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# Determination of concentration level of selected heavy metals in water from sudha dam of Bhokar, (Nanded) Maharashtra, India

**Sayyed Juned A[1], Syed Abrar Ahmed[2*]**
[1] Department of Environmental Science. Arts. Commerce and Science College Onde. Vikramgad. Palghar. Maharashtra. India
[2] Department of Botany. Government College of Arts and Science. Aurangabad. Maharashtra. India
*Corresponding Author: sdabrar645@yahoo.com

**Abstract**
In towns and villages. the dam water is the main source of drinking and agricultural purposes. The dam draining can impact dissolved heavy metal concentrations in discharge water. The current research work indicates the biological effects of trace metals on aquatic life. mainly with concern to the factors controlling like chemicals bioavailability of trace metals and its toxicity. The laboratory examination of trace metals from this dam was carried out for a year and about three sampling sites were selected for water analysis. The status of trace metals level of Sudha Dam was determined by using the UV Spectrophotometer technique. The minimum value of Aluminum, Molybdenum and Nickel was found 0.18, 0.041 and 0.021 at sampling sites $S_1S_3$and $S_1$. The maximum value of Aluminum. Molybdenum and Nickel was found 0.06. 0.013 and 0.003 at sampling site $S_1$ and all values are expressed in mg/L.

**Keywords:** spectrophotometer. trace metals. dam water. bioavailability

## Introduction

Water is essential for life on earth because of its importance in various fields. The pattern of human settlement throughout history has often been determined by the availability of water (Mahmoud et al. 2001) [2]. More than 70% of freshwater is consumed for agriculture (Baroni et al. 2007) [3]. The change in environment causes the change in the nature of the water. Potable water is the one that is safe to drink. pleasant in taste and suitable for domestic purposes. Drinking water must be free from the major type of water pollutants which can be classified into microorganisms. organic wastes. plant nutrients. sediments or silts. inorganic chemicals. acids and bases. heat. radioactivity. heavy metals. and pesticides and other industrial chemicals (Saini. 2006) [4].

The requirement of potable water is essential to both the rural and urban populations in order to prevent health hazards. For water to be described as potable. it has to comply with certain Physico-chemical standards which are designed to ensure that water is safe for drinking (WHO. 1984) [5]. Water quality provides current information about the concentration of various solutes at a given place and time. Water quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. For optimum development, management and beneficial uses, current information is needed which is provided by water quality programs. Unequal distribution of water on the surface of the earth and the fast-declining availability of useable freshwater are the major concerns in terms of water quantity and quality (Boyd and Tucker. 1998). Aluminium occurs ubiquitously in natural waters as a result of the weathering of aluminium-containing rocks and minerals. Aluminium concentration in surface waters can be increased directly or indirectly by human activity through industrial and municipal discharges. surface run-off. tributary inflow. groundwater seepage. and wet and dry atmospheric deposition. Little information is available on the uptake of aluminium into food crops. Uptake into root crops is of particular importance since many plant species concentrate aluminium in their roots. Molybdenum is an essential element to all plant and animal species and as it is an essential plant nutrient it is used in plant food and fertilizers. Some foods such as lentils. whole grains. cauliflower. green peas and spinach naturally contain molybdenum. Although small amounts of molybdenum are essential to human health. large amounts can be toxic. Once molybdenum enters a water body it can attach to sediment and can be consumed by fish. Because molybdenum attaches to the soil. it can be found in agricultural products used for human and/ or livestock consumption. The concentration of nickel in water from rivers and lakes is very low. The average concentration of nickel in rivers and lakes is generally less than 10 parts in a billion parts (ppb). The average concentration of nickel in drinking water is about 2 ppb. Food contains nickel and is the major source of nickel exposure for the general population. We usually consume about 170 micrograms (ug; 1 ug = 1,000 ng) of nickel in our food every day. Foods naturally high in nickel include chocolate. soybeans. nuts. and oatmeal. Our daily intake of nickel from drinking water is only about 2 ug. By keeping this view. we have undertaken our study to find out the concentration of heavy metals from the Sudha dam.

