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Studies on the diversity of Cyanophyceae from Valheri River of Satpura ranges

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Abstract
Present Study reveals the diversity of Cyanophyceae from the Valheri River in Satpura ranges of Nandurbar district Maharashtra. Identify 9 Genera of 13 species viz, *Aphanocapsa pulchra* (Kutz) Rabenh, *Chroococus minor* (Kutz.) Nag. *Chroococus westii* (W. west) Boye- Peterson, *Gleotrichia natans* Rabenhorst ex Born.et Flash, *Cylindrospermum stagnale* (Kutz) Born et flash, *Microcystis aeruginosa* Kutz, *Nostoc commune* Vaucher ex Born et flash, *Oscillatoria princeps* Vaucher ex Gomant, *Oscillatori alimosa* Ag. Ex Gomont, *Oscillatora chlorine* Kutz. Ex Gomont, *Oscillatoria raoi* De Tony, j, *Spirulina major* kutz. ex Gomont, *Synchococcus elongates* Nag. was done.

Keywords: Cyanophyceae, Valheri |River, Nandurbar. Satpura ranges.

1. Introduction
The algae are autotrophic, thalloid plant which is cosmopolitan in distribution. Cyanophyceae is one of the algal class.
Present study shows the diversity of Cyanophyceae of Valheri River, Satpura ranges of Nandurbar district. It is situated at 21.62°N latitude and74.12° E longitude. The flow of river water is east to westward of Satpura ranges. The water of the river is clear crystal in winter and summer because of rocky substratum but in rainy season water is muddy, runs from the deep forest, the river consists of waterfalls which provide suitable habitat for the algal growth.
Cyanophyceae are most diverse prokaryotic algal class in the world, they grow abundantly where there is moisture and sunlight available. BGA showing wide range of thallus organisation from unicellular to multicelluler, like thallus organisation the distribution of cyanophyceae varies from species to species. BGA members may be found in Marine water, streams and lakes, on moist rocks, cement walls and even in the snow. According to some researchers the cyanophycean members having ability to grow in extreme temperature. As per Setcheli (1903) BGA can be grow at maximum temperature of 65°-68°C but according to Molash 1926 the limit increases up to 85°C. As per Prinsheim 1949 Cyanophycean members and bacteria having little relation because bacteria can move with single flagella and other hand member of BGA move by gliding movement. Cyanophycean (BGA) members having some economic importance, some heterocystus members having ability to fix atmospheric nitrogen, mainly in the rice fields. (Hazarika *et al*, 2012). It increases not only fertility of soil but also increase the water holding capacity and help increase crop yield. BGA produces large amount of nutrients, like N_2 and Phosphorus which is useful for paddy field (Sing *et al* 2014).

Materials and Methods
Random sampling method has been applied for algal collection. Algal material was collected from different habitat of study area in the separate plastic bottles. The collected material were washed in the laboratory and preserved in 4% formalin for further study. The micrometric measurements such as length, width for vegetative structure of algal taxa have done with the help calibrated microscope. Microphotograph of specimen taken with the help of digital camera. The identification of algal taxa based on the Desikacharya monograph 1959 [16]. And on the basis of recent research papers.

The enumeration of algal taxa as follows.
1. *Aphanocapsa pulchra* (Kutz) Rabenh.
Thallus gelatinous homogeneous,blue–green, tuberculate, attached or free; cells spherical, 3.5-4.5 µ diam, loosely arranged, single or in twos, pale blue green; individual sheaths of cells

2. *Chroococus minor* (Kutz.) Nag.
Thallus slimy- gelatinous, dirty blue green or olive green; cells spherical, 3.7 µ singly or in pairs, seldom 4 or 8; sheath colourless, very thin, hardly visible.

3. *Chroococus westii* (W. west) Boye- Petersen.
Cells single or in groups of 2-4, without sheath 13 µ diam, with sheath 22.6 µ diam, violet; sheath colourless, distinctly lamellated, coloured yellow to brownish with chlor-zinc-iodide.

4. *Gleotrichia natans* Rabenhorst ex Born.et Flash.
Thallus spherical, up to 10 cm broad, soft, bullate, hollow, blackish olive green to brown, filament loosely arranged; trichome7-9 µ broad, olivaceous, attenuated into a long hair; cells at the base barrel shaped, as long as broad; or somewhat shorter, higher up to 4 times as long as broad; heterocysts basal, or less spherical, 11.2 µ broad; spores cylindrical, straight or bent, without sheath 14 µ broad and 56.2 µ long with sheath up to about 40 µ broad, saccate, transversely constricted, hyaline or brownish.

5. *Cylindrospermum stagnale* (Kutz) Born et flash.
Thallus floccose, expanded, attached or free floating, blue green, trichomes 3.9 µ constricted at cross wall; cells nearly quadrate, or cylindrical, and often 3-4 times as long; heterocyst sub spherical or oblong, 7 µ broad and 7-12.5µ long; spores cylindrical with rounded ends, 10-11.5 µ broad and 32 µ long, with smooth yellowish brown outer layer.
6. *Microcystis aeruginosa* Kutz.
Colonies when young round or slightly longer than broad, solid, when old become clathrate, with distinct hyaline colonial mucilage; cells 3-7 µ in diam, spherical with gas-vacuole.

