

DIVERSITY OF ALGAY FROM NATHSAGAR DAM PAITHAN

Anilkumar M. Desmukh, Mamtaram A. Kare², Maheboob D. shaikh¹ and Revansiddha S. Dhotre^{2*}

Department of Botany, Pratisthan Mahavidhyalaya, Paithan, (M.S.), India.

E-mail - drdeshmukh.a.m@gmail.com

ABSTRACT

Jayakwadi dam is situated on river Godavari at Paithan. It is 50 kms away from Aurangabad. The water of dam is known as “Nathsagar”. The water body of dam is so huge that it covers 339.80 square kms. The water body of dam shows aquatic diversity of Angiosperms, Pteridophytes and algae. The present study deals with algal diversity for the period of one year during February 2015- January 2016. The present investigation reveals that the water bodies are abundant algal species belonging to Chlorophyceae, Bacillariophyceae, Cynophyceae, Euglenophyceae etc.

KEY WORDS: Chlorophyceae, Bacillariophyceae, Cynophyceae, Euglenophyceae and Paithan.

INTRODUCTION

Jayakwadi dam is constructed on river Godavari, about 50 kms away from Aurangabad, at Paithan. The water body of the dam is named as “Nathsagar”. Every year thousands of resident and migratory birds are visiting at this place during winter. Near about of 250 different species. These birds visit at Jayakwadi dam because of food, shelter and environmental change. The migratory birds from different countries like Nepal, Tibet, China and Russia. Therefore, the state government has declared it as Jayakwadi Bird Sanctuary in 1986. The area of this water reservoir is about 339.80 square kms. In this region dam biologically active, where a large number of flora and fauna is observed. Birds are visited here for eat green algae and fishes. This algal species belong to Chlorophyceae, Bacillariophyceae, Cynophyceae, Euglenophyceae etc.

In 1847 algal studies were started in Maharashtra when Griffith describes fertilization in *Eudorina elegans* collected from the pools in Bombay. Borgesen worked on fresh and marine algae of Bombay in 1993. Later on some of the major contributions from Maharashtra are those by Dixit (1936), Gonzalves and Joshi (1945), Gunale and Balkrishnan (1981), Pingale (1981), Sarode (1984), Gole et al., (1985), Jagdale et al., (1987), Trivedi et al., (1990), Badve et al., (1993), Patil (1995) and More (1997).

MATERIALS AND METHODS

Study Area: -

Algal samples were collected from different location on “Nathsagar dam” North Jayakwadi: Latitude N19°52’38.6”, Longitude E075°37’72.1”, Altitude 466.5 m; Esarwadi: Latitude N19°52’62.9”, Longitude E075°38’12.1”, Altitude 458.5 m; Pimpalwadi: Latitude N19°52’30.2”, Longitude E075°18’89.9”, Altitude 462.5 m; Muddalwadi: Latitude N19°52’05.4”, Longitude E075°38’05.2”, Altitude 464.5 m; Kaygaon: Latitude N19°52’28.0”, Longitude E075°37’67.8”, Altitude 468.5 m; Lamgaon: Latitude N19°52’32.2”, Longitude E075°37’67.5”, Altitude 467.5 m; North Colony: Latitude N19°52’25.3”, Longitude E075°37’50.3”, Altitude 474.5 m Ramdoh: Latitude N19°51’65.8”, Longitude E075°38’22.6”, Altitude 503.5 m; Dhakephal: Latitude N19°76’26.8”, Longitude E075°34’30.2”, Altitude 562.5 m; Naga Ghat Latitude N19°46’56.5”, Longitude E075°38’22.7”, Altitude 444.0 m; Ganesh Ghat Latitude N19°46’76.9”, Longitude E075°38’33.2”, Altitude 416.5 m; Shi Dev Ghat: Latitude N19°46’80.9”, Longitude E075°38’29.6”, Altitude 426.5 m; and Toka Latitude N19°52’53.6”, Longitude E075°37’62.5”, Altitude 468.5 m. Collected samples were brought to the laboratory and preserved in 4% formalin for further study. Identification was done by using Prasad and Misra (1992), Rai and Misra (2008), Prescott G. W. (1951), Scott and Prescott (1961), Sen and Naskar (2003), Rath and Adhikari (2005) and other relevant literature. In present investigation collected algal from different location identify by various literature.

