



RESEARCH ARTICLE

## Ecological Study of Algae from Oil Industry Waste Water

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### Manuscript Details

Manuscript Submitted : 10/05/2020  
Manuscript Revised : 22/06/2020  
Manuscript Accepted : 10/07/2020  
Manuscript Published : 15/07/2020

### Available On

<https://plantaescientia.com/ojs>

### Cite This Article As

Magar S D & M. J. Jadhav (2020) Ecological study of algae from oil industry waste water. *Pla. Sci.* 2020; Vol. 03 Iss. 04:45-47.

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### ABSTRACT

Oil industry waste water is one of the important source of water pollution. It is rich in organic contents and shows eutrophic condition. It contains oil, oil products and other organic contents which is responsible for pollution of water and affects aquatic flora and fauna. In such environment there are certain algae which grow and found in diverse form. Oil industry waste water is used as source of nutrients by algae. During present research work algal diversity and physico-chemical assessment of oil industry waste water has been studied in detail. Experimental work was carried out for two consecutive years i.e. from June 2015 to May 2017. Algal samples were collected at monthly intervals from waste water of Mahesh oil industry, located in Selu tehsil area of Parbhani district of Maharashtra. Physico-chemical assessment of oil industry waste water was also performed by selecting certain physico-chemical parameters. Total of 40 species under 27 genera belonged to Chlorophyceae, Bacillariophyceae, Euglenophyceae and Cyanophyceae were recorded. Cyanophycean algal taxa dominated algal flora. Algal genera such as *Gloeocystis*, *trebouxia*, *Chlorella*, *Navicula*, *Cymbella*, *Nitzschia*, *Euglena*, *Aphanothece*, *Oscillatoria*, *Phormidium* and *Plectonema* dominated algal flora. It was observed that winter and summer seasons were suitable for abundance of algae. There is positive correlation between physico-chemical parameters of water and algal flora.

**Keywords:** Ecological study, Algal flora, Oil industry waste water.

## INTRODUCTION

Oil industry waste water is one of the important source of water pollution. It contains oil, oil products and other organic contents which is responsible for pollution of water. Review of literature reveals that very little work has been undertaken on algal flora of oil industry waste water (Kumar et.al.1974, Gaur and Kumar 1981 and Reddy et. al. 1983). In present study an attempts have been made to explore algal flora of oil industry waste water and to asses water quality by performing physico-chemical assesment.

## MATERIALS AND METHODS

In order to study algal diversity of oil industry waste water, algal samples were collected from Mahesh oil industry located in Selu tehsil area of Parbhani district of Maharashtra. The collection was carried out during two consecutive years i.e. from June 2015 to May 2017. Algal samples were collected at monthly intervals. The phytoplanktons, floating and attached forms of algae were collection in acid washed collection bottles. Algal samples preserved in 4% formalin for further taxonomic investigations. Fresh as well as preserved algal forms were observed under microscope and the algae were identified following standard literature (Smith 1950, Prescott 1951, Desikachary 1959, Krieger and Gerlof 1965, Philipose 1967 and Sarode and Kamat 1984).

Physico-chemical assessment of oil waste water was carried to understand quality of water by following Trivedi and Goel (1984) and APHA(2005). 17 parameters were selected for water analysis viz. colour, odour, water temperature, pH, calcium, magnesium, chloride, nitrate, total phosphorus, potassium, silica, sulphate, total dissolved solids, total hardness, dissolved oxygen, free carbon dioxide and biological oxygen demand. Physico-chemical analysis was performed at seasonal interval.

## RESULTS AND DISCUSSTION

A total number of 40 species under 27 genera were identified and recorded (Table 1). Of these 13 species under 11 genera belonged to Chlorophyceae, 6 species under 6 genera belonged to Bacillariophyceae, 2 species under 1 Genus belonged to Euglenophyceae and 19 species under 9 genera belonged to Cyanophyceae. Cyanophycean algae dominated algal flora of oil industry waste water. Kumar et. al. (1974) conducted ecological studies on algae isolated from effluent of an oil refinery. Joseph and Joseph(2002) studied ecology and seasonal variation of microalgae in an oil refinery effluent.

