

Diversity of Cyanophycean Algae from Khadakpurna Reservoir, Buldana District (MS) India

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Abstract: The present investigation deals with the study of class Cyanophyceae from Khadakpurna reservoir of Godavari basin near Deulgaon Raja in Buldana district, Maharashtra, India. In all 21 species of Cyanophyceae belonging to 9 genera viz. *Chroococcus* (4 species), *Aphanocapsa* (2 species), *Spirulina* (1 species), *Oscillatoria* (5 species), *Lyngbya* (2 species), *Anabaena* (4 species), *Scytonema* (1 species), *Myxosarcina* (1 species) and *Aphanothece* (1 species) were recorded.

Keywords: Cyanophyceae; Morphology; Khadakpurna Reservoir

I. INTRODUCTION

The division Cyanophyta includes the blue green algae. It is primitive groups of about 2500 species belonging to 150 genera. Cyanophyceae is morphologically diverse group of unique photosynthetic organisms of great importance because of their very long existence for well over 3.5 billion years and cosmopolitan in distribution. It is terrestrial, freshwater and marine in habitat reported by Desikachary (1959), Kamat (1963) and Barhate & Tarar (1983). Chellapa & Chellapa (2004), Nandan & Jain (2006) studied algae from Sonvad dam of Dhule. In their investigation, they found greater populations of Blue green algae than Diatoms and Euglenoids in reservoir.

Materials, methods and study areas

Water samples were collected from different locations of reservoir in monthly intervals using clean sterilized plastic bottles. Samples of fresh water algae were collected with the help of phytoplankton net mesh and preserved in 4% Formalin. Khadakpurna Reservoir is constructed on Khadakpurna River of Godavari basin, near Deulgaon Raja in Buldana District of Maharashtra state, India. It is situated at 20° 9' 30" N and 76° 4' 30" E, only 60 km away from district headquarter. The dam is about 2160 meters in length with catchment area of 5133.18 sq km. The project is having 160.606 Million cubic meters (mcum) capacity of water storage, which includes 93.404 mcum live, and 67.202 mcum dead water stocks. Collected algal sample were studied with the help of trinocular research microscope in G.S. College, Khamgaon, district Buldana (M.S.).



Fig. 1 – Index Map of Khadakpurna Project

II. RESULTS AND DISCUSSION

The taxonomic study of the collected specimens revealed the presences of 21 taxa of the class Cyanophyceae from Khadakpurna reservoir.

1. *Chroococcus limneticus* Lemmermann
Prescott G. W. 1951, p. 448, pl. 100, fig. 4.

Plate – 1, f.1

Colonies free floating, spherical or ovate of 4-32 spherical cells rather closely and evenly arranged, sometimes in groups of 2-4 cells as a result of rapid cell division; individual cell sheath usually indistinct and confluent with the hyaline, mucilaginous colonial envelop; cell content dull to bright blue-green, not conspicuously granular. Cells 6 µm in diameter.

2. *Chroococcus schizodermaticus* West.

Plate – 1, f.2

Prasad B. N. and Srivastava M. N. 1992, p. 31 pl. 5 fig. 6.

Thallus simple, solitary somewhat globose; arranged loosely in groups of four, somewhat reniform, each cell surrounds very distinct, yellowish-brown lamellate sheath; cell contents blue-green, homogenous without gas-vacuoles; cell wall thick, smooth. Cells are 8-9 µm in diameter.

