Biospectra : ISSN: 0973-7057, Vol. 18(2), September, 2023, pp. 315-320 **Plant Science**
An International Biannual Refereed Journal of Life Sciences

ISSN : 0973-7057

Filiform Cyanophyta flora from Junnar tehsil (Pune district) of the Northern Western Ghats of Maharashtra, India

Balasaheb Shantilal Kale*, Sanjay Appaji Khairnar & Sulabha Sambhaji Lalsare
Department of Botany, S.S.S.M. Arts, Science and Commerce College, Saikheda, Niphad, Nashik, Maharashtra, India

Received : 21st May, 2023 ; Revised : 24th June, 2023
DOI:-https://doi.org/10.5281/zenodo.12206942

Abstract- The Western Ghats is one of the 34th biodiversity hot spots with a rich combination of algal flora together with cyanophyta. Cyanophyta also known as Cyanobacteria are nitrogen fixing and photosynthetic autotrophic microorganisms. The significant contribution in the present day is a food sources, fodder, biofuels, fish cultivation, medicines, and green manure. Among the algal diversity cyanophyta group is one of the ancient algal groups on the earth. It is cosmopolitan in distribution on the planet. To overcome the knowledge gap, the present research was carried out on the cyanophyta flora of the northern Western Ghats in Junnar tehsil (Pune district) of Maharashtra, India. The studied area's immeasurable cyanophyta specimen collections were conducted during pre-monsoon and post-monsoon. The most significant species of cyanophyta was found on soil, tree bark, and rock surfaces. A total of 107 filiform cyanophyta taxa were identified with the help of available literature. The highest number of cyanophyta was documented from Junnar tehsil with 20 *Oscillatoria* taxa. During the study, we documented filiform major cyanophyta taxa followed by 3, 4, 6, 8, 8, 8, 10, 10, 15 and 20 of *Microcoleus, Gloeotrichia, Spirulina, Nostoc, Anabaena, Calothrix, Lyngbya, Phormidium, Scytonema* and *Oscillatoria* respectively.

Key words: Algae, Filiform, Cyanophyta, Junnar tehsil, Western Ghats

INTRODUCTION

Junnar tehsil (Pune district) of Maharashtra located between 19°11'59" North and 73°52'47" East. Junnar tehsil belongs to the Northern western region and the politically boundary is bounded by Ahmednagar district to the north and northeast, Thane district to the west. The Western Ghats is a major significant ecological region as it is one of the major biodiversity hot spots of the world. The Western Ghats are divided into three major parts such as Northern Western Ghats, Central Western Ghats, and Sothern Western Ghats (Figure 1).[1-3] The Western Ghats of India are one of the most extravagant biodiversity area of interest on the planet. Cyanophyta are morphologically particular gathering of nitrogen fixing and photosynthetic autotrophic microorganisms. They are accepted to advance during Proterozoic Era somewhere in the range of 2.5 and 3.5 billion years long time back normally known as the Age of Cyanobacteria and these prokaryotes made our planet earth oxygenic.[4,5]

Algae are the most widespread, cosmopolitan, and abundant photosynthetic autotrophic life existence in aquatic and terrestrial ecosystems. Freshwater ecosystems are varying in size and composition and contain a large diversity of organisms. Algae are a wide group of prokaryotic and eukaryotic autotrophic photosynthetic organisms found in many different forms such as unicellular

*Corresponding author :
Phone : 9890616838
E-mail : kaleunipune@gmail.com

cells, colonies, filaments, and macroalgae. They are found in freshwater bodies of nature like rivers, lakes, ponds, puddles, moist surfaces of soils, etc. Algae is an excellent bioindicator because of their cosmopolitan nature, abundance, eutrophication, and sensitivity to some chemical changes that happened in the environment.[6-10] Recorded some Cyanophyta freshwater algae of some selected regions Peruvannamuzhi forest and Janaki forest of Western Ghats Northern Western Ghats of Maharashtra.[11] Cyanophyceae common algae commonly called blue-green algae were recorded in some taxa from the Suki Dam Soil, Jalgaon district, Maharashtra.[12] Reported 364 algal taxa which mainly belong to Chlorophyceae, Cyanophyceae, Bacillariophyceae, and Eugleonophyceae form Girna reservoir of Nasik district.[13] A total of 79 heterocystous and non-heterocystous ancient algae group Cynophyceae taxa was reported from the western region of Maharashtra.[14] During the survey, the author revealed the major Cyanophyta class of algae from Akkalpada dam, Dhule district. The author reveals the 15 genera and 34 species belonging to the class Cyanophyta, here observed genera such as *Osciallatoria*, *Aphanocapsa,* and *Merismopedia* were observed with more number species.[15] It is accepted that the region is least investigated and accordingly numerous cyanobacterial taxa stays unseen. To satisfy this information holes, the current examination was embraced to investigate the variety of filamentous cyanobacteria in Junnar tehsil