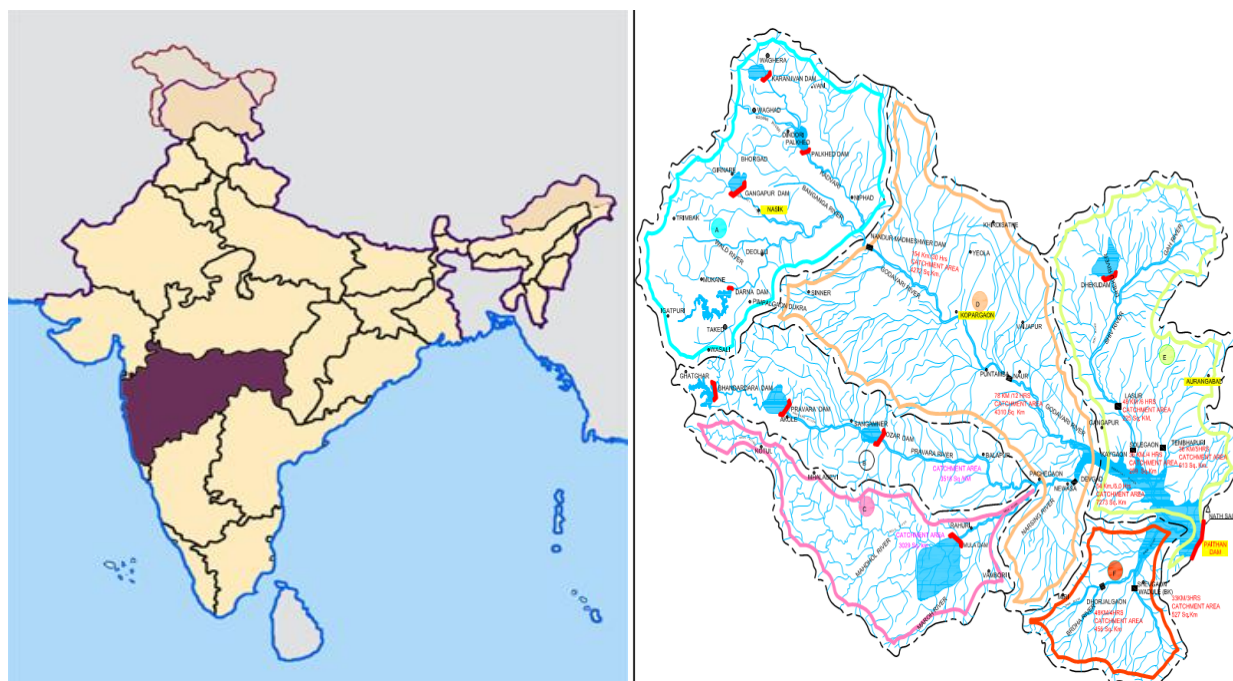


Figure 1: Maps showing location of Maharashtra and Nathasagar Dam Paithan.

Table 1: - Algal flora of Nathasagar Dam

Sr. No.	Division	Class	Order	Family	Bionomial
01	Chlorophyta	Chlorophyceae	Chlamydomonadales	Chlamydomonada ceae	<i>Chlamydomona conferta</i>
02		Trebouxiophyceae	Chlorellales	Scenedesmaceae	<i>Scenedesmus armatus</i>
03					<i>Sc. acuminatus</i>
04					<i>Sc. carinatus</i>
05					<i>Sc. obliquus</i>
06					<i>Sc. quadricauda</i>
07					<i>Sc. quadricauda</i>
08					<i>Sc. quadricanda</i>
09				Chlorellaceae	<i>Chlorella conglomeraata</i>
10					<i>C. vulgaris</i>
11					<i>Closterium limnetium</i>
12					<i>Cl. parvulum</i>
13					<i>Cl. moniliferum</i>
14			Chlorococcales	Hydrodictyceae	<i>Pediastrum duplex</i>
15					<i>P. boryanum</i>
16					<i>P. tetras</i>
17					<i>P. simplex</i>
18					<i>Spirogyra purvula</i>
19		Zygnematophyc-eae	Zygnematales	Zygnemataceae	<i>S. purvula</i>
20		Chlorophyceae	Volvocales	Volvocaceae	<i>Pandorina morum</i>
21		Chlorophyceae	Sphaeropleales	Selenastraceae	<i>Ankistrodesmus falcatus</i>