- 3. *Chroococcus minutus* (Kuetz.) Naegeli** **Plate – 1, f.3**
Prescott G. W. 1951, p. 449, pl. 100, fig. 09.
A small, amorphous, mucilaginous mass in which spherical or hemispherical cells are compactly arranged within a wide hyaline envelope; individual cell sheath indistinct, not lamellate; cell contents blue-green, either homogenous or finely granular; cells 4 µm in diameter.
- 4. *Chroococcus turgidus* var. *maximus* (Kutz.) Nygaard** **Plate – 1, f.4**
Desikachary T.V. 1959, p. 102, pl. 26, fig. 8.
Cells are spherical or ellipsoidal single or in groups. Cells in group of 2-4 or 8 are blue-green, olive or yellowish. Colonies are 34.6 µm long and 27 µm diameter.
- 5. *Aphanocapsa grevillei* (Hass.) Rabenh.** **Plate – 1, f.5**
Prasad B. N. and Srivastava M. N. 1992, p. 36 pl. 5 fig. 2.
Thallus light blue-green, spherical or irregular densely aggregated and embedded in gelatinous matrix; cells spherical, closely arranged in pairs or in groups, individual envelop not distinct; cell content blue-green, homogenous without gas vacuoles; cell wall thin, smooth. Cells are 2.5 µm in diameter.
- 6. *Aphanocapsa delicatissima* West & West** **Plate – 1, f.6**
Prescott G. W. 1951, p. 453, pl. 101, fig. 8.
Colonies spherical or elliptical free floating; cells minute, bluish, evenly distributed throughout copious, colorless mucilage. 0.5 µm in diameter. Common in the phytoplankton of many lakes. Most frequent in soft or acid water.
- 7. *Spirulina major* Kuetz. ex. Gomont** **Plate – 1, f.7**
Prasad B. N. & Srivastava M. N. 1992, p. 51 pl. 7 fig. 12.
Plants dark blue-green, more or less flexuous, twisted throughout their lengths, into a somewhat loose, regular spirals, distance between the spirals 4 µm; sheaths absent; cell contents homogenous without granules and gas-vacuoles; end of trichomes usually rounded, without calyptras; cell wall thin, smooth. Trichome 1.5 µm broad.
- 8. *Oscillatoria anguina* (Bory) Gomont** **Plate – 1, f.8**
Prescott G. W. 1951, p. 485, pl. 108, fig. 24.
Trichomes entangled and interwoven to form a dark green plant mass on submerged object, or intermingled among other algae; straight for most of their length but bent and sometimes twisted in the apical region, slightly tapering toward the apex. Apical cell slightly narrowed and capitate, with a thickened outer membrane. Cells not constricted at the cross walls, which are granular. Swollen refringent cells common throughout the length of the trichome. Cells with 7 µm in diameter.
- 9. *Oscillatoria nigra* Vaucher** **Plate – 1, f.9**
Prescott G. W. 1951, p. 489, pl. 109, fig. 18.
Trichomes aggregated to form a thick, mucilaginous blackish-green plant mass on submerged objects, becoming free-floating; straight or slightly twisted and entangled, slightly tapering towards the apex and curved. Apical cell rotund, not capitates and without calyptras. Cells 8.5 µm in diameter, 3.2 µm long; slightly constricted at the cross walls, which are sometimes granular; cell contents dark olive-green in color.
- 10. *Oscillatoria limosa* Ag. ex Gomont** **Plate – 1, f.10**
Prasad B. N and Srivastava M. N. 1992, p. 65 pl. 9, fig. 4.
Desikachary T.V. 1959, p.206, pl. 42, fig. 11.
Trichomes solitary loosely or compactly entangled forming a dark blackish blue-green or yellowish-green thallus, almost straight, not tapering towards apex, may or may not be constricted at the cross walls, cell contents blue-green or olive-green, homogenous, without gas-vacuoles granules; end cells flatly rounded with slightly thickened outer membrane. Cells are 14.5 µm in diameter and 5 µm long.
- 11. *Oscillatoria curviceps* C. A. Agardh** **Plate – 1, f.11**
Prescott G. W. 1951, p. 487, pl. 108, fig. 17.
Trichomes forms an expanded blue-green plant mass; straight for at least a portion of their length, twisted and much entangled, scarcely tapering to the apex. Apical cell broadly rounded, not capitates, without calyptra. Cells are not constricted at the cross wall, which may be granulate. It forms floating clots. Cells 13.2 µm in diameter and 4 µm long.
- 12. *Oscillatoria formosa* Bory ex Gomont** **Plate – 1, f.12**
Prasad B. N and Srivastava M. N. 1992, p. 62 pl. 9, fig. 6.
Trichomes elongated solitary or aggregated to form dark blue-green masses almost straight, very gently attenuated towards slightly bent apices, may or may not be constricted at the cross walls, cell contents bright blue-green, homogenous without granules and gas vacuoles; end cells obtuse or bluntly rounded, non capitates, calyptras absent; cell wall thick, smooth. Cells quadrate or up to half times as long as broad. Cells 4 µm in diameter and 5.2 µm long.