Algal taxa which were abundant in present study were *Gloeocystisgigas*, *Gloeocystis major*, *Trebouxiahumicola*, *Chlorella*

*vulgaris*, *Navicula cupsidata*, *Cymbella aspera*, *Nitzschia palea*, *Euglena acus*, *Aphanothece nidulans*, *Oscillatori aacuta*, *Oscillatoria obscura*, *Oscillatoria quadripunctulata*, *Oscillatori asubbrevis*, *Phormidium jenkelianum*, *Phormidium molle* and *Plectonema gracillimum*. Physico-chemical analysis of oil industry waste water revealed that colour of water was light yellowish with unpleasent odour. Water temperature was 24<sup>0</sup> C and pH was slightly alkaline. Whitford showed that pH is the best single basis in indicating the type of algal flora. Calcium content of water was 51 mg/l which contributes to the hardness of water. Smith (1950) correlated distribution of algal flora with the amount of calcium present. Calcium is one of the important elements influencing distribution of diatoms (Murlidhar et. al. 2002). The concentration of magnesium in the water was 15mg/l. Magnesium favours algal growth.

Table 1: Algal flora of oil industry waste water

### Chlorophyceae

*Gloeocystis gigas*, *Gloeocystis major*, *Chlorococcum humicola*, *Trebouxia humicola*, *Characium limneticum*, *Trochiscia aspera*, *Trochiscia obtusa*, *Tetradron hastatum*, *Chlorella vulgaris*, *Schroderia setigera*, *Ankistrodesmus falcatus*, *Scenedesmus quadricauda var. longispina*, *Closterium sp.*

### Bacillariophyceae

*Gyrosigma sp.* *Navicula cupsidata*, *Pinnula riadoldosa*, *Cymbella aspera*, *Nitzschia palea*, *Surirella ovata*.

### Euglenophyceae

*Euglena acus*, *Euglena polymorpha*.

### Cyanophyceae

*Microcystis aeruginosa*, *Gloeocapsa polydermatica*, *Aphanocapsa pulchra*, *Aphanothece nidulans*, *Aphanothece saxicola*, *Merismope diatenuissima*, *Oscillatoria acuta*, *Oscillatoria acuminate*, *Oscillatoria obscura*, *Oscillatoria quadripunctulata*, *Oscillatoria subbrevis*, *Oscillatoria tenuis*, *Phormidium jenkelianum*, *Phormidium laminosum*, *Phormidium molle*, *Lyngbyahiero nymusii*, *Plectonema gracillimum*, *Plectonema nostocorum*.

The amount of chloride present in the water samples was 214mg/l which might high and indicates water is polluted. The amount of chloride content of any water gives an idea about the nature and extent of pollution. Nitrate content was 0.59mg/l which is less and affect algal growth. Nitrates in water encourage algal growth. Amount of phosphorous is also low and recorded as 0.16 mg/l. (Zafar 1964) observed abundance of diatoms due to high concentration of phosphorous. Potassium content of water was 6.9 mg/l

which is sufficient for algal growth of algae especially Chlorophyceae, Cyanophyceae and diatoms (Munawar 1970). The concentration of silica was 1.15 mg/l, which is essential for growth of diatoms. The concentration of sulphate was 127 mg/l. Total dissolved solid was high which recorded 841 mg/l. Total hardness is the sum calcium and magnesium concentration. Total hardness was 128 mg/l. Dissolved oxygen in water was 1.8 mg/l. There was no free Carbon dioxide in the water, whereas Biological oxygen demand was 16 mg/l. Seasonal variation study of algal flora revealed that Chlorophycean algae, diatoms and Cyanophycean algae were abundant in winter and summer seasons. Euglenoids were found in maximum number in summer season.

Table 2: The average values of physico-chemical parameters of oil industry waste water.

Sr. No.	Parameter	Average value	Unit
01	Colour	Light Yellow	Hazen
02	Odour	Unpleasant	--
03	Water temperature	24	Oc
04	pH	7.3	--
05	Calcium	51	Mg/l
06	Magnesium	15	Mg/l
07	Chloride	214	Mg/l
08	Nitrate	0.59	Mg/l
09	Total phosphorus	0.16	Mg/l
10	Potassium	6.9	Mg/l
11	Silica	1.15	Mg/l
12	Sulphate	127	Mg/l
13	Total Dissolved Solids	841	Mg/l
14	Total Hardness	188	Mg/l
15	Dissolved Oxygen	1.8	Mg/l
16	Free CO <sub>2</sub>	00	Mg/l
17	Biological Oxygen Demand	16	Mg/l

## CONCLUSION

Hence it is concluded that waste water from oil industry is the habitat where algae can grow and found in diverse form. Physico-chemical assessment of water reveals that there is a positive correlation between physico-chemical parameters and algal flora. Seasonal variation study reveals that winter and summer seasons were found to be more suitable for growth of algae in oil industry waste water.

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