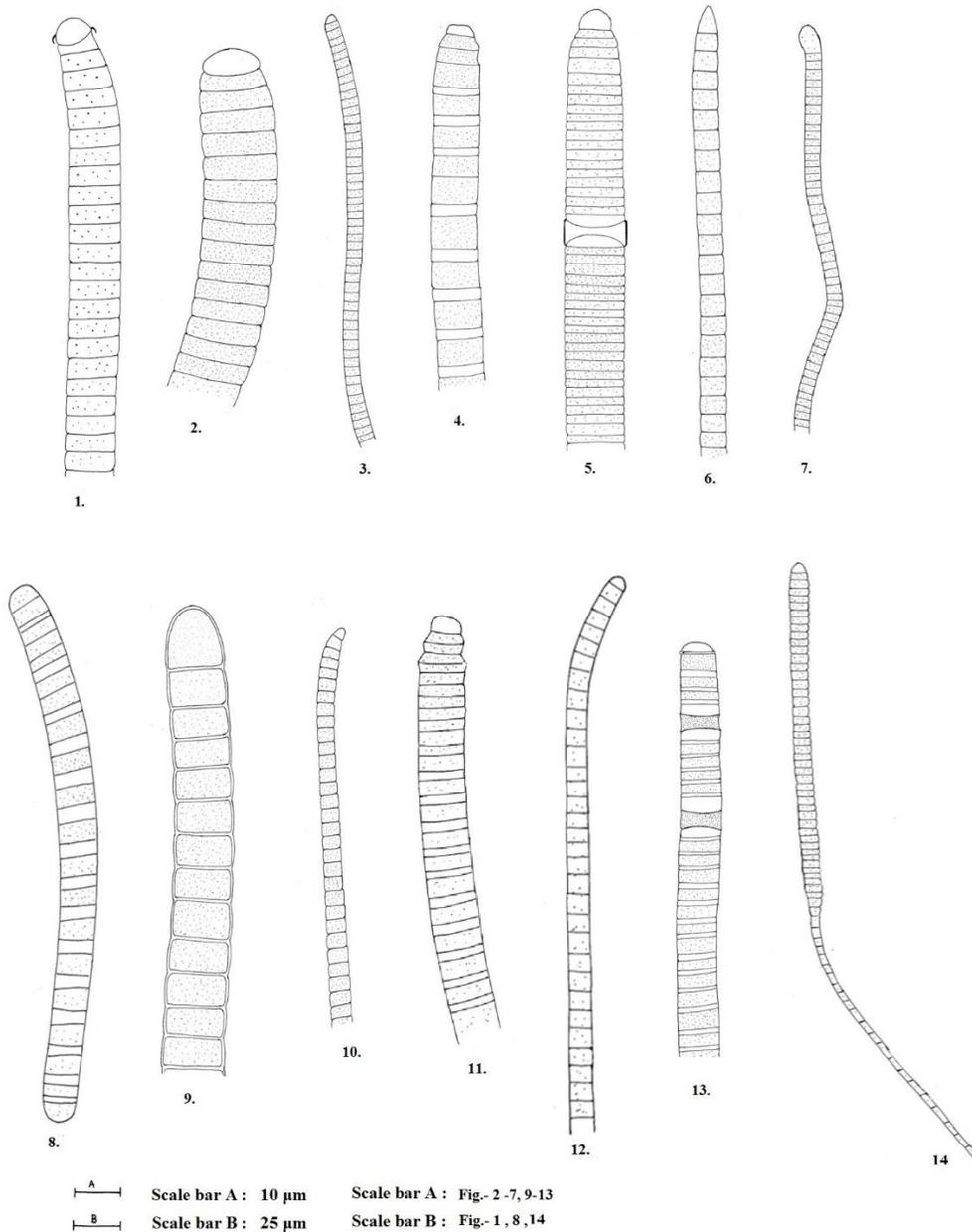
PLATE-1



 Scale bar A : 10 μm Scale bar A : Fig.-1, 2, 3, 4, 6, 7, 8, 10
 Scale bar B : 25 μm Scale bar B : Fig.- 5, 9, 11, 12

- | | |
|---------------------------------|---|
| 1. <i>Kamptonema chlorinum</i> | 7. <i>Oscillatoria anguina</i> |
| 2. <i>Kamptonema cortianum</i> | 8. <i>Oscillatoria annae</i> |
| 3. <i>Kamptonema jasorvense</i> | 9. <i>Oscillatoria margaritifera</i> |
| 4. <i>Kamptonema okenii</i> | 10. <i>Oscillatoria perornata</i> |
| 5. <i>Microcoleus amoenus</i> | 11. <i>Oscillatoria princeps</i> |
| 6. <i>Microcoleus favosus</i> | 12. <i>Oscillatoria princeps</i> var. <i>pseudolimosa</i> |

PLATE-2



1. *Oscillatoria proboscidea*
2. *Oscillatoria sancta*
3. *Oscillatoria subbrevis*
4. *Oscillatoria tenuis*
5. *Oscillatoria vizagapatensis*
6. *Phormidium articulatum*
7. *Phormidium granulatum*

8. *Phormidium insulare*
9. *Phormidium irriguum*
10. *Phormidium schroeteri*
11. *Phormidium uncinatum*
12. *Phormidium willei*
13. *Planktothrix rubescens*
14. *Tapinothrix crustacea*

Planktothrix rubescens (De Candolle ex Gomont) Anagnostidis & Komárek **Pl.2, Fig.13**

Synonyms: *Oscillatoria rubescens* De Candolle ex Gomont

Anagnostidis, K. and Komárek, J. 1988: P. 416

Trichome are nearly straight, at the ends gradually attenuated, 8.2 µm broad, not constricted at the cross-walls, cells 1/2 - 1/3 as long as broad, 2.2 µm long, often granulated at the septa, with gas-vacuoles; end cell capitate, with convex calyptra.

Coll. No. :-2114.

Tapinothrix crustacea (Woronichin) Bohunická & Johansen **Pl.2, Fig.14**

Synonyms: *Homoeothrix crustacea* Woronichin

Bohunická, M., Johansen, J.R. & Fucíková, K., 2011, P.137

Filaments stiff, straight or slightly curved, up to 260 µm long, unbranched flexible, distinctly constricted at cross-walls, attached by one end to substrate. Trichomes pale blue-green, with thin smooth and whitish or bright sheaths, Trichome attenuated at both ends: gradually in apical part, strikingly at the base. Cells blue-green and short, barrel-cylindrical shape with distinct cross walls; sometimes at the base up to two times longer than width. Cells 3.7-5.5 µm long and 2.7-5.5 broad, ending in a very fragile hairs, without visible cells

Coll. No.263.

CONCLUSION

There are 26 taxa, 06 genera, 25 species and 01 variety of filamentous blue green algal taxa were recorded during the present investigation and all these taxa were recorded for the first time from the study area.

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