**Study Area**

Bhokar is the Tehsil place in the Nanded district of Maharashtra. the Sudha reservoir was constructed earlier and it is on the way to Kinwat road and at Bhokar towards eastern. The reservoir is situated $19^0$ 15' latitude $73^0$ 43' longitude. The catchments area of the reservoir is about 105.67 sq. kms. Sudha river is emerging from Sitakhandi near Bhokar of Nanded highway. The flow of water is from west to east in the direction. The area covered by this project is about 175.385 hectares. This project is highly benefitted by Bhokar town and surrounding villages. Water from the dam is mainly used for agriculture, irrigation, drinking and domestic purpose. The water supplies to Bhokar and several villages, more than 75,000people get benefited from this dam.

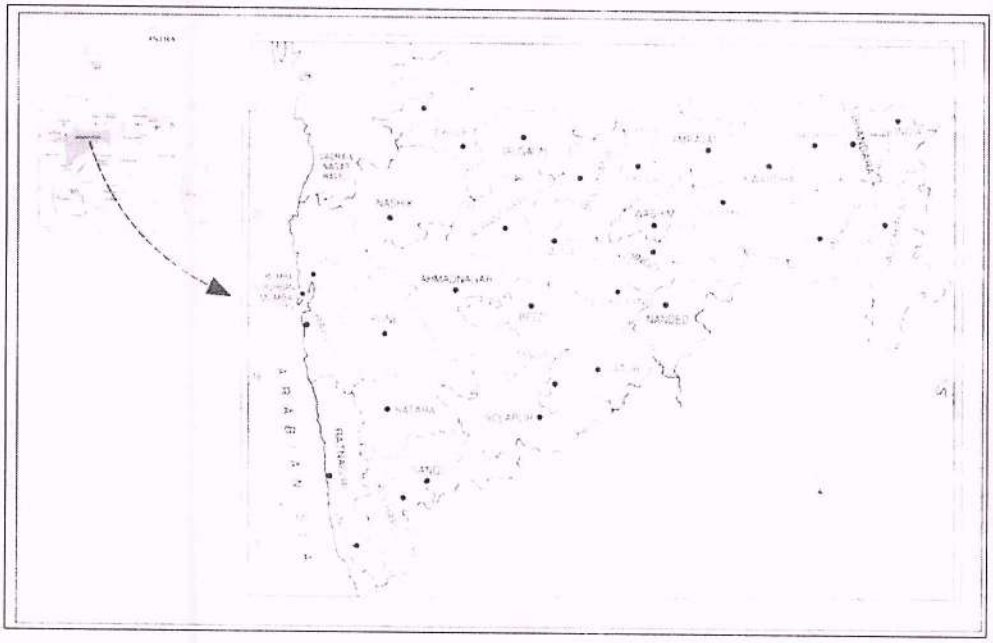

**Fig 1:** Location of Nanded district in Maharashtra State (India)

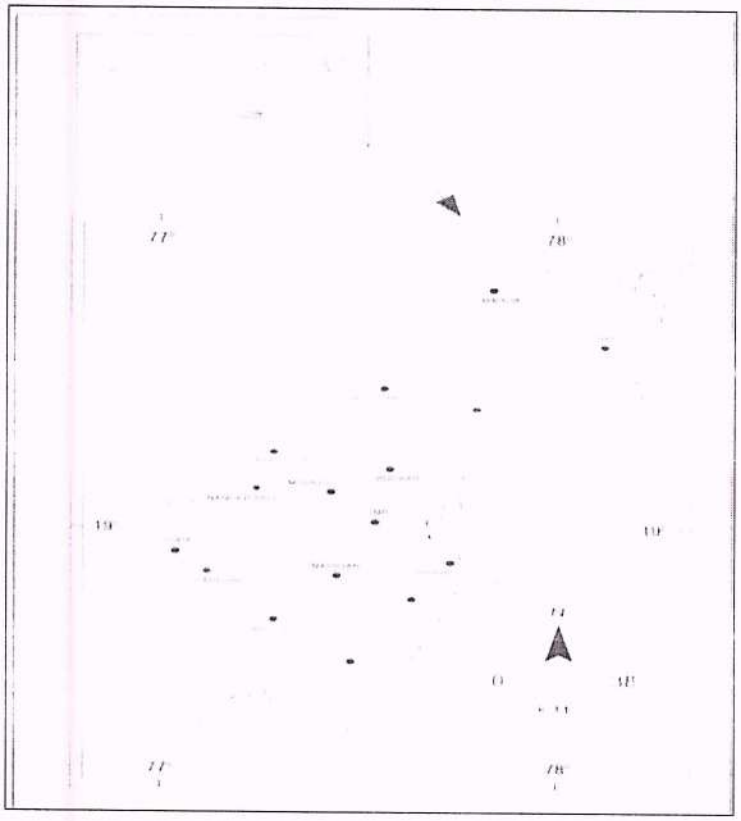

**Fig 2:** Location of Bhokar taluka in Nanded district

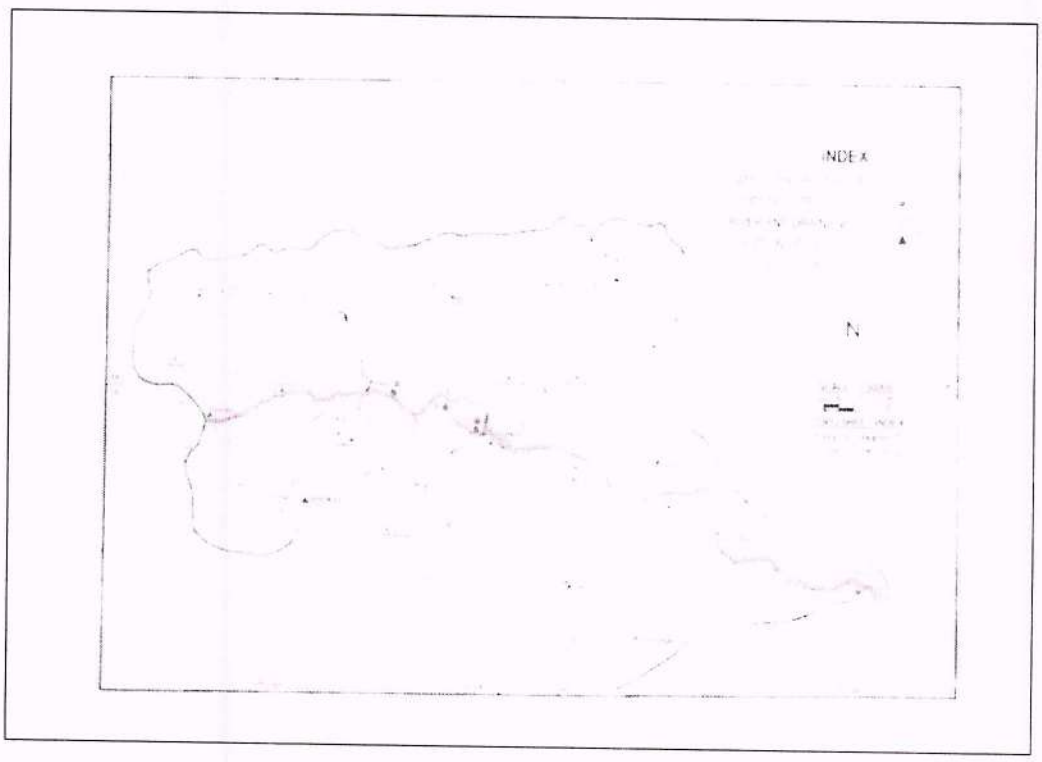


**Fig 3:** Map of the study area

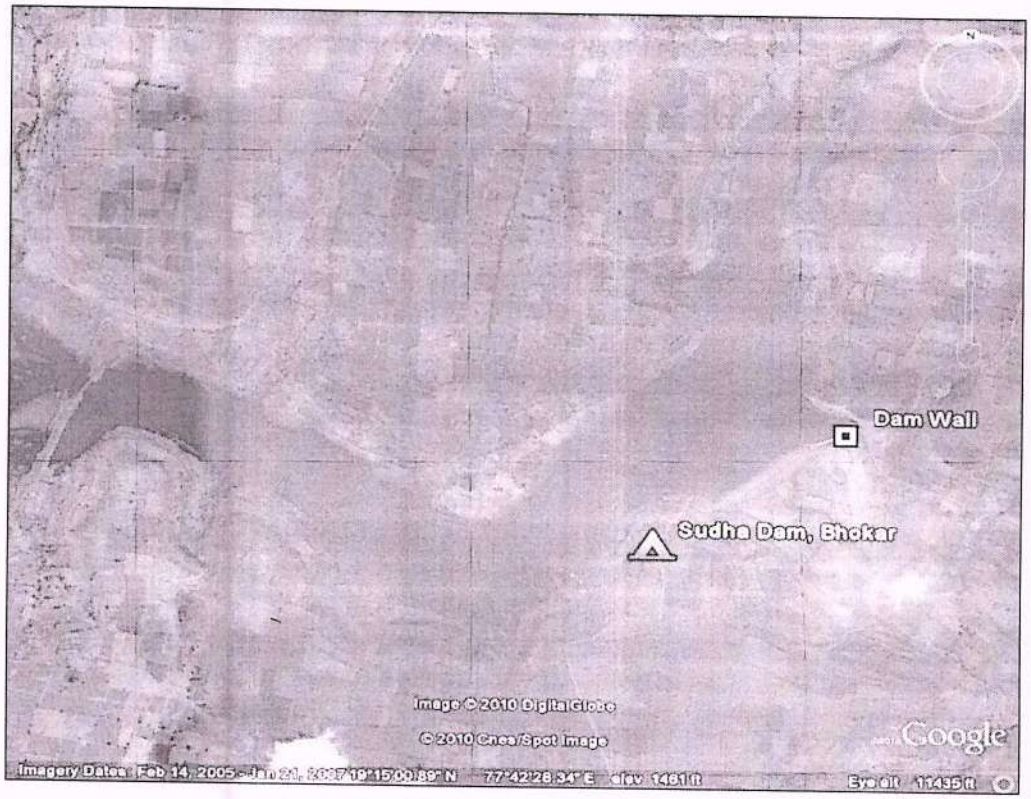


