BLUE GREEN ALGAE FROM INDUSTRIAL WASTE CONTAMINATED SOILS OF AHMEDNAGAR DISTRICT

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Abstract:
In present study, soils samples from industrial wastes contaminated sites of Ahmednagar district were collected. These samples were taken up for algal analysis. Five gm. of soil samples were cultured using liquid and solid Chu's 10 Medium. Cultures were kept under diffused light at room temperature. Periodically algae from culture medium were removed and identified using standard algal monographs. Qualitative algal studies were carried in order to understand variations of algal species in industrial wastes contaminated soils. The aim of algal studies was to identify blue green algal species from industrial wastes contaminated soils of Ahmednagar district. In present study 7 Blue green algae (*Chroococcus, Microcystis, Oscillatoria, Phormidium, Lyngbya, Nostoc* and *Haplosiphon*) were found in industrial waste contaminated soils of Ahmednagar district.
Keywords: Blue green algae, industrial waste contaminated soil, Chu's 10 Medium and Ahmednagar district.

Introduction

Soil exhibit a rich micro flora comprising of bacteria, fungi, viruses, algae and also other microbes and plays an important role influencing the structure and fertility of soil. The soil blue green algae play an important role in nitrogen fixation, increases humus content and fertility of soil and improving texture of soil (Fritsch, 1907; Booth, 1941; Lewin, 1956 and Marathe, 1972). Several important works appeared such as (Fritsch, 1907 and 1922; Bristol, 1927; Petersen, 1935; John, 1942 and Fritsch and John, 1942) described algae as colonizes of new ground and contribute to the increase in humus content of soils. Singh, (1950 and 1961) recommended blue green algae for reclamation of alkaline soils. Fritsch, (1922); Fritsch and John, (1942) and Lund, (1962) observed that blue green algae showed preference to the alkaline soil whereas acidic soils show dominance of green algae.

Industrial and municipal wastes contaminated soil may contain a wide range of pollutant, including metals, hydrocarbons, organic matters, pesticides, herbicides etc. release of pollutants to soil. In industrial effluents contaminated sites showed blue green species such as *Lyngbya, Oscillatoria, Phormidium, Microcystis, Anabaena, Nostoc, Westiellopsis* and *Synechococcus* (Subramaniyan et al., 2007).The losses of fertile agricultural soils have been growing day by day by increasing industrialization. It results mainly deforestation, loss of vegetation and degradation of soil. The industrial wastes reaching land through direct or indirect disposal method and soil and water

contamination occurs by adding various types of contaminants. Such practiceshave resulted into change in physical, chemical and biological properties of soil. The soil algal growth depends on soil types. The aim of present study was to identify algal species tolerant and sensitive to industrial wastes contaminants.

Materials and Methods

Soil samples were collected from 5 different sugar Industrial regions (i.e Rahuri, Rahata, Pravaranagar, Sangamner & Sonai) of Ahmednagar District which represented various climatic conditions. The collected soil sampleswere used for analysis studies (Gupta, 2001 and Trivedy and Goel, 1986). colour of soil was examined by visual observation.P^{H}of soil samples was measured by pH meter in laboratory.

2. Preparation of Chu's 10 Medium –

Salts	Weight
Calcium Nitrate (Ca(NO$_3$)$_2$·4H$_2$O)	0.232 gm
Dipotassium phosphate (K$_2$HPO$_4$)	0.01 gm
Magnesium\ Sulfate Heptahydrate (MgSO$_4$·7H$_2$O)	0.025 gm
Sodium carbonate (Na$_2$CO$_3$)	0.02 gm
Sodium metasilicatepentahydrate (Na2SiO3.5H20)	0.044 gm
Ferric citrate (Fe(C6H5O7).xH$_2$O)	0.0035 gm
Citric acid (C6H8O7)	0.0035 gm
Agar	15.0 gm
Metal Solution	1.0 ml
Distilled water	1.0 L

Metal Solution

Salts	Weight
Boric Acid (H_3BO_3)	2.4 gm
Manganese chloride tetrahydrate ($MnCl_2 \cdot 4H_2O$)	1.4 gm
Zinc chloride ($ZnCl_2$)	0.4 gm
Cobalt Chloride Hexahydrate ($CoCl_2 \cdot 6H_2O$)	0.02 gm
Copper Chloride Dihydate ($CuCl_2 \cdot 2H_2O$)	0.0001 gm
Distilled water	1.0 L

P^H was adjusted to 8.5 for Cyanobacteria. The medium was autoclave for 20 min at 15 lbs pressure.

Preparation for cultures-

I. Sterilization of glassware-The glassware was cleaned, oven dried and paper wrapped to glass wares and sterilized at 15lb pressure for 20 min in autoclave.

II. Isolation and culture of soil algae – For Isolation of soil algae serial dilution method was used. Simultaneously petriplates containing solidifying nutrient agar medium were inoculated with 1 ml inoculums from dilution from all 10 tubes. Then petriplates were wrapped by wrap paper and kept in diffused light at room temperature. The algal growths in petriplates were observed periodically up to 3-4 weeks.

