

FIRST REPORT ON PHYSICOCHEMICAL ANALYSIS OF UNKESHWAR HOT WATER SPRING LOCATED IN MAHARASHTRA, INDIA.

Anupama P. Pathak and Bhagwan N. Rekadwad

DST-FIST Supported School of Life Sciences, Swami Ramanand Teerth Marathwada University,
Nanded-431606, Maharashtra, India.

ABSTRACT

The terrestrial and perennial hot spring is located at Unkeshwar village of Nanded district, India is unique amongst presently active systems. Water samples were collected from Unkeshwar hot spring. The hot springs was free of any algal growth and dirt. The temperature, DO, phosphate, sulphate, sulphite, chloride and nitrate were analyzed. Water analysis of spring samples showed remarkable difference in DO and phosphate content, when compared with control.

Keywords: *Terrestrial hot spring*, Unkeshwar, *DO*, Physicochemical properties

[I] INTRODUCTION

Amongst few terrestrial and perennial hot spring one of the hot spring is located in Unkeshwar village on Deccan basalt of Maharashtra. Being sufficiently hot ($62\pm 2^{\circ}\text{C}$) and eothermal hot spring, analysis of water samples from this hot spring hold lot of potential. Geographically, Unkeshwar lies between ($19^{\circ}34'-19^{\circ}40'N$ and $78^{\circ}22'-78^{\circ}34'E$) from mean sea level. It is positioned on south east corner of Maharashtra. The hot spring is located 1 km on right bank of Penganga River near Godavari rift zone [1-3]. Unkeshwar town is located in tribal area about 165 km from Nanded district towards North. Unkeshwar area falls under tropical deciduous forest. Vegetation in this area is mainly represented by *Tectona grandis* [4]. The two small hot springs are located here is the attraction of tourists. These are existing in the form of rectangular reservoir. The distance between these two hot springs is 28 feet. The reservoirs are clean, free from algal growth, dirt and prohibited for frequent and free access by pilgrims. The first hot spring is Main Kund. The second hot spring is called as Surya Kund. The main reservoir is proximal to main door

and located at right side of temple and called as Mukhya Kund [Figure 1].

The temperature is $62\pm 2^{\circ}\text{C}$. The temperature of the hot springs is almost constant throughout the year. Being a eothermal, terrestrial hot spring water sample analysis with reference to water quality has lot of importance. We, therefore, have collected samples in three different seasons and tested it for various parameters. It is first detailed report created for this hot spring with reference to water analysis.

Fig. 1. Terrestrial hot spring at Unkeshwar



[II] MATERIALS AND METHODS

Water samples were analyzed for various physicochemical parameters. The temperature was measured at the time of collection using digital thermometer [model 275 K] and standard mercury in glass centigrade thermometer [5-6]. The pH was measured using the pH strips at sampling site. Sampling is done in early hours of the day between 8:00 am to 11:00 am. Composite time weighted sampling method was adopted for sampling. Double stoppered, wide mouth bottles were

used for water sample collection. Samples were transported to laboratory within 6 hours. The parameters were examined including temperature, pH, odour, colour, taste, TS, TDS, TSS, DO, COD, total hardness, total acidity, total alkalinity, calcium hardness, magnesium hardness, chloride, phosphate-phosphorus, nitrate-nitrogen, sulphate, sulphite and sulphide as per standard methods given by APHA [7-8].

[Table 1].

Sr. no.	Parameter	Result	
		Mean	Standard deviation
1	Depth (m)	2.44	0.0
2	Odor	Odorless	---
3	Color	Hyaline	---
4	Taste	Taste less	---
5	Temperature ($^{\circ}$ C)	60.7	1.89
6	pH (pH unit)	7.33	0.77
7	TS (mg L $^{-1}$)	491	43.6
8	TDS (mg L $^{-1}$)	387.9	60.58
9	TSS (mg L $^{-1}$)	64.9	38.6
10	Initial DO (mg L $^{-1}$)	13.51	1.031
11	Final DO (mg L $^{-1}$)	12.1	0.4
12	COD (mg L $^{-1}$)	199.6	14.53
13	Total acidity (mg L $^{-1}$)	30.3	3.33
14	Total alkalinity (mg L $^{-1}$)	237.7	1.13
15	Total hardness (mg L $^{-1}$)	127.7	1.92
16	Ca $^{++}$ hardness (mg L $^{-1}$)	28.90	0.83
17	Mg $^{++}$ hardness (mg L $^{-1}$)	13.52	0.49
18	Chloride (mg L $^{-1}$)	27.76	2.37
19	Phosphate (mg L $^{-1}$)	171.7	6.4
20	Nitrate (mg L $^{-1}$)	9.5	0.18
21	Sulphate (mg L $^{-1}$)	69.3	2.31
22	Sulphite (mg L $^{-1}$)	0.0	0.0
23	Sulphide (mg L $^{-1}$)	58.89	0.0

Table 1. Shows the physicochemical properties of terrestrial hot spring at Unkeshwar