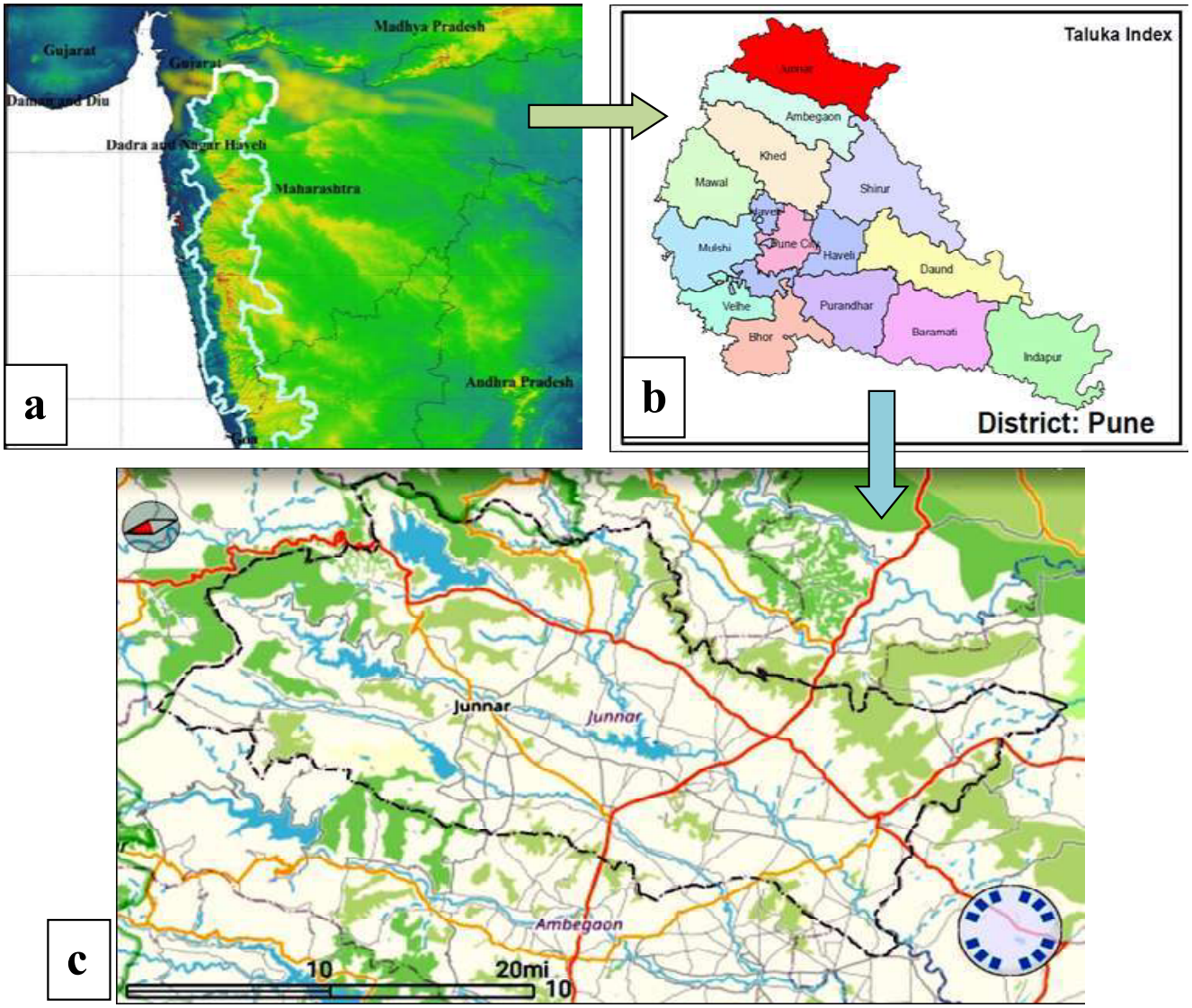


Figure 1- Maps showing filiform Cyanophyta algae distribution
a- Northern Western Ghats of Maharashtra, b- Pune district, c- Junnar tehsil

(Pune district) of the northern Western Ghats of Maharashtra, India.