**Fig 4:** Map of the Sudha dam from Google site.

**Material and Methods**

The water samples were collected twice a month for a period of entire one year from January 2021 to December 2021, from three different sampling locations of Sudha dam. The values were carried out by mean average during the research work. $S_1$water sampling site from where the water was collected. Water sampling site $S_2$ is fixed near entry towards the dam way and the third water sampling site $S_3$ was at the dam end, where the river

opened into the dam. Investigations were carried out to study the status of Iron level in relation to dam water quality, it has been studied for the period January 2021 to December 2021.
All three water samples were collected from selected sites. These samples were collected in airtight plastic containers. Water samples are then labelled in the laboratory for identification, also for systematic analysis.

**Experimental**
The metal analysis was performed according to the standard method of APHA-2005 and using U.V. Double Beem Spectroscopy. All solutions were prepared with deionized water. Stock solutions of all the metals, containing 1000 mg were used in the preparation of the standards for the calibration curve. The analysis has been used in the past to identify these metals.

**Results and Discussion**
In the present study the Aluminum, Molybdenum and Nickel content was estimated in one year and three different seasons i.e. summer, monsoon and winter from January to December 2021 and also has been shown in the various figure shown for different variations.
From January 2021 to December 2021, the maximum concentration of aluminium was found 0.18 mg/L, 0.18 mg/L at sampling sites $S_1$, $S_2$ and $S_3$ in September and October. The minimum concentration of aluminium was recorded 0.21 mg/L, and 0.25 mg/L at sampling sites $S_1$, and$S_2$ in August as shown the table1. The average concentration of aluminium 0.124 mg/L was observed at sampling site $S_1$.
The highest concentration of molybdenum was found 0.036, 0.0275 and0.041 mg/l, at sampling sites $S_1$, $S_2$ and $S_3$ in October and May 2021 respectively. The minimum concentration of molybdenum was recorded 0.013 at sampling site $S_1$ in August 2021 as shown in table 1. The average concentration of molybdenum was recorded at sampling site $S_1$ in the year is 0.022.
The highest concentration of nickel was found 0.0165 mg/L and 0.0127 mg/L at sampling sites $S_2$ and $S_3$ in June and November 2021 respectively. The minimum concentration of nickel was recorded 0.003 mg/L at sampling site $S_1$ in May 2021. The average concentration of nickel recorded at sampling sites $S_1$, $S_2$ and $S_3$ in the year 2021 is 0.0094.