[III] RESULTS

The hot spring water was hyaline, odourless, and tasteless. The physicochemical properties of water samples are shown in table. The pH recorded [at 60.7 $^{\circ}$ C] was 7.33 \pm 0.2. Total solids, dissolved solids and suspended solids were 491.0 mg L $^{-1}$, 387.7 mg L $^{-1}$ and 64.9 mg L $^{-1}$. Acidity and alkalinity detected were 30.0

mg L $^{-1}$ and 237.7 mg L $^{-1}$. We have recorded three fold rises in dissolved oxygen content [Figure 2] of Unkeshwar hot water when compared with other hot spring or warm water. Further investigations of area that surround hot water spring showed existence of one cold spring in vicinity of hot spring. To justify abnormal rise in dissolved oxygen

content [13.51 mg L^{-1}] of hot spring assumption can be made. The reason for rise could be either mixing of cold spring with hot spring beneath the reservoir or that may be due to catalase like activity of hot spring as any algal growth or photosynthetic activity was not observed. Total hardness, calcium hardness, magnesium hardness, chloride, phosphate-phosphorus, nitrate-nitrogen, sulphate and sulphide were 127.7 mg L^{-1} , 28.9 mg L^{-1} , 13.52 mg L^{-1} , 27.76 mg L^{-1} , 171.7 mg L^{-1} , 9.5 mg L^{-1} , 69.3 mg L^{-1} and 58.89 mg L^{-1} [Table 1].

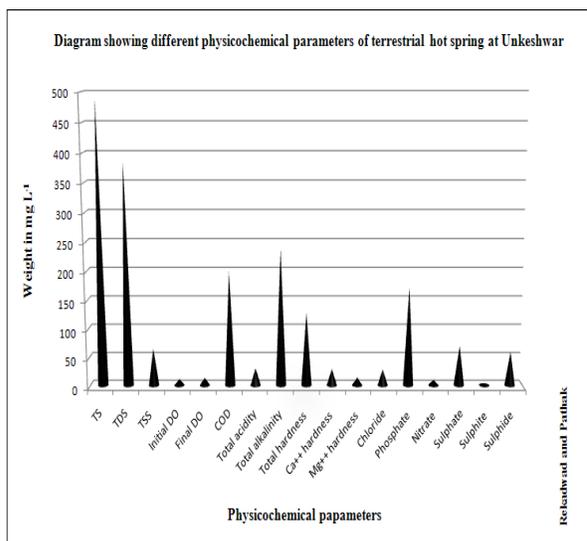


Fig. 2. Physicochemical properties of terrestrial hot spring at Unkeshwar

[IV] DISCUSSION

Water analysis of Unkeshwar hot water spring showed resemblance with tap water. The remarkable difference however was recorded in percentage of DO, phosphate. Remarkable difference 13.51 mg L^{-1} , 171.7 mg L^{-1} in DO and phosphate justify unique feature of this spring. Geothermal activity could be the reason for release of oxygen and enhanced DO content of spring water. Excess phosphate was recorded in spring water which indirectly indicate that this region may contain reservoirs of phosphorus.

[V] CONCLUSIONS

It can be concluded from results that high water temperature, DO and phosphate of

spring water enhances probabilities for finding variety of aerobic thermophiles.

ACKNOWLEDGEMENTS

We are thankful to Dr. S. B. Nimse, Hon.'ble Vice Chancellor, S. R. T. M. University, Nanded, India and School of Life Sciences, S. R. T. M. University, Nanded, India for providing necessary facilities for conducting this research work.

REFERENCES

- [1] Sarolkar P.B. [2005] Geochemical character of hot spring of West Coast, Maharashtra State, India. *Proceedings World Geothermal Congress, Antalya, Turkey.*
- [2] Jay AE, Widdoson M, [2008] Stratigraphy, structure, and volcanology of the SE Deccan continental flood basalts province: implementation for eruptive extent and volumes. *Journal of Geological Society*, **165**:177-188.
- [3] Rekadwad BN, Pathak AP, [2011] Characterization, antibiotic sensitivity of thermostable amylase producing *Haemophilus haemolyticus* isolated from Unkeshwar hot spring and prediction of origin using antibiotic target site. *International Journal of Biotechnology and Research*. **2**(1): 224-229.
- [4] Nanded district Gazetteer (NDG), [1949] <http://maharashtra.gov.in/english/gazetteer/Nanded/other.html> Assessed on 2010-12-20.
- [5] Edema MO, Omemu AM, Fapetu OM [2001] Microbiological and physicochemical analysis of different sources of drinking water in Abeokuta, Nigeria. *Niger journal of Microbiology*, **15**(1): 57-61.
- [6] Ademoroti CMA, [1996] Standard methods for water and effluent analysis, *March prints and Consultancy*, Foludex Press Ltd. Ibaden, pp182.
- [7] APHA (American Public Health Association) [1985] *Standard Methods for the Examination of Water and Waste Water*. 16th Ed, Wasington DC.
- [8] Trivedy RK, Goel PK, [1986] Chemical and biological methods for water pollution studies. *Environmental. Publications, Karad, India*. pp3-96.