Application Of Lunar Crater Natural Water Body For Agricultural Purposes With Reference To Its Analysis Report

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Abstract:

Water is absolutely essential for the existence, development and preservation of human life, making it an essential commodity in the world. However, nearly one billion people in the world lack access to potable water, mainly those living in third world countries (Shah, 2010). People living in third world countries suffering from water crisis has become a major global health issue. Water is essential for life not only for the body's physical needs but also for domestic, industrial and agricultural use. The lack of availability of clean water contributes to numerous waterborne and water washed diseases, causing the death of millions of people annually and hindering the development of communities. Lonar Crater is located in Maharashtra because the entire area of the district is filled by metamorphic rocks and alluvium. Lonar crater created by impact of meteorite or comet is present in the eastern part of Bhuldana district. On the basis of the finding of the study, the annual average values of physico-chemical parameters and heavy metal contents were found beyond the permissible limits set by the CPCB, BIS, WHO and ICMR therefore this water body is unsafe for the domestic and industrial purposes but these water bodies are very much useful for the agricultural purposes.

Keywords: *Physico-chemical characteristic, Micronutrients, Agricultural, Potability.*

1. Introduction

Hydrosphere: The water components of the earth are called as hydrosphere which consists of sea, river, Lake, stream, glaciers (ice river), polar ice caps, underground water sources and water vapour present in the atmosphere.

Hydrosphere covers about 80% of the earth's surface but about 97% of the earth's water present in the sea and oceans which is saline or salty therefore it is cannot be used directly for drinking, agricultural or industrial purposes. About 2.4% water is trapped in the glaciers and polar ice caps which cannot be used for various purposes. About less than 1% of the total water is only available for use by man for domestic, agricultural and industrial purposes.

Due to evaporation of water from the surface of sea, oceans; cloud formation takes place resulting into rains which supply water worldwide through water cycle.

Water is present in the various segment of environment in the different form i.e. ice, water vapour and liquid state. Water is an excellent solvent. It is regarded as universal solvent because maximum number of solutes can be dissolved in water than any other liquid. Water is liquid at room temperature having melting point 00C and boiling point 1000C at atmospheric pressure. Water is poor conductor of heat as compare to the metals. It has high viscosity. Most of the gases such as O_2, CO_2, CO are present in water in dissolved state that is essential for aquatic life. Water is a universal solvent therefore most of the micronutrients present in water in dissolved state in the form of sulphates, carbonates, bicarbonates, chloride and phosphates, which are very much useful for the different crops for the better yield in agriculture. Manganese (Mn): It acts as a catalyst in oxidation reduction in the plant. It helps in chlorophyll formation and act as activator of enzymes. Iron (Fe): it is not a constituent of chlorophyll, but it is essential for its formation and also for synthesis of protein and several metabolic reactions in the plant. Nickel (Ni): Nickel is also required for the plant in smaller amount for the better yield. It is component of some plant enzymes; it metabolizes urea nitrogen into useable ammonia within the plant. Copper (Cu): It activates a group of oxidizing enzymes and is a constituent of certain proteins. It is known to act as an "electron carrier" in enzymes which brings about oxidation-reduction and regulate the respiratory activities of plants. Zinc (Zn): It is the constituent of various enzymes, therefore essential for number of enzymes reactions it is also helps in the formation of growth hormones and chlorophyll of plants. Cobalt (Co): Cobalt is an essential element and plays a critical role in the overall growth process of plants. Cobalt is necessary for the processes of stem growth, elongating the leaf coleoptiles and expanding leaf discs. It is critical element needed for a plant to reach maturity and for healthy bud development. Sodium (Na): Higher plants require sodium in order to be able to grow to their full potential. Increased growth rates resulting from sodium is the result of improved water balance within the plant and resulting cell expansion. Potassium (K): Potassium act as an activator for enzymes involved in protein synthesis and also for several enzymes involved in carbohydrates and nucleic acid metabolism. It increases efficiency of the leaf in manufacturing sugar and starch hence it is essential.

2. Experimental

2.1 Sampling: We have selected a study of water bodies i.e. lake, River, rain water and well water from western Vidarbha region of Maharashtra, India.

2.2 Sampling Sites: The sampling sites are mentioned as bellow located in western Vidarbha of Maharashtra state, India.

3. Lonar Crater

The Lonar natural Crater Lake is located in Bhuldana district, Maharashtra India.

3.1 Sample collection schedule and procedure: The water samples were collected into five liter capacity plastic containers by gently wading the container in the upper layer of the water from the above mentioned sampling sites. The analysis of temperature and pH of water was made on site, as they are liable to change during transport to the laboratory.

