

Regular Article

Biodiversity of Cyanophyceae from Amaravati Dam of Dhule district (Maharashtra)

V.P. Patil* and S.N. Nandan

P.G. Department of Botany, S.S.V.P.'s L.K. Ghogrey Science College, Dhule – 424 005

ABSTRACT: In aquatic ecosystems the flora and fauna interact with the biotic and abiotic factors in their habitat. Therefore flora and fauna are called biological indicators. Man made reservoirs like Dam reflect both terrestrial and aquatic environment as their construction involves superimposition of lentic water body on flowing water mass on the terrain. Algae constitute the main autotrophic component of the aquatic ecosystems. Change in algal community severely affect the species diversity. Biodiversity is greater in fresh water than in the most affected terrestrial ecosystem. So the present study shows biodiversity of Cyanophyceae from Amaravati Dam. Total 35 taxa belonging to 15 genera are discussed in present paper. The genera viz. Microcystis, Chroococcus, Gloeocapsa, Aphanocapsa, Synechococcus, Merismopedia, spirulina, Oscillatoria, Phormidium, Lyngbya, Nostoc, Anabaena, Plectonema, Homoethrix and calothrix.

Key words: Taxonomy, Algae, Cyanophyceae, Ecobiodiversity

Introduction

In India the pioneer work was done on Cyanophyceae (Kamat and Patel, 1973; Marathe, 1965 ; Nandan and Borse 1996; Mahajan and Nandan, 2004).

The region Dhule district though rich in large number of fresh water bodies has so far not been explored as its biotic diversity of algal flora. The present investigation is done on Amaravati dam, which is the main resource of Shindkheda Taluka of Dhule district for drinking and irrigation purpose. In present study three group of algae viz. Cyanophyceae, Chlorophyceae and Bacillariophyceae were studied but present communication deals with taxonomy of 35 algal taxa of cyanophyceae group only. All blue green algal taxa were identified with the help of monograph (Desikachary 1959).

Methodology

The Amaravati dam is located near the village Malpur, taluka Shindkheda in Dhule district (Maharashtra, India). The main sources of amaravati dam are Amaravati river, Nai river & Ghusri nala. The dam is situated at 70° 30' S longitude and 20° 30' N latitude.

The sample were collected in the morning from different habitats of station 1st, 2nd, 3rd and preserved in 4% formalin. For identification line drawings were made with the help of camera lucida.

Results and Discussion

During the present investigation following Blue green algae have been observed.

1. *Microcystis flos-aquae* (Witttr.) Kirchner (PL-1 Fig.1)

Desikachary, 1959, P-94, Pl-17, F-11

Colonies roughly spherical, ellipsoidal, or somewhat elongate or often squarish in optical section, not clathrate, with indistinct colonial mucilage; cells 4 µm in diameter spherical, with gas vacuoles, nannocytes present.

Habitat:- Amaravati Dam Station-ADS-III, November,2006.

2. *Chroococcus turgidus* (Kuetz) Nag. (PL-1 Fig.2)

Desikachary, 1959, P-101, Pl-26, F-6

Cells spherical or ellipsoidal single, or in group of mostly 2-4 without sheath 30 µm, with sheath 13-25 µm, diameter, rarely 40 µm, sheath colourless, not distinctly lamellated.

Habitat:- Amaravati Dam Station-ADS-I, May,2007.

3. *Chroococcus cohaerens* (Breb.) Nygaard (PL-1 Fig.3)

Desikachary, 1959, P-111, Pl-26, F-3

Thallus slimy, or gelatinous, dark green; cells single or up to 2-8 in group without envelope 2 µm diameter, and with sheath 2.5 µm diameter, sheath thin, colourless; unlamellated.

Habitat:- Amaravati Dam Station-ADS-II, July,2007.

