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Assessment Of Heavy Metal Concentration And Physicochemical Parameters Of Nag River Water Near Mahalgaon Village Of Nagpur District (MH).

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Abstract:-The increased industrial activities and urban growth along the rivers and lakes has resulted in pollution load over the water. In the present study physicochemical parameters and concentration of heavy metals in Nag River near the village Temasna were studied. The Parameters such as pH, electrical conductivity, total dissolved solids, alkalinity, Calcium, Magnesium, Fluoride, Total Hardness and BOD were studied. The concentration of heavy metals (Cu, Mn, Fe, Zn, Ni, Pb) from the two water samples were detected. The conc. of Fe and Zn were found to be higher than the permissible limits given by WHO.

Keywords: Mahalgaon, Water Samples, Physicochemical Parameters, Heavy Metals, Nag River.

INTRODUCTION

Water is the most precious source essential to sustain the life on the Earth. Due to anthropogenic activities like mining discharge of industrial and domestic effluents and metal chelates (Amman et al 2002) [1] from different industries resulted in deterioration of water quality producing serious environmental problems. Rapid industrialization and flow of urban population in past few years has suspected to deterioration of water quality. Heavy metal pollution in aquatic ecosystem caused by industrialization has been reported by many researchers around the world [2,3,4]. Use of this polluted water for irrigation purpose without any treatment causes soil and ground water pollution which leads to both qualitative as well as quantitative losses and urban water pollution is growing at alarmingly faster rates. Discharge of heavy metals with industrial effluents of pulp and paper mills (Ali and Rehman 2008) [5] and distillaries (Tewari etal 2006) [6] were also reported.

Objective of this work is to investigate the heavy metals and physicochemical properties of Nag River near Temasna Village which is used for irrigation.

MATERIALS AND METHODOLOGY:-

Sampling:- samples were collected from the Nag River near Temasna. Water samples were collected at the depth of 20-30cm from the river surface directly into 1lit. Pre-conditioned polythene bottles. Two sets of water samples, one set was used for measurement of pH, TDS, EC, alkalinity using a portable meter (Table1). The other set was acidified with 1% Nitric acid solution to keep the metal ions in the dissolved state. The samples were kept in a refrigerator at about 4°c until the analysis was performed.

Sample preparation and analysis:- An atomic absorption spectrometer was used for the elemental analysis of water.

0.2g of water sample and 2 ml of conc. HNO3 (65%) was taken in a Teflon tube and then placed in a bomb. The bomb was placed on a hot plate and digested sample was allowed to keep at room temperature and transferred into polypropylene graduated tubes. The content was diluted with distilled water to give 25ml for aspiration. Two other replicates were prepared out of the sample. The same process was repeated for the other sample.

A blank was prepared using only concentrated HNO3 and analyzed for the concentration of elements under study. The determined concentrations were subtracted from this water to give the actual concentration of each element present.

MEASUREMENT OF PHYSICO-CHEMICAL PARAMETERS OF WATER SAMPLES:

A pre-calibrated HANNA pH/temperature/ conductivity meter (model H1991000) was used for pH, temperature and electrical conductivity (EC) measurements. pH of each water sample was measured by inserting the probe into the water immediately after collection. It was rinsed and left standing in double distilled water before being used for further pH measurement. Temperature and conductivity readings were also taken at the same time as pH. Total Solids (TS) and Total Dissolved Solids (TDS) were analyzed according to the standard methods [7]. Total suspended solids (TSS) were determined by the difference between TS and TDS. Transparency was measured at each sampling site with a disc of 30cm diameter [8] Total Alkalinity was determined by titration of water samples with standard 0.01mol dm-3 HCl with methyl orange as indicator [9]. Total Hardness was determined by titrating water samples with standard EDTA titrant with Eriochrome black-T as indicator according to standard methods. The Modified

Winkler-Azide Method was used to analyze water samples for dissolved oxygen (DO) while Biochemical oxygen demand (BOD) was determined by the difference between DO of samples immediately after collection and DO of samples after incubation at 20 0C for five days. The phenoldisulphonic acid method was used to analyze water samples for nitrate (NO) content while ammonium molybdate reagent (Deniges reagent) and stannous chloride were used to determine phosphate (PO43-) contents of water samples [7]. In both cases, a CHROMA colorimeter (model 257) was used to measure absorbencies.