22	Chlorophyceae	Chaetophorales	Chaetophoraceae	<i>Steigeoclonium aestivale</i>
23				<i>S. tenue</i>
24		Chlorococcales	Chlorococcaceae	<i>Chlorococcum infusionum</i>
25			Scenedesmaceae	<i>Actinastrum lantzschii</i>
26	Ulvophyceae	Ulotrichales	Ulotrichaceae	<i>Ulothrix gonata</i>
27	Chlorophyceae	Chlorococcales	Coelastraceae	<i>Coelastrum microporum</i>
28	Zygnemophyceae	Desmidiales	Desmidiaceae	<i>Cosmarium contractum</i>
29				<i>C. Pseudobirumum</i>
30				<i>C. brachypleunum</i>
31				<i>C. tenue</i>
32	Chlorophyceae	Oedogoniales		<i>Oedogonium patulum</i>
33				<i>O. lautummiarum</i>
34		Sphaeropleales	Selenastraceae	<i>Solenastrum gracile</i>
35				<i>Microspora floccosa</i>
36	Zygnematophyceae	Zygnematales	Desmidiaceae	<i>Micresterias pinnanitifida</i>
37			Desmidiaceae	<i>Euastrum ansatum</i>
38				<i>E. platycerum</i>
39		Desmidiales	Desmidiaceae	<i>Cosmarium angulosum</i>
40				<i>C. auriculatum</i>
41				<i>C. granatum</i>
42				<i>C. impressulum</i>
43				<i>C. margaritatum</i>
44				<i>C. pseudobroomei</i>
45				<i>C. pseudogranatum</i>
46				<i>C. regnellii</i>
47		Desmidiales	Desmidiaceae	<i>Arthrodesmus convergens</i>
48				<i>A. Curvatus</i>
49		Desmidiales	Desmidiaceae	<i>Staurastrum gracile</i>
50				<i>S. gracile Ralfs</i>
51				<i>S. granulosum</i>
52				<i>S. leave</i>
53				<i>S. Pachyrrhynchum</i>
54				<i>S. sexangulare</i>
55				<i>S. sexcostatum</i>
56				<i>S. wildemaniai</i>
57	Chlorophyceae	Zygnematales	Desmidiaceae	<i>Desmidium baileyi</i>
58				<i>D. swartzii</i>
59	Zygnematophyceae	Desmidiales	Desmidiaceae	<i>Sphaerzosma excavta</i>
60	Zygnematophyceae	Zygnematales	Desmidiaceae	<i>Triploceras gracile</i>
61	Chlorophyceae	Oedogoniales		<i>Oedogonium biformae</i>
62				<i>O. varians</i>
63				<i>O. glabrum</i>
64				<i>O. globosum</i>
65				<i>O. hindustanense</i>
66				<i>O. iowense</i>
67				<i>O. khannae</i>
68				<i>O. khannae</i>
69				<i>O. kufferathii</i>
70				<i>O. latiusculum</i>
71				<i>O. leave</i>
72				<i>O. maharastrense</i>
73				<i>O. mitratum</i>
74				<i>O. nobile</i>

75				<i>O. pseudotumidulum</i>	
76				<i>O. pretense</i>	
77				<i>O. rufescens</i>	
78				<i>O. sociale</i>	
79				<i>O. variabile</i>	
80				<i>O. varians</i>	
81	Cyanophyta	Cyanophyceae	Oscillatoriales	<i>Oscillatoria tenuis</i>	
82				<i>O. limnetica</i>	
83				<i>O. princyps</i>	
84				<i>O. subuliformis</i>	
85				<i>O. sanata</i>	
86				<i>O. shlorina</i>	
87				<i>O. curviceps</i>	
88				<i>O. cortiana</i>	
89				<i>O. omoena</i>	
90				<i>O. limosa</i>	
91				<i>O. irriguda</i>	
92				<i>O. formosa</i>	
93				<i>O. gloiophila</i>	
94				<i>O. foreaui</i>	
95		Cynophyceae	Oscillatoriales	Phormidiaceae	<i>Phormidium bohneri</i>
96					<i>P. Corium</i>
97					<i>P. inundatum</i>
98					<i>P. valderianum</i>
99					<i>P. luridum</i>
100					<i>P. subincrustaum</i>
101					<i>P. retzii</i>
102					<i>P. jenkelianum</i>
103					<i>P. tenue</i>
104			Oscillatoriales	Pharmidiaceae	<i>Lyngbya aerugineocoerulea</i>
105					<i>L. kuetzingii</i>
106			Spirulinales	Spirulinaceae	<i>Spirulina laxissima</i>
107					<i>S. major</i>
108					<i>S. subtilissima</i>
109					<i>S. subsala</i>
110			Nostocales	Nostocaceae	<i>Anabaena bekkii</i>
111					<i>A. constricta</i>
112					<i>Aphanocapsa koordersi</i>
113					<i>A. pulchra</i>
114					<i>A. roscana</i>
115					<i>Aphanotheca microscopia</i>
116					<i>A. pallida</i>
117					<i>A. saxicola</i>
118			Chroococcales	Microcystaceae	<i>Microcystis aeruginosa</i>
119					<i>M. pulvarea var. Incertes</i>
120					<i>M. flor-aquae</i>
121					<i>M. protocystis</i>
122			Chroococcales	Chroococcaceae	<i>Chlorococcus minutus</i>
123					<i>Chlorococcus tenax</i>
124			Chroococcales	Merismopediaceae	<i>Merismopedia glauca</i>
125			Oscillatoriales	Phormidiaceae	<i>Arthrospira plantensis</i>
126			Oscillatoriales	Oscillatoriaceae	<i>Lyngbya allorgei Fremy</i>
127					<i>L. aestuarii</i>
128					<i>Liemb. ex. Gomont</i>