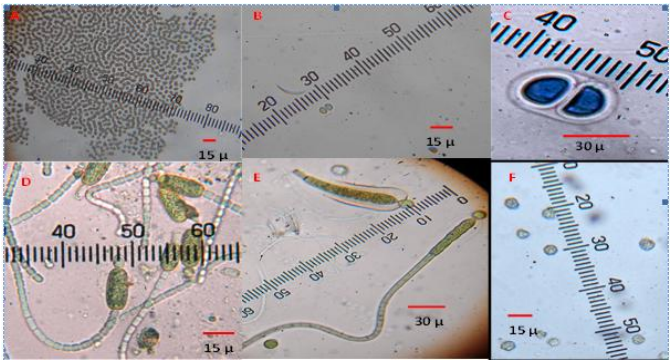

Plate 1: *A. Aphanocapsa pulchra* (Kutz) Rabenh B. *Chroococus minor* (Kutz.) Nag. C. *Chroococus westii* (W. west) Boye- Peterson D. *Cylindrospermum stagnale* (Kutz) Born et flash E. *Gleotrichia natans* Rabenhorst ex Born. et Flash. F. *Microcystis aeruginosa* Kutz.

7. *Nostoc commune* Vaucher ex Born et flash
Thallus firm, gelatinous, at first globose, later flattened, expanding, unsaturated, membranous or leathery, sometimes irregular torn, often perforated, many centimetres diam, blue green olivaceous or brown; filaments flexuous, entangled; sheath mostly distinct only at the periphery, thick, yellowish brown, often lamellated, inside the thallus more or less distinct, but hyaline; trichome 4.5 µ broad, cells barrel shaped or nearly spherical mostly shorter or a little longer than broad 5 µ long; heterocyst nearly spherical, about 7 µ broad; spore only once observed, as big as the vegetative cells epispore smooth and colourless.

8. *Oscillatoria princeps* Vaucher ex Gomant
Trichomes blue green, more or less brownish, violet or reddish, mostly forming a thallus, mostly straight, not constricted at cross walls, 22.5 µ broad, commonly 25- 50 µ, blue –green to dirty green, slightly or briefly attenuated at the apices and bent; 1/11-1/4 as long as broad 3.5-7 µ long, end-cells flatly rounded, slightly capitate or with slightly thickened membrane.

9. *Oscillatoria limosa* Ag. Ex Gomont
Thallus dark blue green to brown; trichome more or less straight, dull blue green, brown or olive green, not constricted at cross walls, or only slightly constricted 11.3 µ, commonly 13-16 µ broad, cells 1/3-1/7 long as broad, 2-5 µ long, cross wall frequently granulated; end-cell flatly rounded with slightly thickened membrane.

10. *Oscillatoria raoi* De Tony j.
Plant mass thin, membranous, firm, pale blue-green to pale bluish violet; trichome straight, usually of uniform thickness, and only rarely slightly tapering at the ends, without constriction at the joints, 5.2 µ broad, septa in distinct, but with distinct granules closely arranged on either side cells 2.5 µ long, with homogeneous content, end cell rounded rarely conical, sometimes with constriction at the septum, not capitate, without any calyptra.

11. *Oscillatoria chlorine* Kutz. Ex Gomont
Thallus very thin, yellowish green, trichome straight or slightly constricted at cross walls; 3.7 µ broad, gas-vacuoles absent; cells somewhat longer or shorter than broad, 3.7-8 µ long, cross-wall not granulated; calyptra absent.

12. *Spirulina major* kutz. Ex Gomont
Trichomes 1.2-1.6 µ broad, regularly spirally coiled, blue green spirals 3.7 µ broad and 3.6 µ distant.

13. *Synchococcus elongates* Nag.
Cells cylindrical 2.5-3.3 µ broad 3.3-6.6 µ long single, or 2-4 cells together; contents homogenous and light blue.

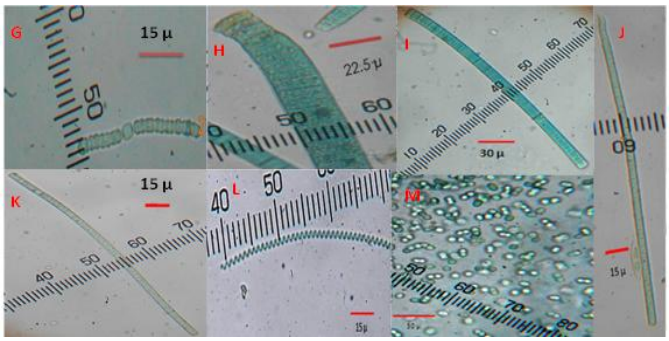

Plate 2: *G. Nostoc commune* Vaucher ex Born et flash H. *Oscillatoria princeps* Vaucher ex Gomant I. *Oscillatoria limosa* Ag. Ex Gomont J. *Oscillatora chlorine* Kutz. Ex Gomont K. *Oscillatoria raoi* De Tony, j. L. *Spirulina major* kutz. Ex Gomont M. *Synchococcus elongates* Nag

Conclusion
The present study in Valheri River shows, presence of unicellular to multicellular genera. Many genera are valuable for its economic importance e.g., *Spirulina* because of its nutritional value for mankind. We also notified many heterocystous cyanophycean members, like

Cylindrospermum, *Gleotrichia and Nostoc* which play vital role in nitrogen fixation and enhance fertility of soil, resultant increasing crop yielding. Filamentous cyanobacteria, *Oscillatoria* are dominant with 4 species; hence we conclude that the river is rich in Cyanophycean flora and well diverse by BGA members.

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