RESULT AND DISCUSSION:-

Table 1:- Physicochemical parameters.

Sr. No.	Parameters	Sample 1
1	pH value	8.8
2	Elecctrical conductivity mhos/cm3)	1324
3	Total dissolved solids (mg/l)	895.64
4	Alkalinity (mg/l)	642.25
5	Calcium (mg/l)	435.74
6	Magnesium (mg/l)	127.78
7	Chloride as Cl (mg/l)	89.62
8	Fluoride as F(mg/l)	0.91
9	Total hardness (mg/l)	834.53
10	BOD (mg/l)	1036.78

pH: pH range of 6.5 to 8.5 is normally accepted as per guide lines by WHO(1948)[10] from above values it is found that the water is alkaline.

EC: The EC of water is useful and easy indication of its salinity and total salt content [11]. In this study it was found that the EC of water samples were quite high (1324 m mhos/cm3) due to some soluble minerals. Conductivity of water depends upon the concentration of ions and its nutrient status and variation in dissolved solid content.

TDS: total dissolved solids denote mainly the various lands of mineral present in the water, due to contamination of domestic waste water, garbage, fertilizers etc in the natural surface water. TDS of water increases to high value hence in present study the values of TDS was found to be high (895.64mg/l).

Alkalinity: Alkalinity of water is its acid neutralizing capacity. It is a measure of an aggregate property of water (APHA 18th Edition 1989 page 2-35) [7]. In the present investigation the values are found to be higher (642.25mg/l) because of addition of large amount of sewage waste, organic pollutant, degradation of plants, living organism and organic waste.

Calcium: The amount of Calcium is increased (435.74mg/l) due to rapid oxidation/decomposition of organic matter [12]. The addition of sewage waste might also responsible for the increase in amount of calcium.

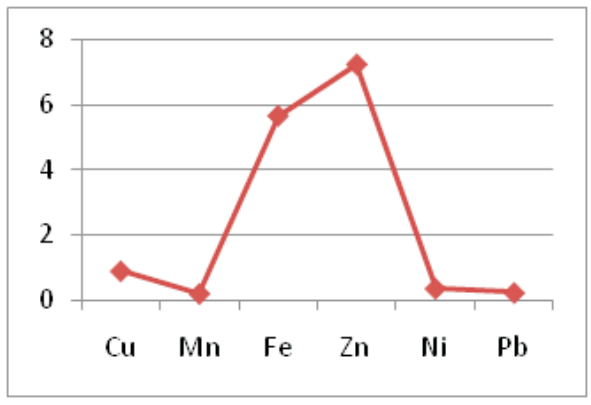
Magnesium: Magnesium is often associated with calcium in all kinds of waters but its concentration remains generally lower than Calcium (127.78mg/l) [13]. Magnesium is essential for chlorophyll growth and it also acts as limiting factor for the growth of Phytoplankton [14].

Total Hardness: The total hardness id due to the presence of Calcium and Magnesium ions. As the value of Calcium and Magnesium is higher it increased the hardness of water (834.53mg/l).

Biological Oxygen Demand: BOD depends on aquatic life. BOD refers to Oxygen used by the microorganism in aerobic oxidation of organic matter. Therefore with increase in amount of organic matter in the water the BOD increases. In the present study the value of BOD was found to be (1036.78mg/l).

Table 2:- concentration of trace metals in mg/l

Cu	Mn	Fe	Zn	Ni	Pb
0.88	0.18	5.67	7.26	0.34	0.21



Heavy Metals:- The concentration of heavy metals are found in order as follows- Mn<Pb<Ni<Cu<Fe<Zn. The levels of Fe and Zn were found to be high. The high level of Fe is attributed to the weathering of Rocks. The value of Zn is found to best in the highest range 7.26mg/l. The increased Zn levels could have a chronic effect on aquatic life. The Fe levels may have adverse effect on the health of users of the water without treatment over a long period of time.

CONCLUSION:-

The assessment of physicochemical parameters and Heavy metal concentration in the Nag River revealed that some parameters are above the permissible limits. It creates some harmful effects on Human health. The repeated use of higher concentration of Fe and Zn causes health problems. If such water is used for irrigation purpose it leads to the higher concentration of heavy metals in vegetables also. The pollution of heavy metals in water should be avoided by giving pretreatment to water before sending it to Nag River.

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