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Research Article

Soil Algal Flora of Lonar Lake (MS) India

Rafiullah M. Khan and Milind J. Jadhav[1]

Department of Botany, Kohinoor College, Khuldabad, Dist. Aurangabad -431101(M.S.) India.
[1]Department of Botany, Sir Sayyed College, Roshan Gate, Aurangabad -431001(M.S.) India.
Email: rmkhan99@gmail.com, dr.mjjadhav@gmail.com

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Abstract

Lonar lake is a natural lake, situated in Buldhana district of Maharashtra. It is alkaline and saline water lake. In present research work, study of soil algal flora and its correlation with physico-chemical characteristics of soil has been conducted in detail. The work was carried out from October 2016 to September 2017. A total of 37 species under 23 genera were identified and recorded. Cyanophycean algal members were found in maximum numbers as compared to Chlorophyceae and Bacillariophyceae. Algal taxa *Gloeocystis major*, *Chlorococcum humicola*, *Chlorella vulgaris*, *Aphanothece nidulans*, *Myxosarcina burmensis*, *Arthospira platensis*, *Spirulina labyrinthiformis*, *Oscillatoria acuta*, *Phormidium jenkelianum*, *Microcoleus acutissimus*, *Nostoc muscorum* and *Plectonema gracillimum* were found dominant in soil of Lonar lake. A positive correlation between physico-chemical parameters of Lonar lake soil and growth of algal flora is found.

INTRODUCTION

Lonar lake is a natural water body. It is situated (North Latitude 19º 55' 45", East Longitude 76º 34' 00") in Buldhana district of Maharashtra state. Unique feature of this lake is its high alkalinity and salinity. Lonar lake is believed to be originated due to meteoritic impact (Beals *et al.*, 1960; Nayak, 1972 and Hagerty and Newson, 2001). It is third largest natural saline water lake in the world. It is postulated that the lake was originated about 50,000 to 60,000 years ago. Many studies have been taken by researchers on lonar lake pertaining to geological, geomorphological and ecological features. Extensive review of literature reveals that, very rare attention has been paid towards soil algal flora of Lonar lake. Therefore to fulfill this lacuna, it has been decided to work on soil algal flora of Lonar lake. Present study deals with soil algae of Lonar lake, efforts were also made to perform physico-chemical analysis of soil by selecting certain physico-chemical parameters.

MATERIALS AND METHODS

In order to study soil algal flora of Lonar lake, algal sample which are grown on moist soil surface of lake were collected at monthly intervals from October 2016 to September 2017. These samples were collected in sterilized collection bottles. Collected algal sample were brought to the laboratory for observation and identification. The sundried soil samples were also collected and examined for their algal components by petriplate culture method. 1 gm of pulverized soil poured and spread uniformly into the petriplates containing agarized Bold`s basal medium (Bold, 1942). Liquid nutrient medium was poured into the plates at the time of keeping those for incubation and frequently supplemented with the same. The petriplates were incubated under the tubelights having 1000 to 1500 lux capacity in algal culture chamber. Petriplates were checked for the growth of algal colonies. After sufficient growth algal colonies were picked up for identification.

Collected and cultured algal forms were observed and carefully under research microscope and identified with the help of standard literature on algae.

In order to know the fertility status of Lonar lake soil, physico-chemical analysis of soil was performed by selecting certain physico-chemical parameters such as Soil texture, Soil density, Total porosity, Water holding capacity, pH, Conductivity, Organic Carbon, available Nitrogen, available Phosphorus, available Potassium, Total Magnesium, Total Calcium, Total Sodium, Copper, Iron, Zinc, Manganese, Boron, Sulphur and Salinity. (Trivedy and Goel, 1984).

RESULTS AND DISCUSSION

A total of 37 species under 23 genera were identified and recorded. 8 species under 7 genera belonged to Chlorophyceae, 3 species under 3 genera belonged to Bacillariophyceae and 26 species under 13 genera belonged to Cyanophyceae (Table 1). The species composition of Cyanophyceae was greater as compared to Chlorophyceae and Bacillariophyceae. Srivastava (1998), Masojdek (2001), Singh et.al. (2009), Satpathy et.al. (2007) and Paul and Raut (2016) extensively studied algal flora of alkaline and saline soil. Algal taxa which were found dominant in soil of Lonar lake are *Gloeocystis major, Chlorococcum humicola, Chlorella vulgaris, Gloeothece palea, Aphanothece nidulans, Myxosarcina burmensis, Arthospira platensis, Spirulina labyrinthiformis, Oscillatoria acuta, Phormidium jenkelianum, Microcoleus acutissimus, Nostoc mucorum* and *Plectonema gracillimum.* Cyanophycean algae were found abundant. Srivastava (1998) observed dominance of Blue green algae in moist soil of alkaline ponds and tanks. Singh et.al. (2009) also reported dominance of Cyanophycean members. Paul and Raut (2016) reported dominance of *Cosmarium* and *Oscillatoria* from alkaline soil inhibited by lime sludge. Physco-chemical analysis of soil reveals fertility status of soil. Data pertaining to physicochemical analysis of soil of Lonar crater lake is given in Table No. 2. The texture of soil is sandy clay with a density 3.79%. Total porosity of soil is 61.17%. The water holding capacity of soil is 70.3%. Soil of Lonar crater lake is alkaline with pH 9.99.