129			<i>L. borgertii</i> Lemm.
130			<i>L. ceylanica</i>
131			<i>L. ceylanica</i>
132			<i>L. cryptovaginata</i>
133			<i>L. cryptovaginata</i>
134			<i>L. digueti</i>
135			<i>L. epiphytica</i>
136			<i>L. gracilis</i>
137			<i>L. hieronymusil.</i>
138			<i>L. hieronymusil</i>
139			<i>L. infixa</i>
140			<i>L. laxespiralis</i>
141			<i>L. limnetica</i>
142			<i>Oscillatoria agardhii</i>
143	Nostocales	Oscillatoriaceae	<i>O. anne</i>
144			<i>O. bervis</i>
145			<i>O. calcuttensis</i>
146			<i>O. chalybea</i>
147			<i>O. curviceps</i>
148			<i>O. curviceps</i>
149			<i>O. formosa</i>
150			<i>O. chilkenis</i>
151			<i>O. margaretifera</i>
152			<i>O. terebriformis</i>
153			<i>O. obscura</i>
154			<i>O. nigro-viridis</i>
155			<i>O. ornate</i>
156			<i>O. perornata</i>
157			<i>O. perornata</i>
158			<i>O. princeps</i>
159			<i>O. pseudogeminata</i>
160			<i>O. pseudogeminata</i>
161			<i>O. quadripantculata</i>
162			<i>O. raoi</i>
163			<i>O. reciborskii</i>
164			<i>O. rubescens</i>
165	Oscillatoriales	Oscillatoriaceae	<i>Phormidium ambiguum</i>
166			<i>P. angustissimum</i>
167			<i>P. autumnale</i>
168			<i>P. bigranulatum</i>
169			<i>P. calicicola</i>
170			<i>P. corium</i>
171			<i>P. fragile</i>
172			<i>P. gyralis</i>
173			<i>P. incrustatum</i>
174			<i>P. papyraceum</i>
175			<i>P. inundatum.</i>
176			<i>P. parchydermaticum</i>
177			<i>P. purpurascens</i>
178			<i>P. retzii</i>
179			<i>P. rotheanum</i>
180			<i>P. stagnina</i>
181			<i>P. subincrustedatum</i>
182	Nostocales	Nostocaceae	<i>Anabaena ambigua</i>

183					<i>A. doliolum.</i>
184					<i>A. fertilissima</i>
185					<i>A. khannae</i>
186					<i>A. laxa</i>
187					<i>A. lyengarii</i>
188					<i>A. naviculoides</i>
189					<i>A. oscillarioides</i>
190		Nostocales		Nostocaceae	<i>Cylindrospermum indicum</i>
191					<i>Anabaena sphaerica</i>
192					<i>Cylindrospermum majus</i>
193					<i>Cylindrospermum licheniforme</i>
194		Nostocales		Aphanizomenonaceae	<i>Raphidiopsis curvata</i>
195					<i>Cylindrospermum michallovskoense</i>
196					<i>Raphidiopsis indica</i>
197					<i>Raphidiopsis mediterranea</i>
198		Nostocales		Fortiaceae	<i>Aulosira fertilizzima</i>
199		Nostocales		Nostocaceae	<i>Nostoc carneum</i>
200					<i>N. carneum</i>
201					<i>N. coeruleum</i>
202					<i>N. colonicola</i>
203					<i>N. commune</i>
204					<i>N. elliposporum</i>
205					<i>N. elliposporum</i>
206		Nostocales		Rivulariaceae	<i>Calothrix brevissima</i>
207					<i>C. brevissima</i>
208					<i>C. castellii</i>
209					<i>C. castellii v. somastipurense</i>
210					<i>C. clavata</i>
211					<i>C. contarenii</i>
212					<i>C. desikacharyensis</i>
213					<i>C. fusca</i>
214					<i>C. javanica</i>
215					<i>C. marchica.</i>
216					<i>C. marchica</i>
217	Heterokontophyta	Bacillariophyceae	Naviculales	Naviculaceae	<i>Nitzschia denticula</i>
218					<i>N. Vermicularis</i>
219					<i>N. recta</i>
220					<i>N. subtilis</i>
221					<i>N. sublinearis</i>
222					<i>N. gandersheimensis</i>
223					<i>Navicula accomoda</i>
224					<i>N. fluens</i>
225					<i>N. simplex</i>
226					<i>N. densestriata</i>
227					<i>N. rostellata</i>
228					<i>N. shonfeldii</i>
229					<i>N. cincta</i>
230					<i>N. krasskei</i>
231					<i>N. cocconiformis</i>
232					<i>N. cryptocephala</i>
233					<i>N. bacilloids</i>
234					<i>N. complanatula</i>

