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Study Of Physiological And Biochemical Analysis Of Water Sample Of Lonar Lake For Isolation Of Alkaline Bacillus Species Prodcing L-Asparginase

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Abstract :

The Lonar crater has been proved to be caused by an Aerolite Meteor (contain mainly rocky material) because no metal fragments have been found strewn around the crater. The pH values generally higher than 10 and occasionally reaching 12. The aim of the present study was to analyze in physico-chemical quality of Lonar lake water and soil. Lonar Lake is a closed one without any outlet and unique due to its salinity, alkalinity and biodiversity. Water is the most vital abiotic component of the lake ecosystem and while studying the biodiversity of any lake ecosystem, the Knowledge of the physicochemical quality of lake water becomes important for production of different enzymes important industrially and pharmaceutically. The physicochemical character of water prevailing in this lake has not been studied in detail with reference to the organisms isolated to produce industrially and pharmaceutically important enzymes viz, L-asparginase, Amylase, CGTase. In the Industrial processes the enzymes might get inactivated at higher pH, So if the organism producing the enzyme is extremophilic then the enzyme might not get inactivated. Therefore it was thought to undertake studies on physicochemical quality of water and in Lonar Lake; and it was seen that chlorides and salinity of the Lake water is decreasing day by day, but the biodiversity of the lonar lake is increasing as we found presence of some microorganisms i.e. Some Bacillus species, Some Lysinibacillus species and Some Pseudomonas species.

Keywords: *Meteor, Biodiversity, Physicochemical character, Bacillus Species, Lysinibacillus species, Pseudomonas species, Extemophilic, Enzymes .*

Introduction :

A meteor entering into Earth's atmosphere can undergo fragmentation. Ignoring the slowing effects of travel through atmosphere, the impact velocity of an object from space is in the range of 11 km/s -72 km/s (H. J Melosh;1989). In order to identify the impact crater, we must study some of the distinctive facts of an impact crater like the presence of rock that has undergone shock metamorphic effects such as shatter- cones, melted rocks and crystal deformations

(Charles W.A. and Anderson Leif; 1978). Meteor impact craters like Barringer Crater also called as aka Meteor Crater in Arizona United States (Hoyt, 1987; Shoemaker, 1963) and the Lonar Crater Lake in Buldhana District of Maharashtra India Fredriksson et al., (1973) are rare on Earth's surface. It is said that some 52,000 years ago, a huge piece came from space and hit the Lonar creating a Crater of about 1830 mts in diameter and 150 mts deep. The Lonar crater has water in it and is one of the biggest meteorite craters having Basalt in it; this crater has a large slope with a dense forest in the region. The two slopes within the crater are 15 to 18 degrees and 30 degrees. The slope measuring 15-18 degrees has a notch through which the Meteor came. The opposite side of slope is increased due to the pressure created by the Meteor and by the remains of the notch side blown away. The pH value of water in Lonar crater is 10.5 which is more than normal. Salts and minerals like sodium, chlorides, fluorides and bicarbonates have been found in this Crater. The Lonar crater has been proved to be caused by an Aerolite Meteor (contain mainly rocky material) because no metal fragments have been found strewn around the crater. In the Lonar Lake, rocks have undergone shock metamorphism. The impact also produces high temperature and pressure as a result of which certain new minerals are formed and rocks get melted and turned into glassy materials. Before the impact the meteor has fragmented in three pieces and has led the formation of three lakes known as Lonar Lake, Ganesh Lake and Amber Lake. The Ganesh Lake and Amber Lake are dried up now. This crater has a great importance for studying our probable meteor impact. From isotopic analysis of Lonar crater sample,the possible elements found in Lonar lake are: Ba, Rb, Sr, Pb, La, Pr, Ce, Nd, Sm, Gd, Ho, Tm, Y, Hf, Nb, Eu, Tb, Er, Yb, Lu, Th, U, Zr, Ta, Sc and V (Chakarbarti and Basu; 2006). The pH values generally higher than 10 and occasionally reaching 12. These alkaline environments are caused by a combination of geological, geographical and climatic conditions. They are characterized by large amounts of sodium carbonate formed by evaporative concentration. In the course of formation of alkalinity, other salts particularly (NaCl) also concentrate, giving rise to an alkaline saline environment. The salinity of the lake is now lowered down to 7.9%. The aim of the present study was to analyze in physico-chemical quality of Lonar lake water. Lonar Lake is a closed one without any outlet and unique due to its salinity, alkalinity and biodiversity. Due to the uniqueness, the lake has evoked much scientific values among researchers and continues to site of attraction for many. Water is the most vital abiotic component of the lake ecosystem and while studying the biodiversity of any lake ecosystem, the Knowledge of the physicochemical quality of lake water becomes important. Today enzymes continue to play key roles in many food and beverage manufacturing processes and are ingredients in numerous consumer products, such as laundry detergents (which dissolve protein based stains with the help of proteolytic enzymes). Enzymes are also of fundamental interest in the health sciences, since many disease processes can be linked to the aberrant activities of one or a few enzymes. With the development of its new functions, a great demand for L-asparaginase is expected in coming years. Thus, it is desirable to search for new bacterial isolates producing L-asparaginase with novel properties from as many different sources as possible. The majority of enzymes currently used in industry are of microbial origin.

