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Research Article

**USE OF ALGAE AS A BIOINDICATOR TO STUDY WATER
QUALITY OF RIVER SAVITRI, DIST- RAIGAD,
MAHARASHTRA (INDIA)**

Valmik R. Jondhale and Sanjiv K.Sadgir

Department of Chemistry, GES Arts Commerce and Science College Shreewardhan, Raigad -
402110) (M.S., India), valmikrj@gmail.com

Abstract:

The samples of algae were collected from pre-defined fix 5 sampling point. The samples were collected monthly from selected sampling stations of river Savitri from August 2016 to June 2017. In present study, the water quality of river Savitri, Algal Species Pollution Index were employed. The total score of each station was greater than 20 indicating the confirmed high organic pollution. Considering all the water parameters and pollution index it was clearly shown that the sampling stations II and III were highly polluted than station I. The results of the present study revealed that the surface water quality was affected from Industrial effluents and domestic water of the river. Thus, algal communities were used as bioindicator of organic pollution of river Savitri.

Keyword: Algae, Bio indicator, Savitri river, , pollution index,

***Corresponding Author:**

Valmik R. Jondhale,
Department of Chemistry,
GES Arts Commerce and Science College Shreewardhan,
Raigad -402110) (M.S., India),
E-Mail: valmikrj@gmail.com

QR code



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INTRODUCTION:

Due to Increase in population, Civilization, technological and industrial progress, the drastic changes are taking place in aquatic environment that decrease the water quality. Water resources are being used by human being for various purposes like agriculture, industries, hydropower, fisheries and recreational uses. At present the quality of water largely under threat due to releases of municipal, industrial, domestic and sewage wastes in the surface and ground water reservoirs. In industrial area, water pollution problems always influence the biological imbalance are both qualitatively and quantitatively Bio indicator show signs that they are affected with environmental pressure because of human activities or the destruction of biological system. The bacteria, fungi, protozoa, algae, higher plants, macro invertebrates, fish are major groups of organisms that have been used as indicators of environmental pollution. The presence or absence of these indicator organisms shows aquatic environment conditions whether they are good for aquatic life. To conserve aquatic life and ecosystem there is a need of regular monitoring and controlling of water quality parameters of river and all water resources. Industrial areas present near river majority destroy the aquatic life due to polluted water and industrial effluent drain in the river water. Algae are involved in water pollution in a number of important ways. For the growth of algae in water bodies, inorganic phosphorous and nitrogen is responsible.

Research in the freshwater ecology of algae related to water pollution is necessary to reduce the pollution. For that pollution indicator are helpful to study the pollution [1]. Algae are one of the most rapid bioindicator of water quality changes due to their short life spans, quick response to pollutants and easy to determine their numbers [2]. The Savitri river flowing from Mahad Industrial area (MIDC) to the Arabian Sea through Bagmandla khadi. Due to MIDC of Mahad Savitri river is polluted [4]. Savitri River water is used for bathing, drinking, irrigation and industrial purposes. Due to increasing urban and industrial activity that influence on the water quality river. The water quality assessment based on algae used as bioindicator is helpful to reduce the pollution.

In present study Palmer, (1969)[6] Algal Genus Pollution Index and Algal Species Pollution Index were employed to study the water quality of river Savitri from Mahad. A list of most pollution tolerant genera and species according to Palmers index were calculated for all sampling stations. A pollution index factor was assigned to each genus and species by determining the relative number of total points scored

by each alga. The pollution status of sampling stations of river was determined based on their index. This water pollution index is used for evaluation of water pollution. This study is helpful to use of algae as bio indicator to determine the quality of river Savitri.

MATERIAL AND METHODS:

Sampling method was used for the study. Water Samples during whole study period were collected from August 2016 to June 2017 to study water quality parameters using algae.

Algae samples were collected from total 5 different sampling sites within Mahad taluka, from upstream and downstream of the Savitri River including Mahad MIDC to check the concentration of different water quality parameters.