**Table 1**

| Months | Aluminum | | | Molybdenum | | | Nickel | | |
|---|---|---|---|---|---|---|---|---|---|
| | $S_1$ | $S_2$ | $S_3$ | $S_1$ | $S_2$ | $S_3$ | $S_1$ | $S_2$ | $S_3$ |
| January | 0.43 | 0.52 | 0.61 | 0.017 | 0.019 | 0.022 | 0.011 | 0.0118 | 0.0115 |
| February | 0.57 | 0.69 | 0.82 | 0.019 | 0.022 | 0.026 | 0.010 | 0.011 | 0.0114 |
| March | 0.25 | 0.49 | 0.73 | 0.021 | 0.023 | 0.025 | 0.005 | 0.009 | 0.013 |
| April | 0.45 | 0.62 | 0.53 | 0.026 | 0.0275 | 0.032 | 0.011 | 0.014 | 0.0117 |
| May | 0.77 | 0.39 | 0.58 | 0.024 | 0.0265 | 0.029 | 0.003 | 0.005 | 0.007 |
| June | 0.57 | 0.41 | 0.49 | 0.017 | 0.021 | 0.025 | 0.012 | 0.0165 | 0.021 |
| July | 0.93 | 0.53 | 0.57 | 0.016 | 0.0185 | 0.021 | 0.006 | 0.0120 | 0.015 |
| August | 0.21 | 0.25 | 0.44 | 0.013 | 0.017 | 0.021 | 0.011 | 0.0115 | 0.0125 |
| September | 1.23 | 1.14 | 1.15 | 0.032 | 0.035 | 0.035 | 0.010 | 0.0115 | 0.013 |
| October | 1.11 | 1.17 | 1.26 | 0.036 | 0.038 | 0.041 | 0.011 | 0.0135 | 0.016 |
| November | 0.86 | 0.44 | 0.65 | 0.032 | 0.034 | 0.036 | 0.0114 | 0.0155 | 0.0127 |
| December | 1.01 | 0.56 | 0.78 | 0.019 | 0.022 | 0.025 | 0.0119 | 0.021 | 0.0123 |

(Nabi et al. 2007) [7], determined the level of aluminium from 5 local streams in the study area Aras water basin is located in the northwest of Iran. To consider the effect of flow quantity on the amount of metal, sampling was done in July and November 2005. While the aluminium concentration During November 2005 the sampling sites $S_1$, $S_2$, $S_3$, $S_4$ and $S_5$ are 0.93, 0.25, 0.48, 0.24 and 0.18 mg/L respectively.
(Pandey et al. 2006) [8], studied the concentration of heavy metals in the well water of Khajuwala located in the western region of Rajasthan in 16 water samples for January 2006. They found the presence of the highest concentration of Aluminum which was found over the permissible level for drinking. This result supports our study where the aluminium concentration is at permissible level.
(Fatoki et. al 2002) [9], worked on metal contamination in the Umtata River during 2002. The results of the one-year measurement campaign of metals in the river are presented. The mean levels of Al in the river varied between 0.22 and 0.36 mg/L in the river and were higher than the TWQR for Al in the domestic water supply 0 to 0.15 mg/L.
(Khalid et al. 2009) [10], determined the heavy metal concentration of molybdenum in King Talal Dam (KTD) reservoir, Jordan. They found the concentration of molybdenum inside 0.0058 and at the outlet 0.0038 respectively.
(Zhi 2000) [11], determined the novel method for the determination of trace amounts of molybdenum has been established. The detection limit was 0.002 mg/L molybdenum;