235					<i>N. radiosa var. tenella</i>
236					<i>N. pulpula var. capitata</i>
237					<i>N. cuspidata var. ambigua</i> <i>Sunodera ulng</i>
238					<i>N. affinis</i>
239	Bacillariophyta	Bacillariophyceae	Mastogloiales	Acanthaceae	<i>Achanthes exigua</i>
240					<i>A. lanceolata</i>
241					<i>A. exilis</i>
242					<i>A. hungarica</i>
243					<i>A. coaretata var. elliptica</i>
244	Euglenophyta	Euglenoidea	Euglenophyceae		<i>Euglena acus</i>
245					<i>E. granulata</i>
246					<i>E. viridis</i>
247					<i>E. pisciformis</i>
248					<i>E. stellata</i>
249					<i>E. anabaena var. minima</i>
250					<i>E. axyuris var. chakowiensis</i>

RESULTS AND DISCUSSION

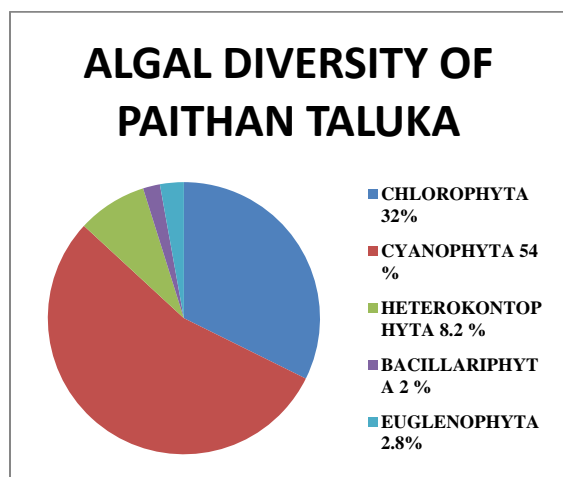


Figure 2: -Algal diversity of Paithan

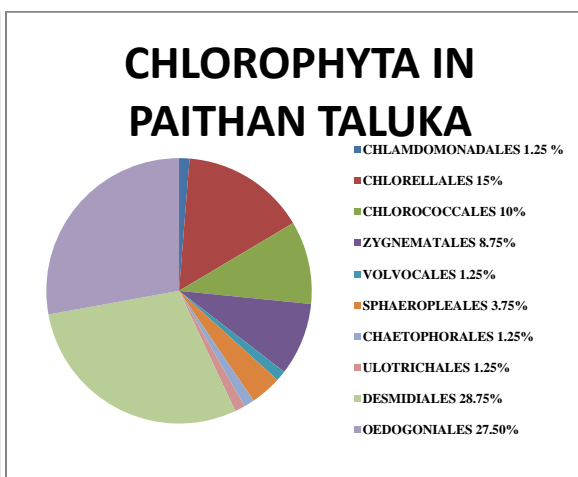


