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Bacteriological and Physico-Chemical Analysis of Lonar Lake Water-A Unique Hypervelocity Nature Impact Crater In Basaltic Rock in the World

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ABSTRACT

Lonar Lake is a unique hypervelocity natural impact crater in basaltic rock in the world which is situated in Buldhana district of Maharashtra state. It is an inland saline crater of only one of its kind in Asia. Lonar Lake is the third largest natural salt-water lake in the world. The crater is 150 meter in depth and is absolutely confined from all sides by the walls of the crater and there is not a single channel of water draining away from it, there by leaving the lake waters stagnant from thousands of years. The sample of water of Lonar Lake were collected and analyzed for their Physico-chemical and Bacteriological analysis to check the water quality and diversity of Lonar Lake.

Keywords: Lonar Lake, standard plate count method, Most Probable Number, Physico-chemical Analysis.

I. INTRODUCTION

Lonar Lake is a natural body created by a meteor that weighed over one million ton in weight. It is located in the Buldhana District of Maharashtra; the lake is an exceptional bowl of biodiversity and a wildlife sanctuary with a unique ecology that is vastly different from the surrounding flat landscape. A land-locked water body is alkaline and saline at the same time, the Lonar Lake supports microorganisms rarely found elsewhere on earth. It is Asia's only magnificent crater formed by hyper velocity crater formed by hyper velocity meteorite impact and is situated in basaltic terrain.

The Lonar crater has attracted the attention of world geologists for investigation of its origin and the source of salinity of lake water; it is ecological wonder (Malu et al., 2007). The positive correlation has indicated that the abundance of B. plicatilis has significantly positive correlation with temperature as there was an increase in all chemical parameters such as water temperature, pH, TS, TDS, Cl, Salinity and EC in the Lonar lake water . Lonar Crater Lake consist of various eco-tones inhabited a wide range of plant and animals life. (Pedge et al., 2013).

In recent years, there has been more interest in studying the microbiological flora of soda lakes since these naturally occurring alkaline hypersaline environments are the potential source of assorted microorganisms. Halophiles, alkaliphiles and haloalkaliphiles are useful for the development of new bioprocesses and microbial products of commercial interest, may be isolated from these environments. These studies have mainly relied on classical isolation techniques that have probably not detected all the types of microorganisms present at these sites . It is now well known that only a small proportion of the microorganisms from an environmental sample can be isolated and cultured in laboratory conditions. (Sunil D. Ahirrao et al., 2011).

II. MATERIALS AND METHODS

Total 6 samples were collected from six different sites at the distance of 200 m from each sample collection of Lonar lake in 1 litter Distilled plastic bottles in the month of January 2018 .The samples were collected and labeled as S1,S2,S3,S4,S5 and S6 respectively on the basic of sample collection. The pH and temperature were recorded on the spot by using pH paper and thermometer and rest of the parameters and bacteriological analysis were analyzed in the laboratory by standard methods. A bacteriological analysis of Lonar water sample collected and analysis of bacteriological studies was carried by two different ways. In the first case the media and serial dilution for Standard Plate Count was done by using distilled water & in the second process Lonar water was used for serial dilution and media preparation. The bacteriological analysis of Lonar water samples were carried out for the total counts of coliform and for the presence of pathogen such as E. coli was determined by using methods. In the same way MacConkey broth was also prepared in two different ways for Most Probable Number. The Physico-chemical properties of water were done with the help of instruments and standard methods.

III. RESULTS AND DISCUSSION

Lonar water has many medicinal properties but whether the water is safe for drinking or for domestic purpose. To check the portability and for other purposes the attempt was made to analyze the microbial quality of Lonar Lake water. The media and serial dilution was done in the distilled water. The maximum count of bacteria was recorded in S-1 samples and count was 38093 cfu/gm. While the lowest count of bacteria was reported in S4- sample i.e. 28960 cfu/gm which was shown in figure 4.1.

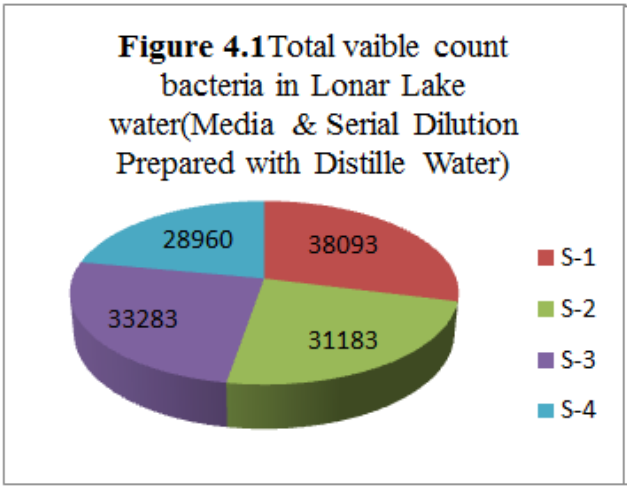

Figure 4.1 Total vaible count bacteria in Lonar Lake water(Media & Serial Dilution Prepared with Distille Water)