4. *Gloeocapsa punctata* Nag. (PL-1 Fig.4)

Desikachary, 1959, P-115, Pl-23, F-2

Thallus gelatinous, light blue-green, cell without sheath 0.7-1.5 µm diameter with sheath 4 µm broad blue green, sheath thick, colourless, unlamellated or scarcely lamellated, cells 2-16 in groups or colonies about 25 µm diameter.

Habitat:- Amaravati Dam Station-ADS-II, February, 2007.

5. *Gloeocapsa nigrescens* Nag. (PL-1 Fig.4)

Desikachary, 1959, P-117, Pl-24, F-17

Thallus crustaceous, light blue-green, cell without sheath 3.3 µm diameter, with sheath thick, colourless, lamellated, cells 4 in groups or colonies about 32 µm diameter.

Habitat:- Amaravati Dam Station-ADS-II, July, 2007.

6. *Gloeocapsa pleurocapsoides* Novacek (PL-1 Fig.6)

Desikachary, 1959, P-118, Pl-24, F-3

Colony microscopically small, more or less roundish or irregular, dull olive green, cells olive coloured or pale blue-green, homogenous, granular; cells 5-10 µm in diameter, elongated, closely arranged, sheath thin, simple coloured yellowish in the peripheral the part, 2-3 µm thick and lamellated, 3-4 lamellae.

Habitat:- Amaravati Dam Station-ADS-I, March, 2007.

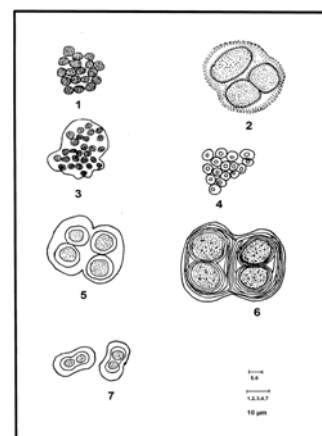
7. *Gloeocapsa Stegophila* var. *crassa* Rao, C.B. (PL-1 Fig.7)

Desikachary, 1959, P-119, Pl-25, F-3

Cells spherical, subspherical or elongated, 14 µ broad commonly single or in colonies of 2-4; sometime striated; colony with sheath 14 broad and 9.6 – 19.2 µm long, sheath up to 3.2 µm thick.

Habitat:- Amaravati Dam Station-ADS-I, July, 2007.

Plate 1

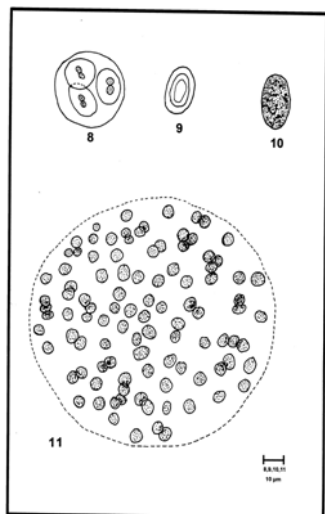


1. *Microcystis flos-aquae* (Witttr.) Kirchner
2. *Chroococcus turgidus* (Kuetz) nag.
3. *Chroococcus cohaerens* (Breb.) Nygaard
4. *Gloeocapsa punctata* Nag.

* Corresponding Author, Email: ssvprgsc@rediffmail.com

5. *Gloeocapsa nigrescens* Nag.
6. *Gloeocapsa pleurocapsoides* Novacek.
7. *Gloeocapsa stegophila* var. *crassa* Rao, C.B.

Plate 2



8. *Gloeocapsa coracina* kutz.
9. *Gloeocapsa Samoensis* Wille. v. *major* Wille
10. *Aphanocapsa grevillei* (Hass.) Rabenh.
11. *Synechococcus aeruginosus* Nag.

8. *Gloeocapsa coracina* kutz. C.B. (PL-2 Fig.8)

Desikachary, 1959, P-121, Pl-24, F-11

Thallus crustaceous, lubricous, cells single, round small, with sheath 7.3 µm and without sheath about 4 µm broad, single or in group of 28 µm diameter laterally uniting; distinctly lamellated, contents homogeneous, blue-green.