(Susumu et al. 1997) [12], developed a sensitive flow injection method for the determination of molybdenum. The detection limit was 0.1 mg/L. Without any preconcentration and separation, the proposed method was successfully applied to analyses of river, lake, rain and tap water samples.
(Ling et al 2010) [13], analysis of trace metal nickel in the water of the Serin River was done at seven selected stations over six sampling trips were conducted between December 2008 and April 2009. The highest mean concentration of nickel is 0.15±0.3 mg/l. at sampling site S-3 and the lowest mean concentration of nickel is 0.11±0.5 mg/L at sampling site S-2 respectively.
(Tandjir and Djebar 2007) [14] found that the concentration of nickel in the dam of Guenitr and this tributary oued Sedjane (Skikda. Algeria) with 3 sampling stations during 2002 to 2003. The maximum concentration of Tower control in nickel is 0.7 mg/l. at S-1 and the minimum is 0.55 mg/l. at sampling sit S-2. The maximum concentration of outfall in nickel is 0.6 mg/L at S-1 and the minimum is 0.55 mg/L at sampling site S-2 respectively.
(Iqbal and Kataria 2006) [15] studied the heavy metal contamination in Halali Dam water of Vidisha district near Bhopal (M.P.) India concerning human health. In the present study Nickel heavy metal was found in the range of. 0.08-0.98 ppm respectively.
(Salnikow and Denkhaus 2002) [16], analysed the typical concentration of Ni in unpolluted waters. They found the maximum nickel concentration was 0.020 mg/L and the minimum nickel concentration was 0.015 mg/L.
(Mustafa S. Dündar and Huseyin Altundag 2018) [17], observed that the Lower Sakarya River sediments were moderately contaminated with Molybdenum 0.71 mg/L elements were classified as uncontaminated to moderately contaminated. However, in the present investigation, the highest amount of molybdenum 0.0275 was found at S2 in the month of April. Which is much more than the results given by them.