13. *Lyngbya aestuarii* (Mert.) Liebmann**Plate – 1, f.13****Prescott G. W. 1951, p. 499, pl. 111, fig. 8.**

Plants aggregated entangled, forming extensive layer on submerged substrates, or upon moist earth and stones; sometimes becoming free floating. Filaments varying greatly in diameter, 16.2 µm wide, Trichomes 18.5 µm in diameter, tapering little at the apices, which vary in shape, conical, truncate, or somewhat capitate. Cells 3.5 µm in length, not constricted at the cross walls. Sheaths firm, becoming thickened, lamellose and discolored with age.

14. *Lyngbya martensiana* Menegh. ex. Gomont**Plate – 1, f.14****Prasad B. N. and Srivastava M. N. 1992, p. 95 pl. 11, fig. 3.****Desikachary T. V. 1959, p. 318, pl. 52, fig. 6.**

Filaments much entangled and interwoven, bright blue-green forming caespitose, mucilaginous thallus, long flexible, somewhat straight. Sheath firm, colourless, smooth, lamellated extending for beyond the apices of trichomes; trichomes not tapering at apices, not constricted at the cross walls; cell contents light blue-green, homogenous, without gas vacuoles, granules few present in each cell towards septa; end cells rounded, not capitate, calyptra absent; cell wall thick smooth. Trichomes 8 µm broad, Sheath 1.5 µm thick, cells 2 µm long.

15. *Anabaena azollae* Strasburger**Plate – 1, f.15****Prescott G. W. 1951, p. 261, pl. 115, fig. 12.**

Trichomes straight or coiled, often in small clusters but more frequently solitary, inhabiting the tissue of Azolla. Cells subglobose to ellipsoid, the contents granular, 4 µm in diameter, 6.5 µm long; heterocysts ovate, 6 µm in diameter, 9 µm long.

16. *Anabaena inaequalis* (Kuetz.) Bornet & Flahault**Plate – 1, f.16****Prescott G. W. 1951, p. 116, pl. 116, fig. 10.**

Trichomes straight or slightly twisted; lying parallel and enclosed by a definite sticky sheath, 5.2 µm wide; forming gelatinous strands, entangled among other algae and adherent. Cells short barrel shaped or truncate globose, 3.2 µm in diameter; heterocysts globose or ovate, 3 µm in diameter.

17. *Anabaena torulosa* (Caem.) Lagerh. ex Born. et Flah.**Plate – 1, f.17****Prasad B. N. and Srivastava M. N. 1992, p. 118 pl. 13, fig. 15.**

Trichomes solitary or entangled in a thin, light brownish green mucilaginous mass, almost straight or slightly bent, free floating, 3.2 µm in diameter; cells 4.5 µm long, barrel shaped or cylindrical often slightly constricted at centre; cell contents light blue-green, homogenous without granules and gas vacuoles; end cells acutely conical with rounded apices; cell wall smooth, thick; heterocysts intercalary, bipolar, subglobular or ovoid 3 µm broad.

18. *Anabaena volzii* Lemm**Plate –1, f.18****Prasad B. N. and Srivastava M. N. 1992, p. 119 pl. 13, fig. 17.**

Trichomes light blue-green, single, planktonic, straight or bent, without any mucilaginous sheath, 3 µm in diameter, constricted at the cross-wall; cells 6 µm long, somewhat cylindrical; cell contents light blue-green, homogenous, without granules and gas-vacuoles; end cells little attenuated with rounded apices; cell wall smooth, thick; heterocysts intercalary, bipolar, cylindrical with flattened ends, 4.9 µm broad, 10.5 µm long.