Habitat:- Amaravati Dam Station-ADS-III, March, 2007.

9. *Gloeocapsa Samoensis* Wille. v. *major* Wille (PL-2 Fig.9)

Desikachary, 1959, P-128, Pl-23, F-6

Cells without envelop 5 µm broad and 10 µm long on the inner walls of a well, sheath hyaline.

Habitat:- Amaravati Dam Station-ADS-I, August, 2007.

10. *Aphanocapsa grevillei* (Hass.) Rabenh. (PL-2 Fig.10)

Desikachary, 1959, P-134, Pl-21, F-9

Thallus gelatinous, spherical or hemispherical, light blue green; cells spherical, 3.3. diameter. Contents finely granular, blue-green, closely arranged in a homogeneous mucilage; individual envelopes not distinct.

Habitat:- Amaravati Dam Station-ADS-II, November,2006.

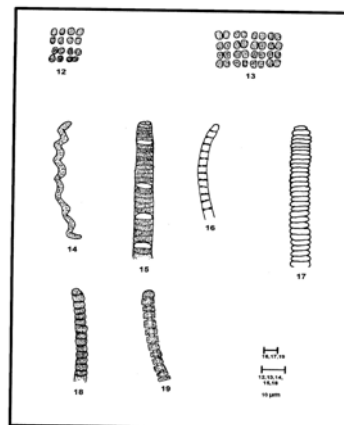
11. *Synechococcus aeruginosus* Nag. (PL-2 Fig.11)

Desikachary, 1959, P-143, Pl-25, F-6,12

Cells cylindrical, 15 µm broad up to 30 µm long, single, pale blue green.

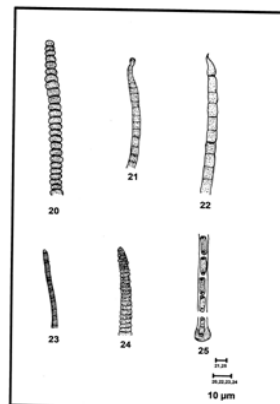
Habitat:- Amaravati Dam Station-ADS-I, February,2007.

Plate 3



12. *Merismopedia punctata* Meyen
13. *Merismopedia glauca* (Ehrenb.) Nag.
14. *Spirulina meneghiniana* Zanard. ex. Gomont
15. *Oscillatoria subbrevis* Schmidle
16. *Oscillatoria subtilissima* Kutz.
17. *Oscillatoria corallinae* (Kutz.) Gomont
18. *Oscillatoria tenuis* Ag. ex. Gomont

Plate 4



20. *Oscillatoria formosa* Bory ex. Gomont
21. *Oscillatoria splendida* Grev. ex. Gomont
22. *Oscillatoria acuminata* Gomont
23. *Phormidium angustissimum* W.et.G.S. West.
24. *Phormidium autumnale* (Ag.) Gomont.
25. *Lyngbya mesotricha* Skuja.

12. *Merismopedia punctata* Meyen (PL-3 Fig.12)

Desikachary, 1959, P-155, Pl-29, F-6

Colonies small, 16 cells, about 60 µm broad; cells not closely packed, spherical or avoid, 2.7 µm broad, pale blue green. Plankton found in stagnant and flowing water and among other algae.

Habitat:- Amaravati Dam Station-ADS-II, Deceber,2006.

13. *Merismopedia glauca* (Ehrenb.) Nag. (PL-3 Fig.13)

Desikachary, 1959, P-155, Pl-29, F-5

Colonies Mostly small with 32 cells, Cells oval or spherical, closely arranged, 3.3. µm broad, pale blue green. In plankton in standing water and among algae, in irrigation channels.

Habitat:- Amaravati Dam Station-ADS-III, May,2007.