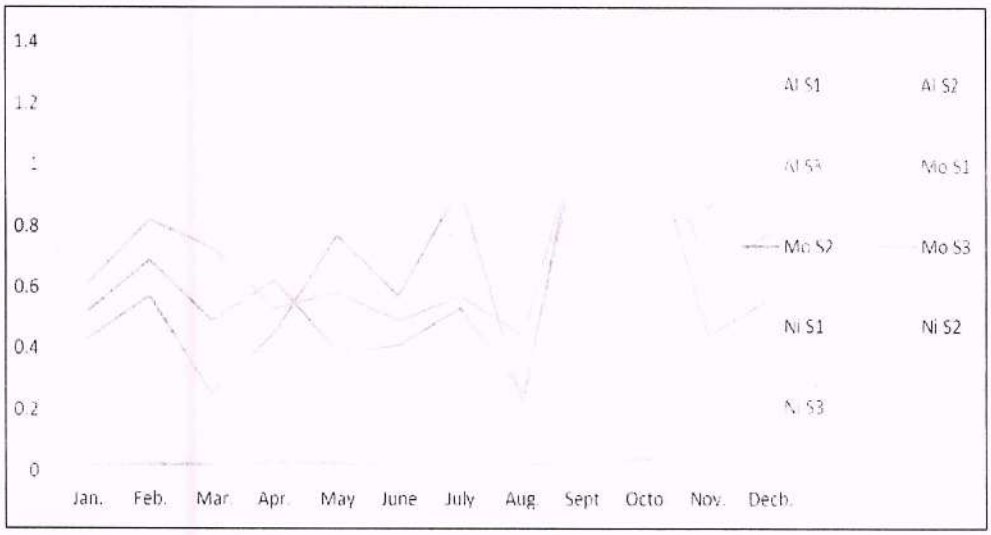


**Fig 5:** Variations of fluoride of Sudha dam water in summer season

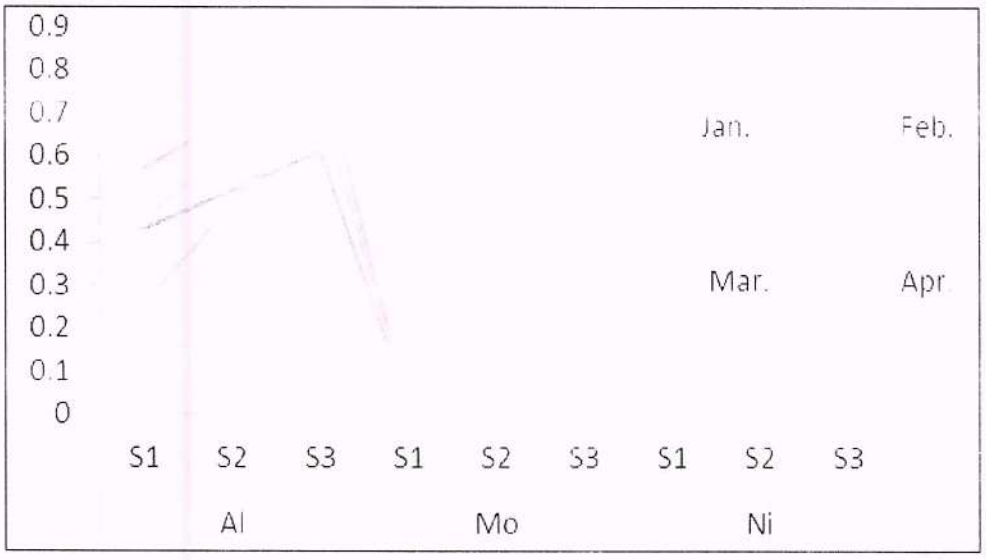


**Fig 6:** Seasonal variations in summer season

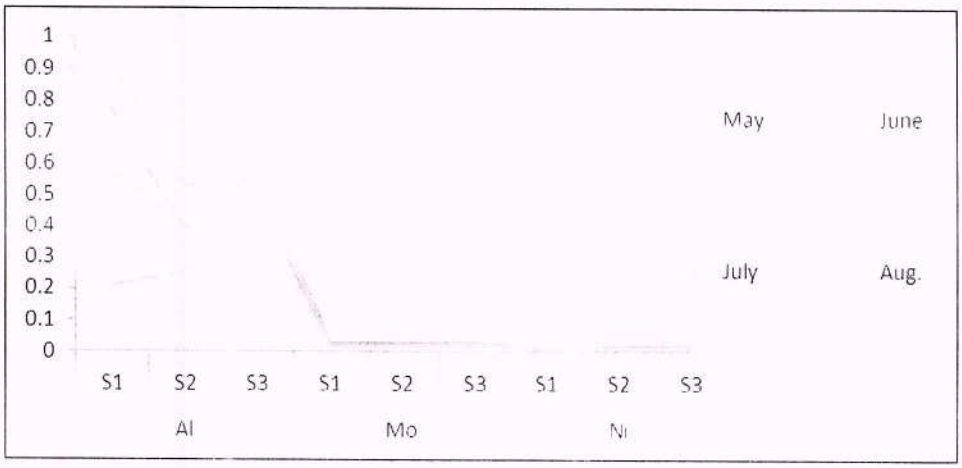


**Fig 7:** Seasonal variations in monsoon season

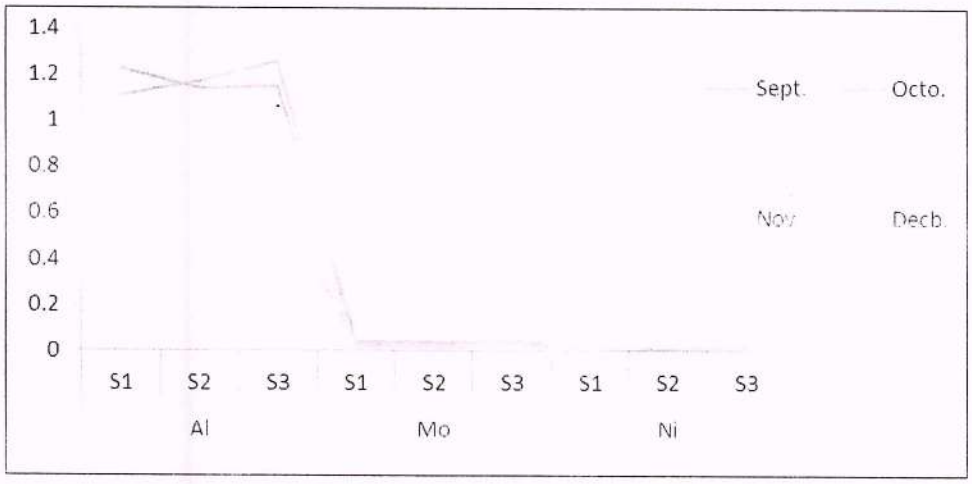


**Fig 8:** Seasonal variations during the winter season

The study shows the trace metals are under permissible limit therefore the planktons were not affected.

**Conclusion**

The trace metals Aluminum, Molybdenum and Nickel found in the Sudha dam are under the permissible limit, though it shows the signs of increasing contamination in trace metals in water were far near to cross permissible. So, it's the alarm to take respective efforts to maintain the water quality and its standard towards sustainable life. Trace metals are also essential for all living beings for their growth.

**Suggestions**

1. Keep agricultural waste, pesticides, and chemicals away from storm drains.
2. Avoid washing clothes and animal catering.
3. Increase the participation of NGOs to aware the people regarding water and its holiness for life.

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