19. *Scytonema arcangelii* Born. et Flah.**Plate –1, f.19****Prasad B. N. and Srivastava M. N. 1992, p. 124 pl. 14 fig. 1.**

Filaments long, brownish-green, compactly interwoven forming expanded floccose-flushy thallus. Sheaths thick, membranaceous, colourless, smooth and sometimes gelatinised at the points from where branches arise. Trichomes freely branched possessing single or geminate branches, neither attenuated, nor constricted at the cross-walls; cells somewhat quadrate or much shorter than broad, 5.2 µm long. Cell contents olive blue green, homogenous without granules and gas vacuoles; end cells rounded; heterocysts intercalary, cylindrical with flattened ends, bipolar, 9 µm broad, 14 µm long; cell wall smooth and thick.

20. *Myxosarcina burmensis* Skuja**Plate –1, f.20****Desikachary T. V. 1959, p.613, pl. 137, fig. 2.**

Plants aquatic, minute, microscopic, rounded, sarcinoid; cells more or less angular or with rounded corners, arranged in transverse and vertical series, 2.2 µm in diameter.

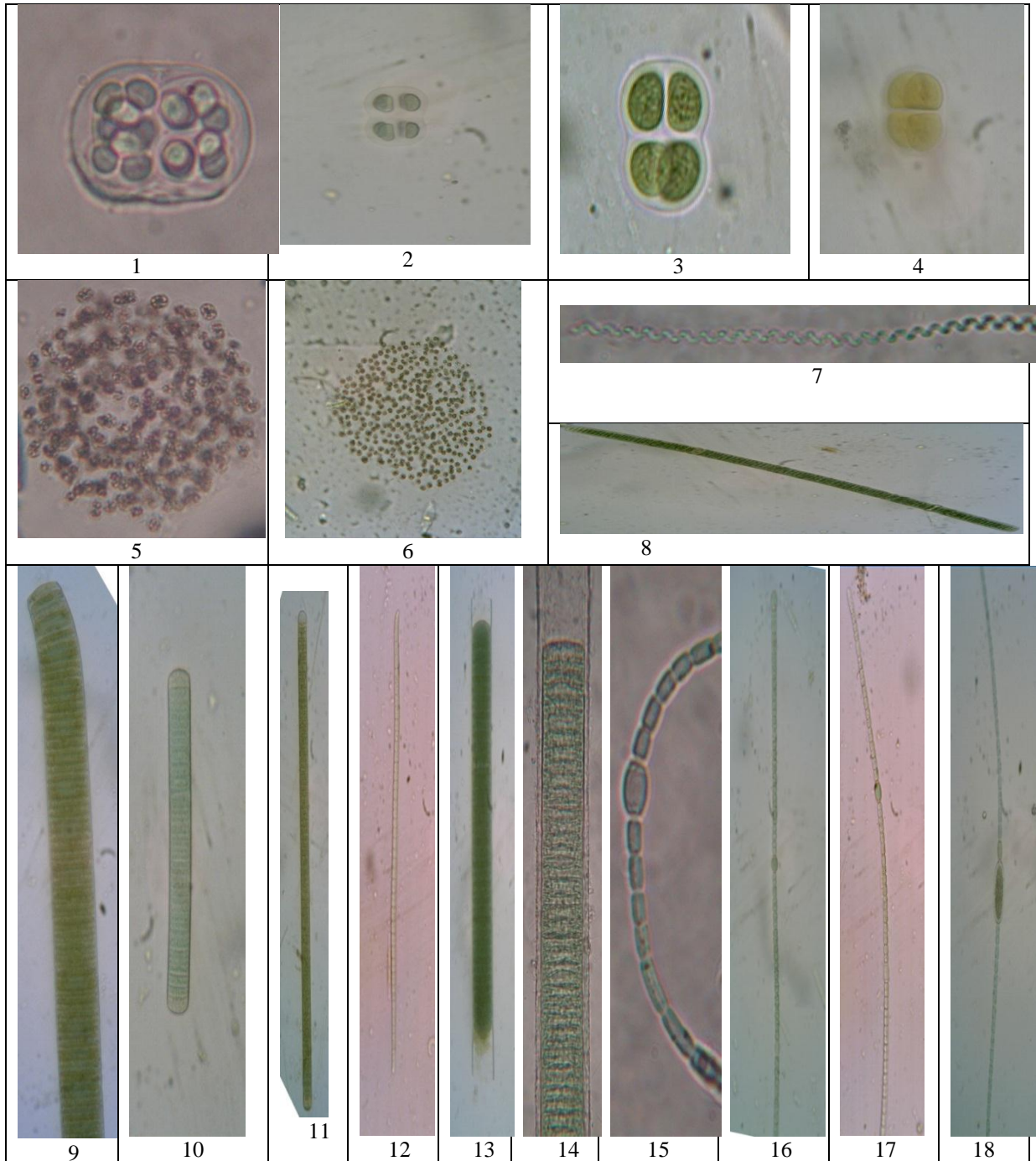
21. *Aphanothece microscopica* Naegeli**Plate –1, f.21****Prescott G. W. 1951, p. 467, pl. 104, fig. 9.**