Figure 3: - Chlorophyta in Paihan

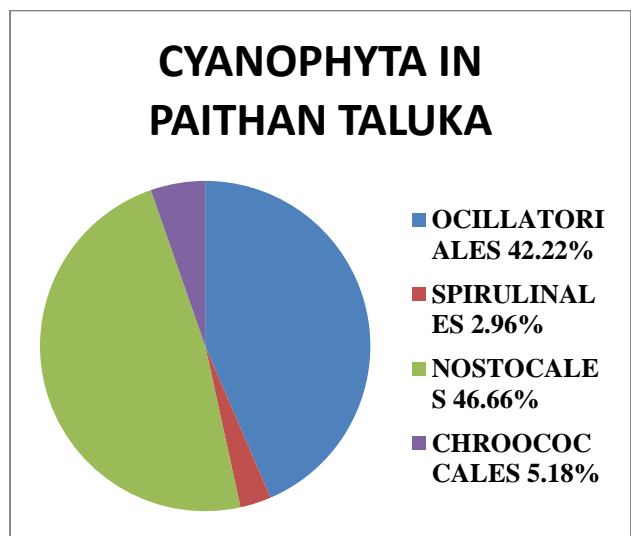


Figure 4: - Cyanophyta in Paithan

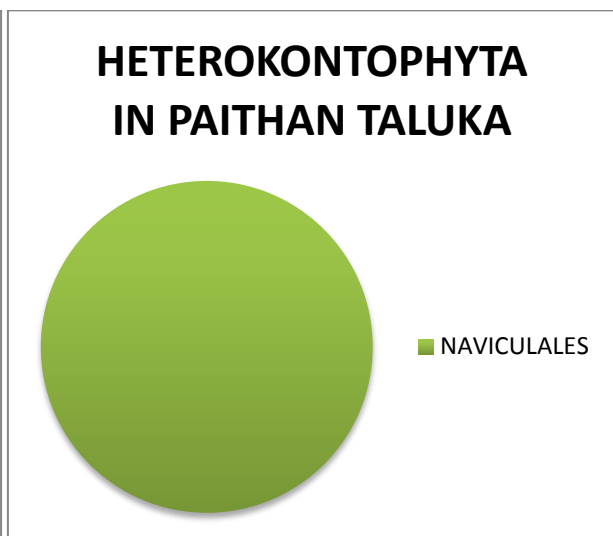


Figure 5: - Heterokontophyta in Paithan

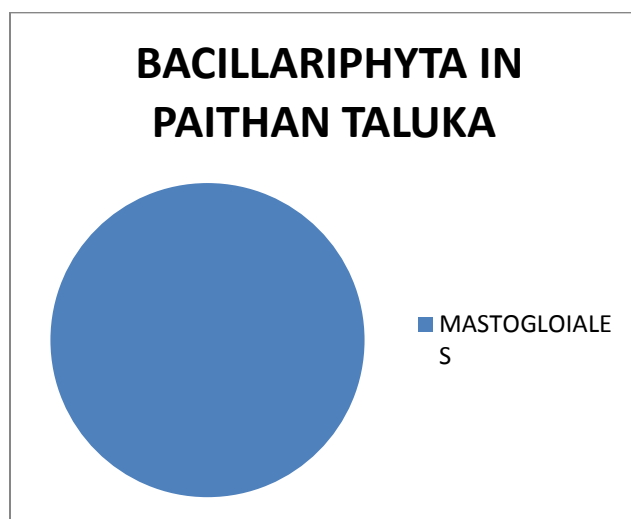


Figure 6: - Bacillariophyta in Paithan Taluka

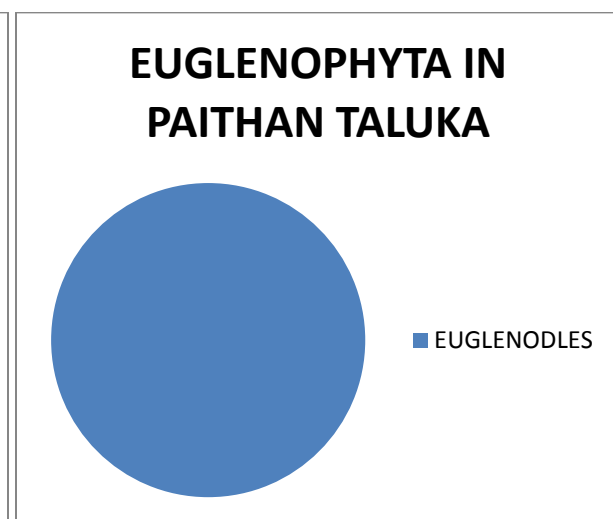


Figure 7: - Euglenophyta in Paithan Taluka

A total number of 250 taxa found in Paithan Taluka. Taxa divided into 5 divisions Chlorophyta 32%; Cyanophyta 54%; Heterokontophyta 8.2%; Bacillariophyta 2% and Euglenophyta 2.8%. Chlorophyta 32% divided into 10 orders Chlamydomonadales 1.25%; Chlorellales 15%; Chlorococcales 10%; Zygnematales 8.75%; Volvocales 1.25%; Sphaeropleales 3.75%; Chaetophorales 1.25%; Ulotrichales 1.25%; Desmidiiales 28.75%; Oedogoniales 27.50%.