MATERIALS & METHODS

Fresh water algal samples were collected from the dams, rivers and, streams of the Junnar tehsil of Pune district, Maharashtra (India) during the year 2021-22 (Figure 1). Algal samples were collected from selected habitats were will be collected from different localities such as planktonic, benthic, terrestrial, epiphyllous, and epiphytic. The algal taxa collected pre monsoon, during monsoon, and post monsoon period. Collected all taxa of algae samples preserved in 4% (v/v) commercial formaldehyde solution on the spot.[16] Filamentous algae were collected by hand. Epiphytic algae under sub-aerial algae growing attached to tree trunk barks, on damp walls were collected by scraping with a scalpel and then picked up with the help of forceps. Soil algae will be collected with the help of a sharp scalpel. For collecting Phytoplanktons will be used plankton net of fine bolting silk of 25µm mesh sized phytoplankton net.[17]

Microscopic observation and Identification: Collected algal samples were carefully examined under compound light microscope (Model-LABOMED Microscope Lx 300). Observed algal cells, thallus structure using different magnifications such as 10X, 40X, and 100X.[16] The macroscopic algae examined we used dissecting microscope. Micrometry instrument were used for measurement of algal cells, thallus structure size. Pictured keys used to identify the common genera of fresh-water algae.[18] Each algal specimen described and identified with the help of standard literature such as research articles, monographs, and online web database (https://www.algaebase.org).[16,19]

Cyanobacterial Diversity Division, University of Calicut, India. Classification of cyanobacteria was followed in the present study.[20] Based on filiform morphology, the cyanophyta taxa were identified and documented up to the genus and species level by using available literature such as algal floras and monographs.[21,22]

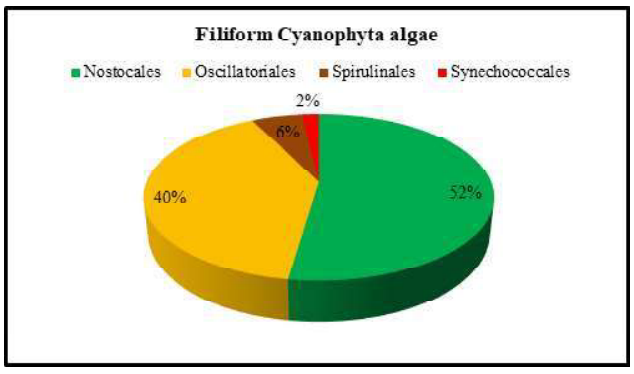
RESULTS & DISCUSSION

During the investigation, a total 107 taxa of filiform cyanophyta belonging to the orders Nostocales (56 taxa), Oscillatoriales (43 taxa), Spirulinales (06 taxa), and Synechococcales (02 taxa) were recorded the total taxa listed in table 1 and figure 2. Canals of Wilson dam (Bhandardara dam) recorded 33 species belonging to the order Nostocales of which 20 are heterocystous and 13 are non-heterocystous. During the investigation we also recorded total 48 nostocales.[23] Investigator recorded total 7 taxa belonging to *Oscillatoria* genera such as *O. geminate, O. fremyii*, *O. schultzii* var. *tergestina, O. margarififera, O. acuta*, *O. pseudogeminata* other than these seven taxa, more three taxa reported newly for Maharashtra such as *O. minimum, O. annae*, *O. limosa* var. *maxima* from Faizpur, Jalgaon District, India. The highest number Oscillatoriales order taxa reported from studied site.[24] During the investigation author documented 21 species, belonging to 07 genera such as *Nostoc* (2), *Chroococcus* (2), *Merismopedia* (2), *Gloeocsapsa* (1), *Phormidium* (1), *Spirulina* (3), *Oscillatoria* (10) of Cyanophyceae of Abhora dam, Raver tahsil of Jalgaon district, Maharashtra.[25] The investigator documented 13 taxa belonging to the family Nostocaceae, in which *Anabaena* was the dominant taxa from Dhule district, Maharashtra. We also noted total 8 taxa of *Anabaena* from studied sites.[26]

