



CYANOBACTERIAL FLORA DIVERSITY FROM THE RICE FIELDS NEAR HIRAKUD DAM, SAMBALPUR, ODISHA

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ABSTRACT

A study was conducted on the cyanobacterial diversity in the rice fields of the adjacent area of Hirakud dam, Burla of Sambalpur district from July to October 2021. Twenty-five (25) species belonging to 15 genera, 6 families, and 3 orders were reported. Both heterocystous and non-heterocystous species were grown in BG-11 medium, with and without nitrogen. All the isolates were collected as a pure culture. Among these, Nostocaceae are represented by 4 genera, followed by Chroococaceae and Oscillatoriaceae with 3 genera each and Scytonemataceae and Rivulaceae with 2 genera each, followed by Stigonemataceae with 1 member. Nostocaceae is represented by a maximum number of species (9), followed by Oscillatoriaceae (4), Chroococaceae (4), Scytonemataceae (2), Rivulaceae (2) and least number in Stigonemataceae. The highest number of nitrogen-fixing cyanobacteria indicates the fertility of the rice field in and around the Hirakud dam. The diversity of cyanobacteria varies greatly. The spread of cyanobacterial flora is influenced by a number of variables, including light, temperature, pesticides, fertilisers, and pH. It fluctuates according to the stage of paddy development. Therefore, it is possible to regularly check the cyanobacterial flora in various locations so that a well-accepted native flora can be chosen as "Biofertilizer."

KEYWORDS: Cyanobacteria, Bio-fertilizer, Hirakud Dam, Rice field, Sambalpur.

INTRODUCTION

The oldest group of algae are the cyanobacteria, also known as blue-green algae. They are all members of the Cyanophyceae or Myxophyceae class, and the division Cyanophyta. These autotrophic plants are the most basic. They share the same type of photosynthesis as all other eukaryotic algae and higher plants, and because they lack any membrane-bound organelles in their cells, they resemble bacteria in terms of cellular organisation. Therefore, it is thought that cyanobacteria serve as a bridge between lower plants and microorganisms. They are well known for helping rice fields fix nitrogen.

Very little information on the diversity of cyanobacteria is available from the rice field soils of Orissa state in general.

According to Anand, N. blue-green algae (of rice fields of south India) has been studied in the year (1989).^[1] Das, M.K. described the soil of cyanobacteria diversity of Sambalpur soil in (2002).^[2] TV Desikachary in the year (1959) described details about cyanophyta.^[3] Parija et al, (1969) described about blue green algae in the district of Cuttack.^[4] Sahu et al, in the year (1999)

thrown light on spreading of blue green algae in the rice fields of Odisha.^[5] Singh, R.N. (1961) indicated about role of blue green algae in nitrogen economy of Indian agriculture.^[6]

In the present study, an attempt has been made to explore the diversity of cyanobacterial flora in the rice fields adjacent to Hirakud dam, Burla from July to October 2021.

MATERIAL AND METHODS

A total of 20 soil samples were taken at random from rice fields in 2021 (June-November) at a rate of 4 samples per location. For further examination, a composite combination of five samples taken from each community was created. A total of 15 flasks were produced for the research, each containing 1 g of each composite combination in triplicate in a 250 ml flask. Each 10 mg sample of soil was dried in the shade, ground, and combined. A 100g sample of each mixture was saved in a polythene bag for future research. Cyanobacteria were cultured in BG-11 medium, either with or without nitrogen. In separate 250ml Erlenmeyer flasks with 100ml of sterile media, 5gm of soil samples

were added. The flasks were incubated for 15 days in a controlled environment with constant fluorescent light (7.5 W/m²) and a temperature of 28 ± 10 °C. With the use of published literature, the isolate was identified (Desikachary, 1959; Anand, 1989).

RESULT AND DISCUSSION

The taxonomic analysis showed that the soil of rice field adjacent to Hirakud Dam, Burla of District Sambalpur Orissa had a rich cyanobacterial diversity represented by 25 species of 15 genera belonging to 3 orders namely Chroococcales, Nostocales, Stigonematales

A list of taxa recorded in the present study is given below as per Desikachary (1959) & Anand (1989).

Systematic enumeration

Order-Chroococcales

Family-Chroococaceae

1. *Chroococcus indicus* Zeller
2. *Chroococcus minutus* (Kütz.) Naeg.
3. *Gloeocapsa gelatinosa* Kütz
4. *Synechococcus elongatus* Naeg.

Order-Nostocales

Family- Oscillatoriaceae

5. *Lyngbya major* Menegh. ex Gomont
6. *Lyngbya subtilis* West.

7. *Lyngbya spiralis* Geitler
8. *Oscillatoria acuta* Bruhl et Biswas orth. Mut. Geitler
9. *Oscillatoria lutea* Ag.
10. *Oscillatoria princeps* Vaucher ex Gomont
11. *Phormidium anomala* Rao, C.B.

Family- Nostocaceae

12. *Anabaena doliolum* Bharadwaja
13. *Anabaena fertilissima* Rao, C.B.
14. *Anabaena variabilis* Kütz. ex. Born. et Flah.
15. *Anabaena torulosa* (Carm.) Lagerh.
16. *Anabaena oryzae* Fritsch
17. *Aulosira fertilissima* Ghose
18. *Cylindrospermum indicum* Rao
19. *Nostoc calcicola* Breb.
20. *Nostoc linckia* (Roth) Born. ex Born et Flah.

Family- Scytonemataceae

21. *Scytonema* sp. Ag.
22. *Tolypothrix* sp. Kütz.

Family – Rivulariaceae

23. *Calothrix* sp. Ag.
24. *Rivularia aquatica* De Wilde

Family- Stigonemataceae

25. *Westiellopsis prolifica* Janet

Table 1: Taxonomic categorization of cyanobacteria encountered in the rice field adjacent to Hirakud Dam, Burla.

Order	Family	Genus	Species
Chroococcales	Chroococaceae	3	4
Nostocales	(1) Nostocaceae	4	9
	(2) Oscillatoriaceae	3	7
	(3) Scytonemataceae	2	2
	(4) Rivulariaceae	2	2
Stigonematales	Stigonemataceae	1	1
	Total	15	25

RESULTS AND DISCUSSION

In the present study on the cyanobacterial diversity in the rice fields of Hirakud Dam from July to October 2021, 25 species belonging to 15 genera, 6 families and 3 Orders were reported. Among these, Nostocaceae are represented by 4 genera, followed by Chroococaceae and Oscillatoriaceae with 3 genera each and Scytonemataceae and Rivulariaceae with 2 genera each, followed by Stigonemataceae with 1 member. Nostocaceae represent by maximum number of species (9), followed by Oscillatoriaceae (4), Chroococaceae (4), Scytonemataceae (2), Rivulariaceae (2) and least number in Stigonemataceae. Highest number of nitrogen-fixing cyanobacteria indicate the fertility of the rice fields in and around the Bheden Block.

The cyanobacteria are highly variable in their diversity. Many factors such as light, temperature, pesticide, fertilizer, pH, determine the distribution pattern of

cyanobacterial flora. Even, it varies with the growth stages of paddy. Hence, regular monitoring of cyanobacterial flora may be taken in different localities, so that well-adopted indigenous flora can be selected as 'Biofertilizer'.

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