3.2 Preservation of samples: For the analysis of other parameters, the samples were brought into laboratory and stored in refrigerator till the completion of analysis. The analysis was completed within 72 hours after collection of water. For dissolved oxygen analysis, samples were collected in 300 ml capacity B.O.D. bottles and oxygen was fixed on site & brought to laboratory for further analysis and tests were carried out immediately after reaching the laboratory.

3.3 Analysis of Samples: The samples were further investigated to screen their properties viz pH, TDS, Alkalinity, Chloride, DO, Total Hardness, Nitrate, Sulphate, Fluoride, BOD, COD, etc. and (ii) Micronutrients (Heavy metal) analysis.

4. Physico-chemical characters

The samples were collected from the water bodies selected for the study by conventional methods. The physical and chemical analysis of water samples selected from different site was carried out for different parameter as described below.

4.1 pH: pH is the negative logarithm of hydrogen ion concentration or hydrogen ion activity. Portable digital pH meter were used for the measurement of pH values of samples after its calibration using standard buffer solutions of pH 4.0 and 9.2.

4.2 Total Dissolved Solids (TDS): The total dissolved solids of samples 1,2,3,4 and 5 were investigated using digital TDS meter. The results were expressed in mg/l or (ppm).

4.3 Total alkanity: Add 3 drops of mixed indicator to the solution in which phenolphthalein alkanity has been previously determined and titrate against 0.02N Sulphuric acid (pH 4.5) colour changes to light pink. (If methyl orange is used as indicator, the end point is from orange to red). If the sample contains suspended matter remove by filtration or centrifugation and then determine the alkanity. If the suspended matter contains any alkanity, add a known excess of standard acid to the sample, boil off carbon dioxide, cool and back titrate with standard alkali.

4.4 Total Chloride: The total chloride was determined by titrimetric method to 50 ml of sample; potassium chromate indicator was added

(2ml) and titrated with 0.02 N silver nitrate until a persistant red ring appear.

4.5 Dissolved Oxygen (DO): The dissolved oxygen was determined by modified Winkler's method. The water sample was collected in 125 ml stopperd glass oxygen bottle. Then carefully, 1ml Magnase sulphate and 1ml of alkaline KI solution was placed at the bottom of the bottle to fix the dissolved oxygen. It was thoroughly mixed and then brown precipitate was allowed to settle. Then 2 ml of concentrated sulphuric acid was added along the sides of the bottle and the bottle was shaked well to dissolve the precipitate. 50 ml of the above solution was taken in a conical flask and titrated with sodium thio-sulphate solution (0.025 N) using starch as an indicator to a colorless end point.

4.6 Total Hardness of Water: To determine total hardness, pipette out 10 ml of water sample in a conical flask, add 1 ml of buffer solution, two drops of erio-chrome black-T indicator and titrate this with 0.01 M EDTA solution from the burette until color changes from wine red to blue. Note down the titer value. Repeat this procedure and find out the constant reading. Measure out 250 ml of hard water sample in 500 ml of beaker; boil gently for 30 minute till volume reduces up to 50 ml. Then filter the water sample into 250 ml volumetric flask and make up the volume up to the mark with addition of distilled water. Then pipette out 10 ml sample solution from a volumetric flask into a conical flask, add 1 ml buffer solution, and 2 drops of erio-chrome black T indicator and then titrate with standard EDTA solution until the color changes from wine red to blue. Note down the titer value. Repeat the procedure to find out the constant reading from the titer value, which corresponds to permanent hardness of water.

4.7 Nitrates: Nitrate is the most oxidized form of nitrogen and is an important plant nutrient. The reaction between nitrate and 1,2,4 phenol disulphonic acid produce 6-nitro-1,2,4 phenol disulphonic acid which on conversion to alkaline salt yields yellow colour. Nitrates were estimated spectro-photo-metrically at 410 nm.

4.8 Sulphates: Sulphate is one of the major anions occurring in natural waters. Sulphates in water are generally bound to alkali and alkaline earth metals and are readily soluble. Sulphates were estimated spectro-photo-metrically at 420 nm against a standard curve.

4.9 Fluorides: A Colorimetric method, viz., SPADNS was used for analysis of fluoride. It is based on the principle that fluoride ion changes the color of Zirconium-SPADNS complex and the color change is proportional to the fluoride ion concentration. Under acidic conditions, fluorides (HF) react with Zirconium-SPADNS solution [2-(4-sulpho phenyl azo), 1, 8-dihydroxy 3, 6-naphthalein di-sulphonic acid trisodium salt] and the 'tale' (color of SPADNS reagent) gets bleached due to the formation of [Zr F6]. Since bleaching is a function of F- ions, it is directly proportional to the concentration of fluoride. Absorbances were measured using spectrophotometer at wavelength 570 nm (λmax) and fluoride of samples 1,2,3,4 and 5 were evaluated from the calibration curve constructed.

