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Research Article

Diversity and Ecological Assessment of Soil Blue-Green Algae (BGA) in Dharashiv District, Maharashtra, India

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Abstract

Soil blue-green algae (cyanobacteria) are vital components of soil ecosystems, contributing to nitrogen fixation, soil aggregation, and fertility enhancement. The present study evaluates the diversity and ecological distribution of soil BGA in semi-black soils of Dharashiv district during the Rabi season. Soil samples were collected from eight talukas with three sites per taluka (24 samples). A total of 900 individual counts were recorded, and 14 species belonging to five genera were identified. Diversity analysis revealed Shannon-Wiener index (H') = 2.49, Simpson's diversity index (1-D) = 0.91, and Evenness (E) = 0.95, indicating high species diversity and uniform distribution. Nostoc and Anabaena were dominant genera, highlighting their ecological importance in nitrogen fixation and soil fertility improvement.

INTRODUCTION

Cyanobacteria (blue-green algae) are photosynthetic prokaryotes widely distributed in terrestrial ecosystems. They play an essential ecological role in nitrogen fixation, soil stabilization, and nutrient cycling. In semi-arid regions like Dharashiv district, their role becomes significant for sustaining agricultural productivity, particularly in semi-black soils during the Rabi season. The present investigation focuses on diversity analysis and ecological assessment of soil BGA using standard biodiversity indices.

Materials and Methods

Study Area

The study was conducted in Dharashiv (Osmanabad) district of Maharashtra, India, characterized by semi-arid climate and semi-black soil.

Identification of Cyanobacteria

Soil samples were examined microscopically, and taxa were identified using standard taxonomic monographs.

Diversity Indices

Shannon-Wiener Index (H'), Simpson's Diversity Index (1-D), and Evenness (E) were calculated using standard ecological formulae.

Table:1 Soil Sampling of Dharashiv

Parameter	Details
Number of Talukas	8
Sampling sites per taluka	3
Total samples	24
Season	Rabi
Soil type	Semi-black soil

Results

Table 2: Species Composition different genera of the Algae

Family	Genus	Species	Occurrence
Chroococcaceae	Aphanothece	A. microscopica	17
	Aphanothece	A. pallida	18
	Chroococcus	C. limneticus	13
	Chroococcus	C. pallidus	10
Oscillatoriaceae	Oscillatoria	O. angustima	28
	Oscillatoria	O. sancta	38
	Oscillatoria	O. chllkensis	29
Nostoceae	Nostoc	N. calcicola	59
	Nostoc	N. muscorum	67
	Nostoc	N. punctiforme	64
	Anabaena	A. laxa	56
	Anabaena	A. naviculoides	64
	Anabaena	A. spiroides	60
	Anabaena	A. vaginicola	63

Table No. 3 Diversity Indices of the algal forms

Index	Value	Interpretation
Shannon Index (H')	2.49	High diversity
Simpson Index (1-D)	0.91	Low dominance, stable community
Evenness (E)	0.95	Uniform distribution

Table No. 4: Relative Abundance of the algal forms

Genus	Species	Occurrence	Relative Abundance (%)
Aphanothece	A. microscopica	17	2.90
Aphanothece	A. pallida	18	3.07
Chroococcus	C. limneticus	13	2.22
Chroococcus	C. pallidus	10	1.70
Oscillatoria	O. angustima	28	4.78
Oscillatoria	O. sancta	38	6.49
Oscillatoria	O. chllkensis	29	4.95
Nostoc	N. calcicola	59	10.07
Nostoc	N. muscorum	67	11.43
Nostoc	N. punctiforme	64	10.92
Anabaena	A. laxa	56	9.56
Anabaena	A. naviculoides	64	10.92
Anabaena	A. spiroides	60	10.24
Anabaena	A. vaginicola	63	10.75

Discussion

The high Shannon index (2.49) and Simpson index (0.91) indicate rich diversity and ecological stability of cyanobacteria in Dharashiv soils. Dominance of heterocystous genera Nostoc and Anabaena highlights their role in nitrogen fixation and soil fertility enhancement in semi-arid agricultural ecosystems.

Conclusion

The study revealed significant diversity of soil blue-green algae in Dharashiv district. High diversity indices and relative abundance patterns confirm ecological dominance of Nostoc and Anabaena, suggesting their potential application as biofertilizers for sustainable agriculture in semi-arid soils.

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