Collection and analysis of algal sample:

The water samples for algal analysis were collected monthly from August 2016 to June 2017 at the selected sampling stations I, II, III,IV and V. Algal samples were not collected due to very heavy flooding of River in the month of August. Palmer (1969) proposed a pollution index based on algal genus and species used in the rating water sample for high or low organic pollution. The pollution tolerant genera and species of algae were recorded from selected sampling stations. A pollution index factor was assigned to each genus and species by determining the relative number of total points scored by each alga. A list of most pollution tolerant genera and species according to Palmers index were calculated for all sampling stations. The pollution status of sampling stations of river Savitri was determined based on their index as shown in Table 1 and Table 2. Identification was done using standard keys of algae by, Smith 1950; Prescott 1951; Desikachary 1959; Randhawa 1959; Ramnathan 1964; Sarode and Kamat 1984.

RESULT AND DISCUSSION:

Palmer (1969) [6] made the first major attempt to identify and prepare a list of genera and species of algae tolerant to organic pollution. According to that, scores of 20 or more are indication of high organic pollution. The pollution tolerant genera and species belonging to four groups of algae from Five stations of Savitri River were recorded. The pollution tolerance is an indicator of organic pollution and tolerance to heavy metals which is recorded in present investigation. The use of algae as biological indicators of pollution has been studied by rating pollution tolerant algae in the rivers based on the report of Palmer, (1959) [5]. By using Palmer's index

of pollution for rating of water samples as high or low organically polluted at five stations of river Savitri were tested. The present study showed presence of *Chlamydomonas*, *Chlorella*, *Scenedesmus*, *Micractinium*, *Oscillatoria*, *Anacystis*, *Euglena*, *Cyclotella*, *Rivularia*, *Anabena*, *Volvox*,

Ulothrix and *Spirogyra* species. Total score at station II and III is high, which indicate presence of organic pollution due to presence of Mahad MIDC near to river. Similarly at station I index is 13 shows moderate organic pollution.

Table 1: Pollution index of Algal genera according to Palmer, (1969) at Five stations of Savitri River Raigad.

Sr. No.	Algal genera	Pollution Index	Stations				
			I	II	III	IV	V
	CHLOROPHYCEAE						
1	<i>Chlamydomonas</i>		-	-	4	-	4
2	<i>Chlorella</i>	3	3	3	3	-	3
3	<i>Scenedesmus</i>	4	4	4	4	4	-
4	<i>Micractinium</i>	1	-	1	1	1	-
	CYANOPHYCEAE						
5	<i>Oscillatoria</i>	5	5	5	5	-	5
6	<i>Anacystis</i>	1	1	-	1	-	1
	EUGLENOPHYCEAE						
7	<i>Euglena</i>	5	-	5	5	5	5
	BACILLARIOPHYCEAE						
8	<i>Cyclotella</i>	1	-	1	1	1	-
9	<i>Synedra</i>	2	-	2	2	2	2
		Total	13	21	26	13	20

Table 2: Pollution index of Algal species according to Palmer, (1969) at Five stations of Savitri River, Raigad.

Algal species	Pollution Index	Stations				
		I	II	III	IV	V
<i>Euglena viridis</i>	6	6	-	6	6	6
<i>Chlorella vulgaris</i>	2	2	2	2	-	2
<i>Cyclotella meneghiniana</i>	2	-	2	2	2	-
<i>Oscillatorialimosa</i>	4	4	4	4		
<i>Oscillatoria princeps</i>	1	-	1	1	-	1
<i>Scenedesmus quadricauda</i>	4	4	4	4	4	-
<i>Synedra ulna</i>	3	-	3	3	3	3
	Total score	16	16	22	15	12

CONCLUSION:

As a result we revealed algae sensitive to water pollution and these were; the algae from station II and III which were polluted water showed the dominance of *Scenedesmus quadricauda* and *Euglena*, *Chlorella vulgaris*, *Oscillatoria* and *Melosira granulate* throughout the year, which are considered to be indicators of organic pollution. Thus over all pollution index showed that at station II and III the river water showed confirms high organic pollution and station I and IV suggests moderate organic pollution. It was supported by data of physico-chemical analysis of Savitri river water during that period, Evaluation of the Range of Heavy Metal concentration and its levels of Accumulation in the Fish Sample of River Savitri.

In present study Presence of above algae indicates, that algae are reliable indicators of water pollution. These pollution tolerant algae can be used for remediation of domestic wastewater.

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