4.10 Biochemical Oxygen Demand (BOD): Biochemical oxygen demand is the amount of dissolved oxygen required in milligrams per liter for stabilizing the biodegradable organic matter by microorganisms of the sample under aerobic conditions in a stated time. In other words it represents that fraction of dissolved organic matter which is degraded and easily assimilated by bacteria. It is a good index of the organic pollution and therefore, helps in deciding the suitability of water for consumption.

Method:

Adjust the pH of sample to neutrality using 1 N acid and alkali solutions. Fill the sample in 6 BOD bottles without bubbling. Add 1ml of allylthiourea to each bottle. Determine dissolved oxygen content in three of the bottles by modified Winkler's method. Incubate the remaining three bottles in BOD incubator at 270 C. After 3 days incubation estimate the oxygen concentration and record it.

4.11 Chemical Oxygen Demand (COD): As mentioned earlier BOD is used as a measure of biodegradable organic compounds, which form a reasonable fraction of organic matter in lakes. In recent times, with the increase of pollution by large amounts of various chemically oxidizable organic substances of different nature entering in the aquatic systems, BOD alone does not give a clear picture of the organic matter content of the sample. Furthermore, the presence of various toxicants in the samples may severely affect the validity of the BOD test. Hence, chemical oxygen demand is a better estimate of the organic matter, which needs no sophistication and is time saving. However, COD i.e. the oxygen consumed (OC) does not differentiate the stable organic matter from the unstable form. Therefore, the COD values are not directly comparable to that of BOD. Furthermore, some cyclic organic compounds (e.g. benzene) are not oxidized; whereas, on the other hand, many inorganic compounds like nitrites, sulphides and reduced metal ions get oxidized. Samples containing chlorides more than 2 g 1-1, the chloride ions are oxidized to chlorine giving erroneous results. Despite these limitations COD is still an important parameter for estimating the carbon-aceous fraction of the organic matter much closer to the actual amounts.

Method:

Take 50 ml sample in a 100 ml flask at least in triplicate. Simultaneously run distilled water blanks and standards. Add 5 ml of KMnO4 solution and place the flask in water bath for one hour at boiling temperature. Cool the samples for 10 minutes. Add 5 ml KI solution followed by 10 ml of H2SO4 in each flask. Titrate with 0.1 M sodium thiosulphate solution until pale yellow. Add 1 ml of starch solution to it. The solution turns blue. Continue the titration until the blue colour disappears completely and note the reading.

5. Micronutrients (Heavy Metals)

Atomic absorption spectrometer Model-AAS-280 were used to test the ppm of Manganese (Mn), Iron(Fe), Nickel (Ni), Copper(cu), Zinc(Zn), Cobalt(Co), Sodium(Na), Potassium(K) and Chromium(Cr) present in samples by using following formula (Perkin-Elmer method)

6. Result and Discussions

Physico-chemical parameters in Lonar crater water such as pH, TDS, Alkalinity, Chloride, Total Hardness, Nitrate, BOD, COD & Fluoride values are above the limit set by the CPCB, WHO, ICMR and BIS except DO, Sulphate. Therefore according above result revels that water is unfit for domestic and industrial applications directly. The annual average values of various micronutrient parameters in Lonar crater water are presented in Tables 7.1 such as Iron (Fe), Cobalt (Co), Sodium (Na), Potassium (K), and Chromium (Cr) are beyond the limit set by the CPCB, WHO, ICMR and BIS except Manganese (Mn), Nickel (Ni), Copper (Cu) and Zinc (Zn). Therefore this water is not suitable for the domestic, industrial application but very much useful for the agricultural applications for the cultivation of different crops which required all above micronutrients for the better yield. In Lonar crater water along with micronutrients N, P, K, carbon is also present in abundant quantity which is required to increase the total organic carbon of the soil, for the better yield of the crop.

Nitrogen is present in the water in the form of nitrates (92.25ppm), Sulphure in the form of sulphate (174.25ppm), Carbon in the form of carbonate as well as bicarbonate (3687.00ppm), potassium in the form of either chloride or salt (31.88ppm), in the above form plant uptake these constituents easily therefore we get high yield.

7. Conclusion

According to Physico-chemical and micronutrient analysis data of water samples collected from Lonar crater are not suitable for the potable as well as industrial purposes directly but they are very much useful for agricultural an application which increases the yield of the agricultural crop.