Cells ovate to subglobose, densely arranged in small, free floating or attached ovate colonies; cell sheath not evident; cell contents light blue green, finely granular; cells 2.8 µm in diameter and 4.6 µm long.

IV. CONCLUSION

Great diversity of Cyanophycean algae has been recorded from the reservoir. Twenty one different species of class Cyanophyceae were indentified on the basis of morphology and cell measurement. Predominantly species are abundant during winter season, gradually decreased in summer and low occurrence in rainy season which may due to contamination of water through water flow. Among the Cyanophyceae 5 species of *Oscillatoria*, 4 species of *Chroococcus* and *Anabaena* each were recorded however only one species of *Spirulina*, *Scytonema*, *Myxosarcina* and *Aphanothece* were recorded from the reservoir.

Plate No. 1.



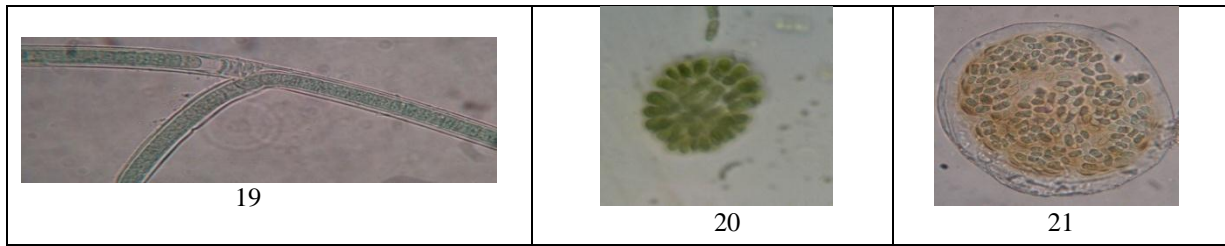


Plate No. 1. Fig. 1. *Chroococcus limneticus* Lemmermann, **2.** *Chroococcus schizodermaticus* West., **3.** *Chroococcus minutus* (Kuetz.) Naegeli, **4.** *Chroococcus turgidus* var. *maximus* (Kutz.) Nygaard, **5.** *Chroococcus turgidus* var. *maximus* (Kutz.) Nygaard, **6.** *Aphanocapsa delicatissima* West & West, **7.** *Spirulina major* Kuetz. ex. Gomont, **8.** *Oscillatoria anguina* (Bory) Gomont, **9.** *Oscillatoria nigra* Vaucher, **10.** *Oscillatoria limosa* Ag. ex Gomont, **11.** *Oscillatoria curviceps* C. A. Agardh, **12.** *Oscillatoria formosa* Bory ex Gomont, **13.** *Lyngbya aestuarii* (Mert.) Liebmann, **14.** *Lyngbya martensiana* Menegh. ex. Gomont, **15.** *Anabaena azollae* Strasburger, **16.** *Anabaena inaequalis* (Kuetz.) Bornet & Flahault, **17.** *Anabaena torulosa* (Caem.) Lagerh. ex Born. et Flah., **18.** *Anabaena volzii* Lemm, **19.** *Scytonema arcangelii* Born. et Flah., **20.** *Myxosarcina burmensis* Skuja, **21.** *Aphanothece microscopica* Naegeli.

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