Fig. 1: Soil algae of Lonar lake

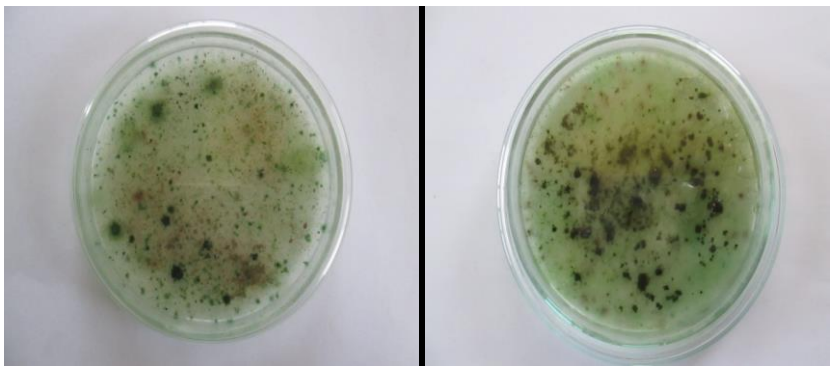

Fig.2: Culturing of soil algae

Table 1. Algal taxa recorded from soil of Lonar lake

Sr.No.	Name of algal taxa	Occurrence of algal taxa
I	**CHLOROPHYCEAE**	
1	*Gloeocystis gigas*	++
2	*Gloeocystis major*	++++
3	*Tetraspora lamellosa*	+
4	*Chlorococcum humicola*	++++
5	*Trebouxia humicola*	++
6	*Chlorella vulgaris*	++++
7	*Ankistrodesmus falcatus*	+
8	*Actinastrum hantzschii* Var. *fluviatile*	+
II	**BACILLARIOPHYCEAE**	
1	*Pinnularia* sp.	+
2	*Gomphonema* sp	+
3	*Nitzschia palea*	++
III	**CYANOPHYCEAE**	
1	*Chroococcus minutus*	+
2	*Chroococcus turgidus*	+
3	*Gloeothece palea*	++
4	*Aphanothece nidulans,*	++++
5	*Aphanothece saxicola*	++
6	*Myxosarcina burmensis*	++++
7	*Arthospira platensis*	++++
8	*Spirulina laxissima*	++
9	*Spirulina labyrinthiformis*	++++
10	*Spirulina major*	++
11	*Oscillatoria acuta*	++++
12	*Oscillatoria animalis*	++
13	*Phormidium fragile*	+
14	*Phormidium jenkelianum*	++++
15	*Phormidium molle*	++
16	*Lyngbya gracilis*	+
17	*Microcoleus acutissimus*	++++
18	*Microcoleus sociatus*	+++
19	*Microcoleus subtorulosus*	+
20	*Nostoc linckia*	+
21	*Nostoc microscopicum*	+
22	*Nostoc muscorum*	++++
23	*Nostoc punctiformae*	+++
24	*Plectonema gracillimum*	++++
25	*Plectonema nostocorum*	++
26	*Stigonema hormoides*	+

+ =Minimum, ++ = Moderate, +++ =Maximum, ++++ = Dominant

Table 2: Physico-chemical parameters of soil of Lonar crater lake

Sr. No.	Parameters	Observation	Remark
1	Soil texture	Sandy clay	Normal
2	Soil density (%)	3.79%	Normal
3	Total porosity (%)	61.17%	Moderate
4	Water Holding Capacity (%)	70.03%	High
5	pH	9.99	Alkaline
6	Conductivity (M mhos/cm)	0.107%	Normal
7	Organic carbon (%)	0.28	Low
8	Available nitrogen (kg/ hectare)	142.51%	Low
9	Available phosphorus (kg/ hectare)	8.53	Very low
10	Available potassium (kg/ hectare)	710.8	Very high
11	Total magnesium (%)	7.83 %	High
12	Total calcium (%)	4.35 %	Moderate
13	Total sodium (ppm)	31.51	High
14	Copper (ppm)	2.05	Sufficient
15	Iron (ppm)	1.70	Less
16	Zinc (%)	2.41%	Sufficient
17	Manganese (%)	12%	Sufficient
18	Boron (ppm)	1.90	Sufficient
19	Sulpher (%)	8.9%	Sufficient
20	Salinity (%)	0.98%	Normal

(Remarks are as per standard of Agri RAB Jan-15)

Electric conductivity of soil is 0.107 mili mhos/cm. Organic carbon is 0.28% which is low. Available nitrogen is 142.51 Kg/hectare which is low. Available phosphorus is also low, 8.53 Kg/hectare. Available potassium of Lonar crater lake soil is very high which is 710.8 Kg/hectare. Total magnesium, Total calcium and Total sodium are 7.83, 4.35 and 31.51 respectively. Copper is 2.48%, Iron is 10.43%, Zinc is 2.41%, Manganese 12%, Boron 0.80% and Sulphur is 8.9%. The salinity of soil is 0.985.

Sandy clay soil with high water holding capacity favours growth of algae. Cyanophycean, Chlorophycean and diatoms shows positive correlation with maximum water holding capacity. Electrical conductivity of soil below 1 mili mhos/cm is best for growth of algae. It is observed that Cyanophycean algae grows abundantly in alkaline soil. High amount of potassium and magnesium and sufficient amount of copper, zinc, manganese, boron and sulphur favours growth of algae. Srivastava (1998) also studied physico-chemical parameters of soil of saline ponds. He observed that Grey brown alkaline soils favours growth of algal flora. Blue green algal flora were found dominant and harbours excellent moist holding capacity of soil.

Shinde and More (2013) also studied physico-chemical qualities of Lonar lake soil. Paul and Raut (2016) studied pH, conductivity, moisture content, bulk density, organic carbon and texture of soil inhibited by lime sludge waste.

Hence it is concluded that alkaline and saline soil of Lonar lake shows richness of algal flora. Cyanophycean algal taxa were found dominant. A positive correlation between physico-chemical parameters of Lonar lake soil and growth of algal flora is found.

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