14. *Spirulina meneghiniana* Zanard. ex. Gomont (PL-3 Fig.14)

Desikachary, 1959, P-195, Pl-36, F-8

Trichome 1.9 µm broad, flexible irregularlyspirally coiled, bright blue-green, forming a thick blue-green thallus, spiral 3.2-5 broad and 3.5 µm distant from each other.

Habitat:- Amaravati Dam Station-ADS-III, August,2007.

15. *Oscillatoria subbrevis* Schmidle (PL-3 Fig.15)

Desikachary, 1959, P-207, Pl-40, F-1

Trichomes single, 5-6 µm broad, nearly straight not at attenuated at the apices; cells 2 µm long, not granulated at the cross-walls.

Habitat:- Amaravati Dam Station-ADS-II and III, June,2007.

16. *Oscillatoria subtilissima* Kutz. (PL-3 Fig.16)

Desikachary, 1959, P-215, Pl-38, F-1

Trichomes single or a few together, seldom forming a thallus, yellowish green, 2 µ broad, straight or curved, septa indistinct, without gas vacuoles.

Habitat:- Amaravati Dam Station-ADS- III, May,2007.

17. *Oscillatoria corallinae* (Kutz.) Gomont (PL-3 Fig.17)

Desikachary, 1959, P-221, Pl-40, F-16

Trichome 6 µ broad, constricted at the cross walls,

Slightly bent or curved at the end, a little attenuated, cell 1/2 – 1/3 as long as broad 2.7-4 µ long, not granulated at the cross walls, end cells slightly capitate, with a convex slightly thickened membrane.

Habitat:- Amaravati Dam Station-ADS-II and III, May,2007.

18. *Oscillatoria tenuis* Ag. ex. Gomont (PL-3 Fig.18)

Desikachary, 1959, P-222, Pl-42, F-15

Thallus thin blue green or olive green, slimy, trichome straight, fragile slightly constricted at the cross walls, 4 µ broad blue green, sometime bent at the end, not attenuated at the apices, not capitate; cell up to 1/3 as long as broad, 2.6 µ long at the septa mostly granulated; end cell more or less hemispherical with thickened outer membrane.

Habitat:- Amaravati Dam Station-ADS- III, March,2007.

19. *Oscillatoria pseudogeminata* G. Schmidle (PL-3 Fig.19)

Desikachary, 1959, P-228, Pl-41, F-10

Thallus pale blue green, trichome coiled, pale blue-green, end not attenuated, 1.3-2.2 µ broad; cell as long as broad or some what longer or shorter than broad, about 2.6 µ long, not constricted at the cross at the cross walls, cross-walls thick, not granulated, end cell rounded.

Habitat:- Amaravati Dam Station-ADS- III, May,,2007.

20. *Oscillatoria formosa* Bory ex. Gomont (PL-4 Fig.20)

Desikachary, 1959, P-232, Pl-40, F-15

Thallus blue-green; trichome straight, slightly constricted at the cross-walls 4-6 broad; bright blue green, attenuated at the end and bent; cells nearly quadrate, up to 1/2 as long as broad, 2.5-5 long septa sometime slightly granulated; end cells nearly obtuse, calyptra absent, not capitate.

Habitat:- Amaravati Dam Station-ADS- I and II, July,2007.

21. *Oscillatoria splendida* Grev. ex. Gomont (PL-4 Fig.21)

Desikachary, 1959, P-234, Pl-37, F-7,8

Thallus brilliant blue green or olive green, trichome straight or curved, not constricted at the cross walls, at the ends gradually attenuated, 2-3 broad; cells 2-4 time longer than broad rarely quadrate, 3-9 µ long, septa often granulated; end more or less bent, some time screw like or a sickle; end cells capitate nearly rounded, mostly without calyptra.

Habitat:- Amaravati Dam Station-ADS- II and III, April,2007.