The physicochemical character of water prevailing in this lake has not been studied in detail. Therefore it was thought to undertake studies on physicochemical quality of water in Lonar Lake to isolate extremophilic organisms which helps to produce industrially and pharmaceutically important enzymes viz, L-asparginase, Amylase, CGTase.

Methodology :

Four Water samples were collected from selected sites of Lonar Lake with the help of sterile collection bottles with cap following the standard recommended methods. Sampling was done in March-2014[One samples] & June-2014 [One sample]. The parameter selected for analysis For water were temperature, pH, color, odour, total dissolved solids, alkalinity, total hardness, permanent hardness, BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), Chloride, Nitrates, Nitrites, Turbidity, Salinity, dissolved sulphate, and phosphate. The pH and temperature recorded on the spot by using pH paper and thermometer and rest of the parameters were analyzed in the laboratory by standard methods.

Result & Discussion:

The alkaline Lonar Lake, in Central India, situated in the village at Lonar, Buldhana district, Maharashtra ranks third in the world based on diameter and its high (pH 10.5) alkalinity (Taiwade, 1995). It is a closed system without outlets and regular influents are responsible for its existence. Based on the geological studies, it is postulated that the Lake originated as a meteorite impact crater around 50-53 thousand years ago (Jhingran and Rao, 1954; Nandy and Deo, 1961). The diameter around the Lake is about 1.75 Km and water enters the Lake through rain, ground water seepage and the springs situated in the cliffs at the edge of the Lake. It does not receive any industrial discharges. Alkalinity of the Lake is attributed to the high content of sodium carbonate and hence was used previously as a source of washing soda (Thakker and Ranade, 2002,). The water in the crater is very salty. It is 10 times saltier than drinking water. Salts and Minerals like sodium, chloride, carbonates, fluorides and bicarbonates (TDS around are found and as this water do not drain away these substances get collected beneath the surface (Nathani, 2010, Shoemaker, 1963; Bhandari, 1984). In such conditions one cannot think of any living organisms, but microorganisms like *Arthrospora,* proteobacteria and algae are found abundant (Malu *et al,* 2002).

It revealed that Lake water is alkaline (pH 8.2) and characterized by high concentration of salts (3000 mg/l), chloride (390 mg/l), salinity (1100 mg/l), alkalinity (420 mg/l), total hardness (650 mg/l), calcium hardness (821 mg/l), nitrate (Traces) and dissolved oxygen (135 mg/l).

Physical Characters of the lonar lake Water sample are Appearance turbid with algal growth; Odour Objectionable; Turbidity as NTU 4.2.

Chemical Characters of Lonar lake water sample are pH 8.2, Chlorides 390.00; Nitrates Traces; Nitrites traces; Total hardness 650; Permanent Hardness 250; TDS 790; Iron 0.40; Fluorides 1.75; Alkalinity 420; Total Suspended solids 160; Total solids 825; BOD 120; COD 520 (Table 1).

Form these observations we can say that the alkalinity of the lonar lake is decreasing as the pH is ranging between 8.0 to 8.2 and calcium magnesium and sodium concentrations are minimum; due to which salinity of the soil is not high. But the water sample is having high chlorides, hardness and salinity due to which the alkalinity of the water is in higher range. But these reports are not as high as previous reports of scientists on lonar lake water and showing a continuous decrease in the salinity and chlorides of the lake water (Tambekar *et al,* 2010).

The Lonar Lake is unique in the world for its alkalinity and salinity of the water but it was seen that chlorides and salinity of the Lake water is decreasing day by day (Tambekar *et al,* 2010).

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Tables:

Table 1: Lonar Lake Water Analysis

Sr. No.	Parameters	Observations	
		Sample I	Sample II
1	Physical Appearance	Turbid	Turbid
2	Temperature	26°C	26°C
3	Colour	Dark Green	Pale Green
4	Odour	Offensive	Offensive
5	Turbidity (As NTU)	3.50	3.40
6	pH	8.00	8.20
7	Chlorides	390.00	385.00
8	Nitrate	Traces	Traces
9	Nitrites	Traces	Traces
10	Total Hardness	520.00	650.00
11	Permanent Hardness	220.00	250.00
12	Total Dissolved Solids	785.00	790.00
13	Dissolved Oxygen	120.00	135.00
14	Carbonate	2000.00	2023.00

15	Potassium	281.00	290.00
16	Ammonia	Traces	Traces
17	Iron	Nil	0.40
18	Fluorides	0.80	1.75
19	Alkalinity	420.00	410.00
20	Total Suspended Solids	140.00	160.00
21	BOD	120.00	102.80
22	COD	400.00	520.00
23	Total Solids	799.00	825.00
24	Calcium	801.60	821.00