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Study on the algal flora as indicator of organic pollution in Darna River, Nasik (M.S.)

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Abstract:

The algal flora i.e. algal bio indicators can be used for assessing the status, magnitude of the deterioration of the fresh water bodies; Moreover, aquatic algae can act as good indicators of water quality i.e. certain algal forms grow in a specific type of polluted water. These provide information of kind of organic pollution for that particular fresh water ecosystem. In the present research paper, Palmer s algal genus and species pollution index (1969) was used to determine the tolerance of algal species towards an organic pollution in the Darna River. Thus the algal genera that are most tolerant to organic pollution can be identified. The Palmers algal index is simply calculated by summing up the scores of all relevant algal taxa present within the collected water samples from the Darna River.

Keyword: algae, Pollution index, Darna River

Introduction:

The physical & chemical parameters are important in the assessment of the water quality in terms of extent of pollution; the biological diversity is equally important as it can give a clue about the comprehensive status & ecological imbalance that has occurred in the particular habitat. Thus the limnological studies involving the bio monitoring or biological studies always had an upper hand in assessment of the status of any fresh water bodies. In some parts of the Maharashtra state; few workers like Gunale (1978), Pingale (1982)and Zaware (2005) have carried out the algal studies in relation to the water pollution. Some workers have paid attention on limnological studies of Rivers and dams. Nandan and Patel 1986; Venugopal, et.al. 2008; Oiding and Taffs (2015), Rey et.al. (2019) other side, Cyanopyceae or the blue green algae; grow in the water bodies that are full of decaying organic materials. So that, Cyanophyceae members can be considered as bioindicators of organic pollutants. In other word; the absence of large numbers of blue green algae is an indication of clean water. Sarles (1961) recorded blue green algae under blooming conditions in areas where there was high rate of organic enrichment. The microorganisms present in water play an important role as biological indicators of water quality (WHO 1971). Oeding and Taffs (2015) pointed out that the use of diatoms as bioindicators of water quality is common in temperate regions

Material and methods:

Darna River is located the southern side of Nasik District. In the present limnology study, six sampling station were selected for the collection water sample regular monthly intervals covering all seasons for the period of 24 months i.e. two consecutive years from January 2015 to December 2016. The pollution tolerant genera and most pollution tolerant species of algae were recorded for each sampling site of Darna River. Algal pollution indices of Palmer (1969) based on genus and species were used in rating samples for high organic pollution. A list of all significantly occurring algal genera was prepared for selected sampling sites of Darna River.

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Result and discussion:

The Palmers algal index is simply calculated by summing up the scores of all relevant algal taxa present within the collected water samples from the Darna River. According to Palmer (1969) there are about sixty most pollution tolerant genera and eighty most pollution tolerant species of algae. Algal tolerances to organic pollution algal genera are rated on a scale 1 to 5. According to Palmer (1969) algal genera like *Oscillatoria, Microcystis, Navicula, Nitzschia, Euglena* etc. are found in organically polluted water. Pearsall (1932) and Patrick (1968) were the pioneers who showed that there exists a close co relationship between occurrence of algal members and organic pollution.

During the present study; pollution tolerant algal genera at six sampling sites were recorded. Of these; genera like *Ankistrodesmus, Chlorella, Closterium, Coelstrum, Cosmarium, Oedogonium, Pediatrum* from Cholorohyceae, *Chroococcus, Lyngbya, Microcystis, Nostoc, Oscillatoria, Phormidium, Scytonema* from Cyanophyceae *Cymbella, Gomphonema, Navicula, Nitzschia, Pinnularia* form Bacillariophyceae and *Euglena, Phacus* from Euglenophyceae are recorded as Pollution tolerant genera. Algal genera like *Cymbella, Closterium, Gleocapsa, Phormidium Pinnularia* and *Phacus* are found to have less pollution index value of 1. (Table no1)

Conclusion

As the River Darna is exposed to ever increasing pressure in terms of several anthropogenic factors especially rapid rates of human settlements; biological productivity is found to be increasing which is evident from increased number of algal species especially organic pollution tolerant genera like *Oscillatoria, Scytonema, Chlorella, Nostoc, Navicula, Euglena* etc. It has also been observed that at some of the sampling stations like sampling stations S4 (Back water of Darna Dam), S5 (Near Devlali region) and S6 (Nasik Pune Highway bridge) are under great threat due to untreated discharge of domestic sewage and agricultural effluents etc. The downstream is more organic pollution than upstream of Darna River.