22. *Oscillatoria acuminata* Gomont (PL-4 Fig.22)

Desikachary, 1959, P-240, Pl-38, F-7

Thallus blue-green; trichome more or less straight, not constricted or slightly constricted at the cross walls, 4 µ broad, than broad, rarely subquadrate, 6 µ long, some time granulated at the cross wall, end cell mucronate, without calyptra.

Habitat:- Amaravati Dam Station-ADS- II and III, March,2007.

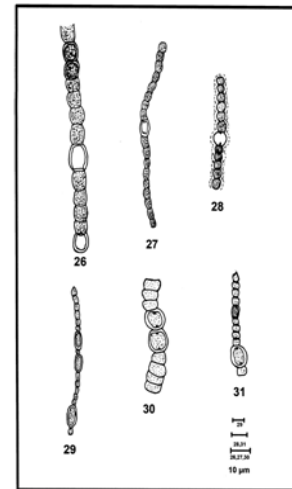
23. *Phormidium angustissimum* W.et.G.S. West. (PL-4 Fig.23)

Desikachary, 1959, P-253

Thallus leathery, thin pale blue-green; trichome bent, entangled, constricted at the cross wall, end not attenuated, straight, 0.6-0.8 broad pale blue-green; sheath colourless, agglutinated; cells cylindrical, 2-8 mostly 4-5 time as long as broad, septa not granulated, apical cell not capitate.

Habitat:- Amaravati Dam Station-ADS- III, September,2007.

Plate 5



26. *Nostoc ellipsosporum* (Desm.) Rabenh. ex Flah.

27. *Nostoc muscorum* Ag.ex Bron et Flah.

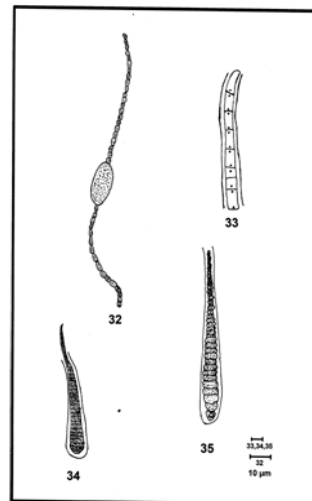
28. *Nostoc piscinale* Kuetzing ex Born. et Flah.

29. *Anabaena orientalis* Dixit

30. *Anabaena ballyganglii* Banerji.

31. *Anabaena doliolum* Bharadwaja

Plate 6



32. *Anabaena circinalis* Reichenhorst ex Born. et Flah.

33. *Plectonema notatum* Schmidle

34. *Homoeothrix juliana* (Menegh.) Krichn.

35. *Calothrix thermalls* (Schwabe) Hansg.

24. *Phormidium autumnale* (Ag.) Gomont. (PL-4 Fig.24)

Desikachary, 1959, P-276, Pl.44, F.24,25

Thallus expanded, dark blue-green or brownish-green, filament straight, rarely flexuous, variously entangled; sheath firm, mucilaginous, distinct or diffuent in an amorphous mucilaginous matrix, trichome blue-green, not constructed at the cross-walls, 4-7 µ broad, end mostly briefly attenuated, rarely gradually attenuated straight or scarcely curved, prominently capitate; cells quadrate or 1/2 as long broad, 2-5 µ long, septa frequently granulated end cell with a rounded or truncated conical calyptra.

Habitat:- Amaravati Dam Station-ADS- III, February,2007.

25. *Lyngbya mesotricha* Skuja. (PL-4 Fig.25)

Desikachary, 1959, P-282, Pl.50, F. 1,2

Filaments erect or more or less curved, fixed to the substratum by the basal portion; growing together caespitose and fasciculate, rarely solitary, 3.5 µ broad, up to 1 mm long, sheath thin to moderately broad, firm colourless; trichome 25-3 µ broad, ends

not attenuated not constricted at the cross-wall, cross walls marked with one or two larger granules on either side; cells 1-2 time longer than broad, 4-8 µm long, content pale blue-green; homogeneous; apical cell rounded conical.