Cyanophyta 54% divided into 4 orders Oscillatoriales 42.22%; Spirulinales 2.96%; Nostocales 46.66%; Chroococcales 5.18%. Heterokontophyta 8.2% divided into 1 order Naviculales. Bacillariophyta 2% divided into 1 order Mastoglorales. Euglenophyta 2.8% divided into 1 order Euglenodes.

These algae distributed into 46 genera, 24 family, 17 order and 10 classes. This data is important for taxonomical, industrial and medical aspect. This study is important to know algae in food, biofuel, fertilizer and allied industries.

ACKNOWLEDGEMENTS

The Authors are thankful to the Principal, Pratishthan Mahavidyalaya, Paithan, Dist- Aurangabad for providing library and laboratory facilities to carry out this work.

REFERENCES

- Chaudhari A.M., Mahajan S.R. and Nandan S.N. (2007).** Some *Nostocaceae* from paddy field soils of North Maharashtra. *Res. Link.* 37(2): 13-15.
- Dhande J.S. and Jawale A.K. (2006).** On *Oedogonium* (Link) Hirn from Jalgaon District, Maharashtra. *Geobios* 33(4): 321-322.
- Dhande J.S. and Jawale A.K. (2007).** On *Spirogyra* (Link) from Hartala lake, District Jalgaon, Maharashtra, Proceeding Nat. Symp. "Recent Trends in Algal Biodiversity" 101-103.
- Dhande J.S. and Jawale A.K. (2008).** *Oedogonium* (*Chlorophyceae*, *Oedogoniales*) from Jalgaon District. *Indian Hydrobiol.* 11(1): 43-46.
- Dhande J.S. and Jawale A.K. (2008).** On Genus *Fragilaria* lyngbye and *Synedra* Ehr. From Hartala lake, Maharashtra. *Indian Hydrobiol.* 11(2): 217-222.
- Dhande J.S. and Jawale A.K. (2009).** Genus *Cosmarium corda* from Hratala lake District Jalgaon Maharashtra, Shood samiksha aur Mulyacan, 7, 196-198.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2008).** *Dendrocystis raoi*, a rare member of Chlorococcales from North Maharashtra. *Indian Hydrobiol.* 11(1): 185-188.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2009).** Fresh water *Chlorophyceae* from Jalgaon District, North Maharashtra I-Unicellular Volvocales. *Indian Hydrobiol.* 12(1): 1-9.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2009).** Fresh water *Chlorophyceae* from Jalgaon District, North Maharashtra II-colonial Volvocales. *J. Indian Bot. Soc.* 88(3 - 4): 231-235.
- Jawale A.K., Kumawat D.A. and Chaudhari N.A. (2010).** Additions to the *Volvocales* Maharashtra. *Indian Hydrobiol.* 13(1): 13-18.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2010).** *Carteria maharashtrensis*, a new member of Volvocales, *J. Chemo Biosphere.* 1(1); 78-80.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2010).** Some members of order *Chlorococcales* new to Maharashtra. *Bioinfolet.* 7(2): 94-97.
- Jawale A.K, Kumawat D.A. and Chaudhari N.A. (2010).** Some taxa of *Chlamydomonas* (*Chlorophyceae: Volvocales*) new to Maharashtra, *Bioinfolet.* 7(4): 298-301.
- Jawale A.K, Kumawat D.A. and Dhande J.S. (2005).** Desmids from fish ponds at Anjale District Jalgaon (M.S.) India. *Proc. Nat. Con. Plant Sci. Pravaranagar.* 472-478.
- Jawale A.K. and Dhande J.S. (2005).** A Preliminary survey of *Chlorococcales* from Hartala lake – Genus *Scenedesmus meyen.* *Plant Diversity Biotech.* 45-48.
- Jawale A.K. and Dhande J.S. (2005).** Some species of *Oedogonium* form Hartala Lake, District Jalgaon, Maharashtra. *J. Aqua. Biol.* 20(2): 17-20.
- Jawale A.K. and Dhande J.S. (2007).** Some taxa of *Characium* A. Braun Ex Kuetz. (*Chlorophyceae*, *Chlorococcales*) from Maharashtra, Proceeding Nat. Symp. "Recent Trends in Algal Biodiversity" , 37-39.
- Mahajan Neelama and Mahajan A.D. (1990).** On some fresh water Blue green algae form Satpuda ranges in Jalgaon District (M.S.). *Perspectives Phycol.* 157-159.