Table no. 1: Pollution tolerant algal genera recorded at six sampling stations during January 2015 to December 2016

Sr. No	Algal Genera	Sampling Sites					
		S1	S2	S3	S4	S5	S6
I	**Chlorophyceae**						
1	*Ankistrodesmus*	+	-	+	-	+	+
2	*Chlorella*	+	-	+	-	-	-
3	*Closterium*	+	+	-	+	-	+
4	*Coelastrum*	-	+	-	+	-	+
5	*Cosmarium*	-	+	-	-	+	-
6	*Oedogonium*	+	+	-	+	-	+

7	*Pediastrum*	+	+	+	+	-	-
II	**Cyanophyceae**						
8	*Chroococcus*	+	+	-	+	+	-
9	*Gleocapsa*	+	-	+	_	+	+
10	*Lyngbya*	-	+	-	+	-	+
11	*Microcystis*	+	-	+	+	-	-
12	*Nostoc*	-	+	-	-	+	+
13	*Oscillatoria*	+	+	+	+	-	+
14	*Phormidium*	-	+	+	-	-	+
15	*Scytonema*	+	+	+	+	-	+
III	**Bacillariophyceae**						
16	*Cymbella*	+	-	+	+	+	-
17	*Gomphonema*	-	+	-	-	+	+
18	*Navicula*	-	+	-	+	-	+
19	*Nitzschia*	+	+	+	-	-	+
20	*Pinnularia*	+	+	-	+	+	-
IV	**Euglenophyceae**						
21	*Euglena*	+	+	+	+	+	-

Table No.2. Pollution index of algal species recorded at six sampling stations during January 2015 to December 2016.

Sr. No	**Algal Genera**	**Pollution index**					
		S1	**S 2**	**S 3**	**S 4**	**S 5**	**S6**
I	**Chlorophyceae**						
1	*Ankistrodesmus falcatus*	**2**	**-**	**2**	**-**	**2**	**2**
2	*Chlorella vulgaris*	**--**	**-**	**3**	**-**	**-**	**-**
3	*Closterium sps.*	**1**	**1**	**-**	**1**	**-**	**1**
4	*Oedogonium moniliformii*	**--**	**--**	**-**	**3**	**-**	**3**
5	*Pediastrum simplex*	**2**	**2**	**-**	**2**	**-**	**-**
II	**Cyanophyceae**						
6	*Chroococcus minutus*	**--**	**2**	**-**	**2**	**2**	**-**

7	*Gleocapsa rupestris*	**1**	**-**	**1**	**-**	**1**	**1**
8	*Microcystis robusta*	**--**	**-**	**2**	**-**	**2**	**2**
9	*Nostoc punctiformae*	**-**	**3**	**3**	**-**	**3**	**3**
10	*Oscillatoria acuta*	**--**	**--**	**4**	**4**	**4**	**4**
11	*Phormidium ambigum*	**-**	**1**	**1**	**-**	**-**	**1**
12	*Scytonema bohneri*	**3**	**--**	**-**	**3**	**-**	**3**
III	**Bacillariophyceae**						
13	*Cymbella aspera*	**1**	**-**	**1**	**-**	**1**	**-**
14	*Navicula cuspidata*	**-**	**-**	**-**	**3**	**3**	**3**
15	*Nitzschia obtusa*	**2**	**2**	**-**	**-**	**-**	**2**
16	*Pinnularia interrupta*	**1**	**1**	**-**	**1**	**1**	**1**
IV	**Euglenophyceae**						
17	*Euglena polymorpha*	**-**	**4**	**-**	**4**	**4**	**-**
18	*Phacus orbicularis*	**1**	**-**	**-**	**-**	**1**	**1**
Total Score		**14**	**16**	**17**	**23**	**24**	**27**

0-10: Lack of organic pollution **10-15: Moderate pollution.**
15-20: Probable evidence of high organic pollution. 20 or more: High organic pollution.

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