7.1. Tables

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Table 1 contains micronutrients parameters of water

Micronutrients Parameters	Micronutrients Parameters in ppm
Manganese (Mn)	0.13
Iron (Fe)	1.91
Nickel (Ni)	0.10
Copper (Cu)	0.02
Zinc (Zn)	0.17
Cobalt (Co)	0.02
Sodium (Na)	5975.63
Potassium (K)	31.88
Chromium (Cr)	0.65

Table 2 contains physicochemical parameters of water

Physico-chemical parameters	Physico-chemical parameters in ppm
pH	8.2-9.2
TDS	7551.21
$CaCO_3$ Alkalinity	1209.50
Chloride	1417.75
DO	2.0
Total Hardness	2477.50
Nitrate	92.25
Sulphate	174.25
BOD	1876.00
COD	3168.00
Fluoride	1.35

7.2. Figures

Figure 1. Bhuldana District Map,

Figure 2Satellite view of Lonar Crater, Bhuldana District, and Maharashtra, India.

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References

1. Lokhande, R.S., Singare, P.U., and Pimple, D.S., (2011b). Quantification Study of Toxic Heavy Metals Pollutants in Sediment Samples Collected from Kasardi River Flowing along the Taloja Industrial Area of Mumbai, India. *The New York Science Journal*, 4(9), 66-71.
2. Veeraputhiran, V, Alagumuthu, G., (2010). A report on Fluoride distribution in drinking Water, *International Journal of Environmental Sciences*, 1(4), 558-566.
3. Navneet Kumar, (2011). Variation of fluoride and correlation with alkalinity in

groundwater of shallow and deep aquifers, *International Journal of Environmental Sciences*, 1(5), 884-890.

4. Mahadevaswamy.G, Nagaraju.D, Siddalingamurthy.S, Lakshmamma, Mohammad Subhan lone, P.C.Nagesh, Krishna Rao, (2011). Groundwater quality studies in Nanjangud Taluk, Mysore District, and Karnataka, India, *International Journal of Environmental Sciences*, 1(7), 1582-1591.
5. Sami G. Daraigan, Ahmed S. Wahdain, Ahmed S. BaMosa, Manal H. Obid, (2011). Linear correlation analysis study of drinking water quality data for AlMukalla City, Hadhramout, Yemen. *International Journal of Environmental Sciences*, 1(7), 1692-1701.
6. Zare Garizi; V. Sheikh; A. Sadoddin, (2011). Assessment of seasonal variations of chemical characteristics in surface water using multivariate statistical methods. *Int. J. Environ. Sci. Tech.*,8(3), 581-592.
7. Salma Bilal and Sami ur Rahman, (2013). Determination of Trace Elements in the Drinking Water of Hassan Abdal (Punjab), Pakistan, *Journal of Scientific and Innovative Research*, 2(2), 372-379.
8. Chaitali V. Mohod and Jayashree Dhote,(2013). Review of Heavy Metals In Drinking Water And Their Effect On Human Health. *International Journal of Innovative Research in Science, Engineering and Technology*, 2(7), 2992-2996.
9. Raifa Ahmed Hassanein, Hanan Ahmed Hashem, Mohamed Hashem El-Deep, Ahmed Shouman, (2013). Soil Contamination With Heavy Metals and Its Effect on Growth, Yield and Physiological Responses of Vegetable Crop Plants (Turnip and Lettuce). Journal of Stress Physiology & Biochemistry. 9(4), 145-162.
10. Trivedi, R. K. and Goel, P.K, (1986). Chemical and biological methods for water pollution studies. Environmental Publications, Karad, 129.
11. APHA–AWWA WPCF (1985). Standard methods for the examination of water and waste water. 2nd edition American Public Health Association, Washington DC.
12. Trivedy R. K. and P. K. Goel (1984). Hand book of chemical and Biological method for water pollution studies Environmental publications, Karad, 1-247
13. APHA-AWWA-WPCF (1989). Standard Methods for the Examination of Water and Wastewater, 17th Edition Published by W.W. Norton & Company.
14. APHA-AWWA and WPCF, (1995). Standard methods for the examination of water and waste waters, 19th Edition Published by American Public Health Association, Washington D.C.
15. Department of Agriculture and Cooperation, Min. of Agriculture, Government of India Report (2012).
16. Gaddamwar A.G, Rajput P.R, (2013). Influence of constituent of coconut water on Fenugreek plant, International journal of Herbal Medicine 1(2),162-168.
17. Gaddamwar A.G, Rajput P.R, (2012). Physico-Chemical Analysis of Rain Water to Predict Polluted, Un polluted Regions of Vidharbha and Its Impact on Agricultural Crops, Journal of water research and development, 2, (1&2). 54-58
18. Gaddamwar A.G, Rajput P.R, “Analytical study of Bembala damp water for fishery capacity, portability and suitability for agricultural purposes”, International Journal of Environmental Sciences, vol. 2, (2012), issue 3, pp.1278-1283