For algal culture in liquid medium 5gm.of soil was added to 100ml liquid medium in cultural bottle. The inoculated bottles were incubated under diffused sunlight at room temperature. The observations were taken periodically up to 3 months.

III. Algal analysis- For qualitative studies algal slides are prepared and observed under research microscope. Identification of algae was made with the help of standard monographs. (Desikacharya, 1959; Prescott, 1951and Smith1950).The microphotography of soil algae was done simultaneously during study period.

Results and Discussion -

In present work Industrial wastes contaminated soils showed p^H in the ranges between 7.11-7.87. In present study observed 7 Blue green algae (*Chroococcus, Microcystis, Oscillatoria, Phormidium, Lyngbya, Nostoc* and *Haplosiphon)* were found in industrial wastes contaminated sites of Ahmednagar district. Shapiro and Stadtman (1970), Gantar et.al (1984), Forsberg et al. (1988), Kelly (1988), Xue and Sigg (1990), Ali et al. (1999), Gupta et. al (2001), Adonis and Leonardo (2001), Dwivedi et al. (2005), Rai et al. (2005 and 2007), Singh et al. (2007) and Subramanian et al.(2007) observed that the different groups of algae growing on industrial effluent (*Chlorella, Scenedesmus, Chroococcus, Anabaena, Microcystis, Nostoc, Westiellopsis, Synechococcus,* Oscillatoria, Spirulina, Gleocapsa, *Oedogonium* and *Spirogyra* exhibit high amount of toxic heavy metal (Fe, Mn, Cu, Ni, Zn and Cr) accumulation and have been found useful for bioremediation of significant amount of toxic heavy metal pollution in industrial sites. *Oscillatoria* and *Phormidium* along with *Lyngbya* were found dominating all the industrial effluents. Our result shows *Oscillatoria* and *Phormidium* were dominant in industrial effluents. Singh and Saxena, (1969), Venkateswarlu (1969), Rai and Kumar (1977), Nazneen (1980), Venu*et al.* (1984), Anand (1998), Boominathan (2005), Murugesan and Subramanian (2005) and Vijayakumar *et al.* (2005) reported that the growth of Cyanobacteria than any other algae found in industrial effluent are more. In our work also found the Cyanophycean members were more in industrial wastes contaminated soils.

The work indicated that 7 blue green algae were tolerant in industrial wastes contaminated sites. *Oscillatoria* are common tolerant algae in industrial wastes contaminated sites. These results indicate that the higher number of species and population of algae indirectly contributing in degradation of contaminants through algal associated saprobic flora.

Summary and Conclusion

All industrial wastes contaminated soil samples showed alkaline P^H. Total 7 Blue green algae (*Chroococcus, Microcystis, Oscillatoria, Phormidium, Lyngbya, Nostoc* and *Haplosiphon)* were found in industrial waste contaminated sites. The populations of *Oscillatoria* were more as compared to other algal population.
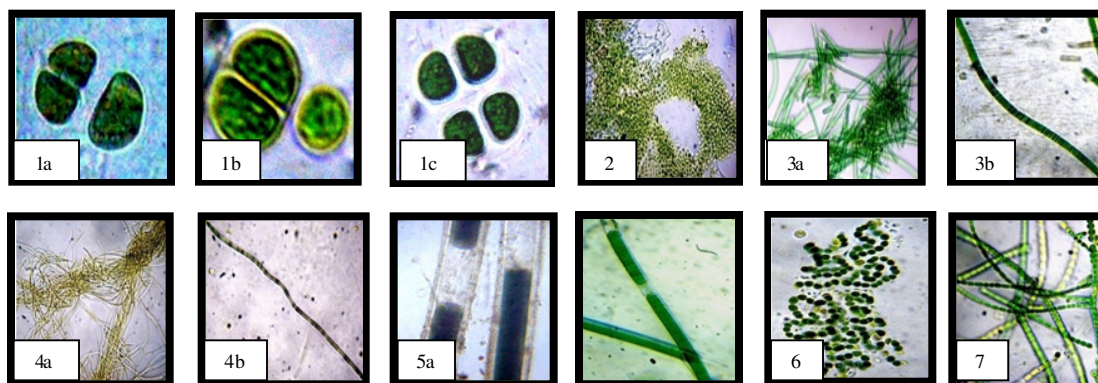
Acknowledgement

1. Culture of soil blue green algae from industrial waste contaminated sites of Ahmednagar district

2. Soilblue green algae from industrial waste contaminated sites of Ahmednagar district

(**Figure** 1a, b & c *Chroococcus sp.,* Fig.2 *Microcystis sp.,* Fig.3 a & b *Oscillatoria sp.,* Fig.4 a & b *Phormidium sp.*, Fig.5 a & b Lyngbya *sp.,* Fig.6 *Nostoc sp.* and Fig.7 *Haplosiphon sp.*)

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