- Mahajan S.R. (2000).** Saprobity system for the assessment of water quality of Velhala lake of Jalgaon, Maharashtra. *J. Aqua. Biol.* 17(1):1-4.
- Mahajan S.R. and Nandan S.N. (2004).** Blue green algae of Hartala lake of Jalgaon, Maharashtra. *J. Aqua. Biol.* 19(1): 11-12, 2004
- Mahajan S.R. and Nandan S.N. (2004).** Studies on Eugleophycean diversity in Velhala lake of Jalgaon, Maharashtra, *J. Aqua. Biol.* 19(1): 13-14.
- Mahajan S.R. and Nandan S.N. (2005).** Studies on algae of polluted lakes of North Maharashtra (INDIA). *Plant Diversity Biotech.* 67-71.
- Mahajan S.R. and Nandan S.N. (2007).** Contribution to the knowledge of *Euglenoids* of Hartala lake of Jalgaon, Maharashtra, Proc. Nat. Symp. “Recent Trends Algal Biotech. Biodiversity.” 110-113.
- Nandan S.N. and Mahajan S.R. (2002).** Limnological study of Hartala lake of Jalgaon (Maharashtra), Ecology and conservation of lakes. *Reservoirs Rivers.* 556-561.
- Nandan S.N. and Mahajan S.R. (2002).** Observation of Periphyton in Hartala lake of Jalgaon district, Maharashtra, *Geobios* 29(1): 65-66.
- Nandan S.N. and Mahajan S.R. (2002).** Observations of periphyton in Velhala lake of Jalgaon District, Maharashtra. *J. Indian Bot. Soc.* 81: 133-136.
- Nandan S.N. and Mahajan S.R. (2002).** Saprobity system for the assessment of water quality of lakes of Jalgaon District, Maharashtra. *J. Curr. Sci.* 2 (2): 233-236.
- Nandan S.N. and Mahajan S.R. (2003).** Pollution indicating algae of Hartala lake of North Maharashtra (India), *Trends Life Sci.* (India). 18(1): 49-57.
- Nandan S.N. and Mahajan S.R. (2006).** Cyanobacterial diversity in polluted lakes of Jalgaon district of North Maharashtra. *Aquatic Environ. Toxicol.* 28-61.
- Nandan S.N. and Mahajan S.R. (2006).** Studies on algae of polluted lakes of Jalgaon (Maharashtra): Role of Blue Green Algae. *Ecology Lakes Reservoirs.* 54-62.
- Nandan S.N. and Mahajan S.R. (2007).** Green algae of Hartala lake of Jalgaon, Maharashtra, Proc. Nat. Symp. “Recent trends in algal biotechnology and biodiversity” 51-54.
- Nandan S.N., Mahajan S.R. and More Y.S. (2001).** Study of Eutrophication and pollution of Panzara River of Maharashtra (INDIA). *Proceedig of ICCE- 2001*
- Patil K.J. and Mahajjn R.T. (2011).** Enzyme profile of fresh water uncultured Algae Belonging to Bhusawal region, Maharashtra. *J. Chemo Biosphere.* 1 (2): 33-38.
- Patil K.J., Patil V. A., Mahajan S.R. and Mahajjn R.T. (2011).** Bioactivity of algae belonging to Bhusawal region, Maharashtra. *Current Botany.* 2(1):29-31.
- Prasad, B. N. and Misra, P. K. (1992).** Fresh water algal flora of Andman and Nicobar Islands, Vol. II, *Bishen Singh Mahendra Pal Singh, Dehra Dun.*
- Prescott G. W. (1951).** Algae of the Western Great Lakes Area, Cranbrook Institute of Science, Michigan.
- Rai, S. K. and Misra, P. K. (2008).** On some Desmids from Koshi Tappu Wildlife Reserve, Nepal. *Ecoprint.* 15: 47-58.
- Rath J. and S. P. Adhikary (2005).** Algal Flora of Chilika Lakes, Daya Publishing House, Delhi.
- Scott A. M. and G. W. Prescott (1961).** *Hydrobiologia.* 17(1-2):1.
- Sen N. and Naskar (2003).** Algal flora of Sundarabans Manga- I, Daya Publishing House, Delhi.