Habitat:- Amaravati Dam Station-ADS- II, December,2007.

26. *Nostoc ellipsosporum* (Desm.) Rabenh. ex.Flah. (PL-5 Fig.26)

Desikachary, 1959, P-383, Pl.69, F. 5

Thallus gelatinous, irregularly expanded, attached by the lower surface, radish brown, filaments flexuous; loosely entangled; trichome about 4 µm broad, light blue-green, cells cylindrical 6-14 µm long; heterocysts subspherical, or o b long, 6-7 µm long; spore ellipsoidal to oblong cylindrical, 6-8 µm broad, 14-19 long, episore smooth, hyaline.

Habitat:- Amaravati Dam Station-ADS- II, September,2007.

27. *Nostoc muscorum* Ag.ex Bron et Flah. (PL-5 Fig.27)

Desikachary, 1959, P-385, Pl.70, F. 2

Thallus gelatinous – membranous, irregularly expanded, attached by the lower surface, tuberculate, dull olive or brown, 2-5 cm diameter; filaments densely entangled; sheath distinct only at the periphery of the thallus, yellowish brown trichome 3-4 µm broad; cells short barrel-shaped to cylindrical, up to twice as long as broad; heterocysts nearly spherical, 6-7 µm broad; spores oblong, many in series, 4-8 µm broad, 8-12 µm long.

Habitat:- Amaravati Dam Station-ADS- III, November,2006.

28. *Nostoc piscinale* Kuetzing ex Born. et Flah. (PL-5 Fig.28)

Desikachary, 1959, P-377, Pl.69, F. 3

Filaments flexuous, loosely entangled; sheath distinct at the periphery of the thallus, trichome 3-7 µm broad; cells shorter or longer than broad up to nearly twice as long as broad; heterocysts subspherical, 4.5-6 µm broad; spore globose, 6-7 µm broad, in long chains.

Habitat:- Amaravati Dam Station-ADS- I, November,2006.

29. *Anabaena orientalis* Dixit (PL-5 Fig.29)

Desikachary, 1959, P-405, Pl.77, F. 6

Trichome single, straight or slightly curved, 2.5-4 µm broad cells quadrate or cylindrical, rarely slightly barrel shaped, upto twice as long as broad, 3.7-4.8 µm long, end-cell conical with rounded apex; heterocysts single, intercalary, cylindrical or slightly ellipsoidal with rounded end walls, 4.8-5.5 µm broad, and 7.4-9.2 µm long; spore one on each side of a heterocyst, ellipsoidal, 7.4-9.2 µm broad and 14.8 – 16.6 µm long.

Habitat:- Amaravati Dam Station-ADS- I, August,2007.

30. *Anabaena ballyganglii* Banerji. (PL-5 Fig.30)

Desikachary, 1959, P-409, Pl.77, F. 4

Trichome fragile, circinate, never straight, forming a thin pale blue green stratum over the surface of a small water pond, cells compressed, spherical as long as broad or slightly shorter or longer than the diameter, 7-8.5 µm broad and 6.5-13.5 µm long, content granular, heterocyst some what spherical with homogenous contents, single or in pairs; heterocyst 7.5-10 µm broad and 7.5-11 µm long; spore single; ellipsoidal, younger ones somewhat spherical remote from the heterocyst, wall of the spore thick, smooth colourless content granular.

Habitat:- Amaravati Dam Station-ADS- II, February,2007

31. *Anabaena doliolum* Bharadwaja (PL-5 Fig.31)

Desikachary, 1959, P-410, Pl.78, F. 3

Plant mass mucilaginous, pale blue green; trichome single, free swimming, straight, curved or slightly coiled, 3.6-4.2 µm broad, slightly tapering at the ends, with conical apical cell, possessing almost pointed apex; cells barrel-shaped as long as broad or a little longer or shorter than broad; heterocyst barrel shaped, 5.2-6.3 µm

broad and 6.3-9.4 µm long; spore ellipsoidal with almost pointed apices in short or long chain, adjoining the heterocyst but developed centrifugally, episore thick, smooth and hyaline or yellow-brown, 4.2-6.2 µm broad and 6.3-11.5 µm long.