Table 1- List of algal species from Junnar tehsil

Sl. No.	Order	Name of Algal taxa
		***Gloeotrichia* J. Agardh ex Bornet & Flahault, 1886**
1.		*G. indica* Schmidle
2.		*G. intermedia* (Lemm.) Geitler
3.		*G. kurziana* Zeller orth. Mut.
4.		*G. raciborskii* Woloszynska
		***Nostoc* Vaucher ex Bornet & Flahault, 1886**
5.		*N. calcicola* Brebisson ex Born. et Flah.
6.		*N. carnaeum*Ag.ex. Born. et Flah.
7.		*N. entophytum* Born. et Flah.
8.		*N. humifusum* Carmichael ex Born. et Flah.
9.		*N. linckia* (Roth) Bornet ex Born.et Flah.
10.		*N. paludosum* Kutzing ex Born. Et Flah.
11.		*N. punctiforme* (Kuetz.) Hariot
12.		*N. spongiaeformi* Agardh ex. Born. et Flah.
		***Scytonema* C. Agardh ex É. Bornet & C. Flahault, 1886**
13.		*S. bewsi* Fritsch et Rich
14.		*S. bohneri* Schmidle
15.		*S. cincinnatum* Thuret ex Born.et Flah
16.		*S. chiastum* Geitler
17.		*S. crustaceum* Ag. ex Born. et Flah.
18.		*S. coactile* Montagne ex Born. et Flah
19.	Nostocales	*S. geitleri* Bharadwaja
20.		*S. multiramosum* Gardner.
21.		*S. mirabile* (Dillw.) Born
22.		*S. pseudohofmanni* Bharadwaja
23.		*S. pseudopunctatum* Skuja