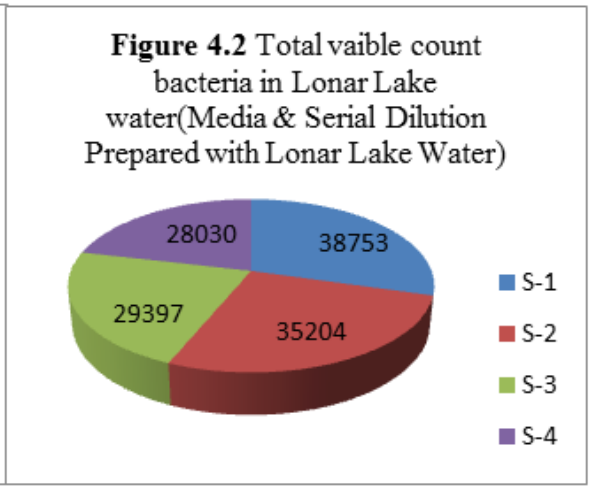

Figure 4.2 Total vaible count bacteria in Lonar Lake water(Media & Serial Dilution Prepared with Lonar Lake Water)

As shown figure 4.2, the Lonar Lake water samples were analyzed for total viable count of bacteria. The media and serial dilution was done in Lonar lake water. The maximum count of bacteria was recorded in S-1 samples. The count was 38753 cfu/gm. The lowest count of bacteria was reported in S-4 sample i.e. 28030 cfu/gm which was shown in figure 4.2.

In figure 4.3, the Lonar Lake water samples were analyzed for total Most Probable Number. The media was prepared in distilled water. The Most Probable Number was seen high in Sample 2 which was 1600 and low in Sample 3 which was 130.

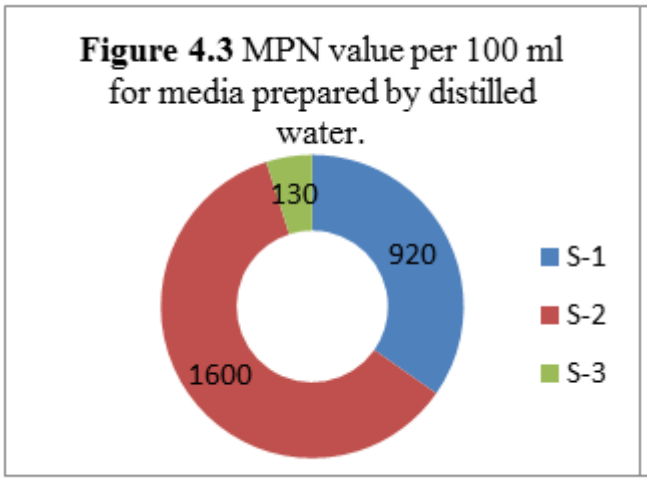

Figure 4.3 MPN value per 100 ml for media prepared by distilled water.

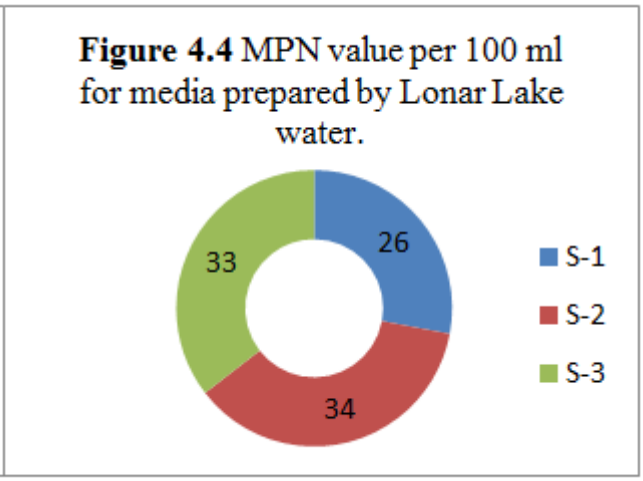

Figure 4.4 MPN value per 100 ml for media prepared by Lonar Lake water.

As shown figure 4.4, the Lonar Lake water samples were analyzed for total Most Probable Number. The media was prepared in Lonar Lake water. The Most Probable Number was seen high in Sample 2 which was 34 and low in Sample 3 which was 33.

The Lonar Lake has varied micro ecosystems with unique biodiversity. A total of five water samples from different locations from Lonar Lake were collected, which have been named as Sample 1,2,3,4,5,and 6.Lake water had a strong murky odure with high pH in the range 9.4 to 10.8. In spite of the high total dissolve solids, the total hardness was very low and was in the range of 124-160 mg/ml at all the sampling locations. These values are comparable to those reported. High alkalinity (1460-1510 mg/ml) and high salt content is the characteristic feature of this lake. In spite of high alkalinity, total hardness was very less and can be categorized under the class-moderately saline with the total hardness in the range of 124-160 mg/l. Average chloride content was 2135 mg/l making it unit for both human and cattle consumption and also for agriculture use. Sulphate and Potassium were well within the stipulated standards for drinking water. Sodium concentration was very high with an average concentration of 5725 mg/l making it unsuitable for domestic and industrial use. It is very clear from the studies that except sodium and chloride, all other parameters do not pose any problem. If sodium and chloride is efficiently removed by some suitable economically viable technology the water can be used for many purposes.

IV. CONCLUSION

In this study total 6 water samples were analyzed for the Bacteriological & physicochemical quality of Lonar Lake water. The Bacteriological result concludes that the water is not fit for drinking and can be used for the domestic purpose. Many different species of microorganisms may be isolated by various methods like media preparing in Lonar lake water. The number of physicochemical parameters in those physical parameters like pH, temperature, colour, odour, total solid and total dissolved solids (TDS). And the chemical parameter like total alkalinity, total hardness, calcium hardness, magnesium hardness, dissolved oxygen, BOD (biochemical oxygen demand), COD (Chemical oxygen demand), chloride, salinity, dissolved sulphate, and phosphate were performed. In the present study the data revealed that there were considerable variations in the quality with respect to their physicochemical characteristics.

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