Habitat:- Amaravati Dam Station-ADS- III, May,2007

32. *Anabaena circinalis* Rebenhorst ex Born. et Flah. (PL-6 Fig.31)

Desikachary, 1959, P-414, Pl.77, F.2

Thallus forthy, floating, trichome mostly circinate, seldom straight, mostly without a sheath, 8-14 µm broad. Cells barrel shaped or spherical, somewhat shorter than broad, with gas-vacuole; heterocyst subspherical, 8-10 µm broad; spore cylindrical sometime curved, end rounded, 16-18 µm broad, ordinarily away from the heterocyst, episore smooth and colourless.

Habitat:- Amaravati Dam Station-ADS- III, July,2007

Family:- Scytonemataceae.

33. *Plectonema notatum* Schmidel (PL-6 Fig.33)

Desikachary, 1959, P-440, Pl.83, F.5

Filaments variously bent, not forming any distinct thallus, 1.7-2 µm broad; false branching sparse, single or geminate; sheath thin, colourless; cells cylindrical, 2-3 time as long as broad; with two granule at the cross-walls not constricted, pale blue-green, end cell rounded.

Habitat:- Amaravati Dam Station-ADS- II, July,2007

Family:- Rivulariaceae.

34. *Homoeothrix juliana* (Menegh.) Krichn. (PL-6 Fig.34)

Desikachary, 1959, P-519, Pl.107, F.7

Filaments single or many together forming a olive coloured thallus, when dried amethyst coloured erect, rigid, unbrached, 10-15 µm broad, up to 2 mm long, thickened at the base sheath thin close to the trichome, colourless, not lamellated; trichome 9-12.5 µm broad, produced into a long hair and fragile; cells discoid harmogones 4-5 time as long as broad 30-60 µm long.

Habitat:- Amaravati Dam Station-ADS- III, August,2007

35. *Calothrix thermalis* (Schwabe) Hansg. (PL-6 Fig.34)

Desikachary, 1959, P-533, Pl.114, F.10

Thallus expanded mucilaginous, soft blue-green or olive green, filaments intricate, flexuous, up to 3 mm long, densely arranged, 8-10 µm broad, swollen at the base, sheath thick, homogenous hyaline or yellowish at the base; unlamellated; cells 5-8 µm broad, 1/3 to as long as broad seldom longer, blue-green.

Habitat:- Amaravati Dam Station-ADS- III, May,2007

Acknowledgement

One of the author (VPP) is thankful to the Principal Dr. S.N. Nandan and Shri. A.C. Patil Head of the Department of Botany for providing necessary laboratory and library facilities.

Reference

- Desikachary, T.V. 1959 cyanophyta I.C.A.R. - New Delhi.
Kamat, N.D. and Patel, M.Z. 1973 Soil algae of rice field at different depths. Botanique 4:101-106.
Mahajan, S.R. and S.N. Nandan, 2004 Blue green algae of Hartala lake of Jalgaon, Maharashtra. J. Aquatic Biology 19(1) : 11-12
More, Y.S. and Nandan S.N. 2000, Hydrobiological study of Algae of Panzara dan (MH) Eclo. And Cons. 6(1) : 99-103
Ganpati, S.V. 1940 The ecology of the temple tank containing a permanent bloom of Microcystis. J. Bomb. Nat. Hist. Soc, 42(1) : 65-77
Nandan S.N. and D.S. Jain 2006. Biodiversity of cyanophyceae in Sonvad Project dam and Devbhane dam of Dhule (MH): Biodiversity assessment and conservation-PP.107-138.