23.		*S. pseudopunctatum* Skuja
24.		*S. schmidlei* J. De Toni
25.		*S. simplex* Bharadwaja
26.		*S. tolypothrichoides* Kutzing ex Born.et.Flah.
27.		*S. ocellatum* Lyngbye ex Born et Flah.
		***Anabaena* Bory ex Bornet & Flahault, 1886, nom. cons.**
28.		*A. ambigua* Rao C. B.
29.		*A. ballyganglii* Banerji
30.		*A. iyengarii* Bharadwaja
31.		*A. khannae* Skuja
32.		*A. laxa* (Rabehn.)
33.		*A. naviculoides* Fritsch
34.		*A. oscillarioides* Bory ex Bron. et Flah.
35.		*A. variabilis* Kuetz. ex. Born. et Flah.
		***Microcoleus* Desmazières ex Gomont, 1892**
36.		*M. acutissimus* Gerdener
37.		*M. chthonoplastes* Thuret ex Gomont
38.		*M. lacustris* (Rabenh.) Farlow.
		***Anabaenopsis* V.V.Miller, 1923**
39.		*A. arnoldii* Aptekarj
40.		*A. circularis* (West, G. S.) Wolosz et Miller
		***Cylindrospermum* F.T.Kützing ex É.Bornet & C.Flahault, 1886**
41.		*C. muscicola* Kutzing ex Born.et Flah.
42.		*C. stagnale* (Kutz.) Born. et Flah.
		***Calothrix* C.Agardh ex Bornet & Flahault, 1886**
43.		*C. atricha* Fremy
44.		*C. bharadwajae* De Toni, J.
45.		*C. clavata* West, G. S.
46.		*C. elenkinii* Kossinskaja
47.		*C. epiphytica* W. et G. S. West
48.		*C. fusca* (Kutz.) Bornet et Flahault
49.		*C. marchica* Lemmermann
50.		*C. thermalis* (Schwabe) Hansg.
		***Tolypothrix* Kützing ex Bornet & Flahault, 1886**
51.		*T. byssoidea* (Berk.) Kirchner
52.		*T. distorta* Kuetzing ex Born. et Flah.
		***Rivularia* C.Agardh ex Bornet & Flahault, 1886, nom. cons.**
53.		*R. beccariana* (De Not.) Born.et Flah.
54.		*R. manginii* Fremy
		***Aulosira* O.Kirchner ex É.Bornet & C.Flahault, 1886**
55.		*A. bombayensis* Gozalves
		***Nodularia* Mertens ex Bornet & Flahault, 1886, nom. cons.**
56.		*N. spumigena* Mertens ex Born.et Flah.
	Oscillatoriales	***Oscillatoria* Vaucher ex Gomont, 1892**
57.		*O. acuta* Bruhl et Biswas
58.		*O. agardhii* Gomont
59.		*O. amphigranulata* Van Goor
60.		*O. chalybea* (Mertens) Gomont
61.		*O. curviceps* Ag. ex Gomont
62.		*O. irrigua* Kuitz. Gomont
63.		*O. limosa* Ag. ex Gomont
64.		*O. margaritifera* (Kuetz) Gomont
65.		*O. minnesotensis* Tilden
66.		*O. nigra* Vaucher
67.		*O. obscura* Bruhl *et* Biswas
68.		*O. princeps* Vaucher ex Gomont
69.		*O. raciborskii* Wolosz.
70.		*O. rubescens* DC ex Gomont
71.		*O. sancta* (Kutz.) Gomont
72.		*O. subbrevis* Schmidle
73.		*O. subtilissima* Kuetz.
74.		*O. tenuis* Ag ex Gomont
75.		*O. terebriformis* Ag. Ex Gomont
76.		*O. vizgapatensis* Rao C.B.
		***Phormidium* Kützing ex Gomont, 1892**
77.		*P. ambiguum* Gom.
78.		*P. anomala* Rao, C. B.
79.		*P. corium* (Ag.) Gomont
80.		*P. foveolarum* Gomont
81.		*P.increstatum* (Nageli) Gomont
82.		*P. laminosum* Gomont
83.		*P. lucidum* Kuetzing ex Gomont
84.		*P. mucosum* Gardner
85.		*P. rubroterricola* Gardner
86.		*P. usterii* Schmidle
		***Lyngbya* C.Agardh ex Gomont, 1892, nom. et typ. cons.**
87.		*L. baculum* Gomont
88.		*L. connectens* Bruhl et Biswas
89.		*L. digueti* Gomont
90.		*L. hitronymusii* Lemm.
91.		*L. lachneri* (Zimmermann) Geitler
92.		*L. magnifica* Gardner
93.		*L. majuscula* Harvey ex Gomont
94.		*L. subconfervoides* Borge
95.		*L. truncicola* Ghose
96.		*L. versicolor* (Wartmann) Gomont
		***Plectonema* Thuret ex Gomont, 1892**
97.		*P. tomasinianum* (Kutz.) Born. ex. Gomont
		***Homoeothrix* (Thuret ex Bornet & Flahault) Kirchner, 1898, nom. cons.**
98.		*H. hansgirgi* (Schmidle) Lemmermann
		***Arthrospira* Sitzenberger ex Gomont, 1892**
99.		*A. gomontiana* Setchell
		***Spirulina* Turpin ex Gomont, 1892**
100.		*S. gigantea* Schmidle
101.		*S. labyrinthiformis* (Menegh.) Gomont
102.	Spirulinales	*S. major* Kuetz.ex. Gomont
103.		*S. meneghiniana* Zanard. ex Gomont
104.		*S. princeps* W. et G. S. West
105.		*S. subtilissima* Kuetz ex Gomont
		***Schizothrix* Kützing ex Gomont, 1892**
106.	Synechococcales	*S. arenaria* (Berk) Gomont
107.		*S. ericetorum* Lemmermann



REFERENCE

1. **Myers N., Mittermeier R. A., Mittermeier C. G., da Fonseca G. A. B. & Kent J. 2000.** Biodiversity hotspots for conservation priorities. *Nature.* **403:** 853–858.
2. **Ramachandra T. V., & Suja A. 2001.** Sahyadri/ : Western Ghats Biodiversity Information System. *Energy Wetl. Res. Gr.* **1:** 461–468.
3. **Rao R. 2002.** Floristic diversity in Western Ghats: Documentation, Conservation and Bioprospection - A priority agenda for action. *Sahyadri West. Ghats Biodivers. Inf. Syst. SAHYADRI E-NEWS.* 1–37.
4. **Den C. van, Mann H. D. & Jahns H. M. 1996.** Algae/ : An Introduction to Phycology. *Cambridge Univ. Press* 1–640.
5. **Kumar R. 2006.** Glimpses of Cyanobacteria. *Daya Publ. House* 1–356.
6. **Barinova S. S. & Krupa E. G. 2017.** Diversity and Ecology of Periphytonic Algae in the Arys River Basin, Kazakhstan. *J. Ecol. Nat. Resour.* **1:** 1–14.
7. **Das M. & Keshri J. P. 2017.** Algal diversity in foot hills of Eastern Himalayas-I (Cyanoprokaryota: Oscillatoriales). *Phykos* **47:** 64–75.
8. **Hassan F. M. 2016.** Assessment of a lotic ecosystem by using diatomic indices (Epipelic Algae), Iraq. *Mesopotamia Environ. J.* **2:** 87–100.
9. **Larson C. A. & Passy S. I. 2012.** Taxonomic and functional composition of the algal benthos exhibits similar successional trends in response to nutrient supply and current velocity. *Fed. Eur. Microbiol. Soc.* **80:** 352–362.
10. **Yenkar A. W. 2015.** Bio-Diversity of Fresh Water Algae of Dahegaon Gondi Reservoir of Wardha District of Maharashtra, India. *Bull. Pure Appl. Sci.* **34-B:** 31–34.
11. **Nikam T. D., Nehul J. N., Gahile Y. R., & Auti B. K. 2013.** Cyanobacterial diversity in some Districts of Maharashtra Cyanobacterial Diversity in Western Ghats Region of Maharashtra, India. *Bioremediation, Biodivers. Bioavailab.* **7:** 70–80.
12. **Bhoge O. N. & Ragothaman G. 1986.** Studies on the Cyanophyceae from Jalgaon Region, Maharashtra. *Phykos* **25:** 129–131.
13. **Magar U. R. 2008.** *Biodiversity of algal flora and limnological studies of girna dam of Nashik district*.
14. **Patil S. & Chaugule B. 2009.** Diversity of blue green algae in paddy field of the Western Maharashtra. *Indian Hydrobiol.* **12:** 89–94.
15. **Chaudhari G. S. & Nandan S. N. 2018.** A preliminary survey on Cynophyceae potential from Akkalpada dam of Dhule (Maharashtra). *Int. J. Res. Biosci. Agric. Technol.* **6:**34-35.
16. **Behera C., Dash S. R., Pradhan B., Jena M. & Adhikary S. P. 2020.** Algal Diversity of Ansupa Lake, Odisha, India. *Nelumbo.* **62:** 207–220.
17. **Samuel Eddy. 1934.** *A study of fresh-water plankton communities*.
18. **Prescott G. W. 1954.** *How to Know the Fresh-Water Algae. WM. G Brown Company*.
19. **Guiry M. D. & Guiry G. M. 2022.** Algaebase.
20. **Komárek J., Kaštovský J., Mareš J., & Johansen J. R. 2014.** Taxonomic classification of cyanoprokaryotes (cyanobacterial genera) 2014, using a polyphasic approach. *Preslia.* **86:** 295–335.
21. **Anand N. 1989.** Handbook of blue-green algae (of rice fields of south India). *Bishen Singh Mahendra Pal Singh*, pp. 20–45.
22. **John J. & Francis M. S. 2013.** Illustrated Algal Flora of Kerala, Vol.I. *GCS Books, Cochin.* 245–281.
23. **Auti B. K. & Pingle S. D. 2006.** Nostocales from Northern Circle of Ahmednagar District (M.S.). *Indian Hydrobiol.* **9:** 147–150.
24. **Kumawat D. A. & Jawale A. K. 2007.** The Genus Oscillatoria Vaucher (Cyanobacteria) from fish ponds of Research Centre, Department of Botany, Dhanaji Nana Mahavidyataya, Faizpur-425503, Jalgaon District, India). *J. Indian Bot. Soc.* **85:** 97–102.
25. **Patil S. B. & Patil S. A. 2015.** Cyanophyceae from Abhora dam of Jalgaon district, Maharashtra. *Int. J. Innov. Res. Rev.* **3:** 57–61.
26. **Nandan N. S., Jain D. S., Kumavat M. R. & Aher N. H. 2009.** Biodiversity of Blue Algae in Sonvad Dam and Devbhane Dam of Dhule District of Maharashtra. *Biol. Biodivers. Microalgae, Cent. Adv. Stud. Bot. Chennai, Madras*.

***