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Monitoring and analysis of water quality of seven sample stations in Chandrapur(M.S)

Sushma N. Thakre*, A. K. Dixit[1] and M. D. Choudhary[2]

[1]Department of Applied Chemistry, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur (M.S)
[2]Department of Applied Chemistry, Bapurao Deshmukh College of Engineering, Sewagram, Wardha, M.S.

ABSTRACT

Water is one of the most abundantly available resources in nature. It is an essential constituent to all living beings. It occupies nearly 75% of matter of earth's crust. But due to industrialization and urbanization natural water resources are lessening or declining to a great extent. A call for conservation and probable option for water resources is on peak. Limited[1] natural rainfall-recharge and increased water usage throughout the country calls for conservation as well as augmentation .Physico-chemical monitoring of ground water samples of various reservoirs in Chandrapur town, was carried out. Water samples for above study were collected from 7 stations enlisting tube well, coal mine reservoir and rivers. Various parameters were analyzed by using standard methods (APHA) and their comparison with WHO standard values, suggested that most of the parameters were within permissible limit and by water treatment the concentration of parameters beyond the limits in coalmine could be reduced and could be an invaluable source for domestic purposes in the region. The present paper accounts water quality of various sites situated in Chandrapur and their efficiencies respectively.

Keywords : Coal mine reservoir, augmentation, WHO Standard Values, Parameters, APHA,

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INTRODUCTION

Water[2] is a scarce and precious national resource to be planned, developed, conserved and managed as such, and on an integrated and environmentally sound basis, keeping in view the socio-economic aspects and needs of the States. Water is a prime natural resource and a basic human need. Surface Fresh water is a small fraction of global water. The freshwater supply is unevenly distributed. In India[3] the average use of water for irrigation became very high after Green revolution. A[4] 2003 study conducted by the Congressional Government Accountability Office indicates that 36 states anticipate water shortages in the next ten years under normal water conditions, and 46 states expect water shortages under drought conditions. Water[5] supply and demand estimates by EPRI for the years 1995 and 2025 also indicate a high likelihood of local and regional water shortages in the United States.

In[4] India about 250 trillion litre of water are extracted for irrigation every year of which only about 150 trillion Liters are replaced by rain. In 1951 ,per capita availability of water in India was 5177 m^3 which has reduced to extent of 1869 m^3 in year 2001 and may come down to 1341 m^3 in year 2025.It is estimated that out of total precipitation of around $400X10^4$ million cubic metre per year in India, Surface water resources cover as $176.8X10^4$ million cubic meter and out of this only 50% can be put to beneficial use .An estimated total water use of 4074 million m^3/day for year 2000-01 has been reported .The distribution among various uses is-domestic - 2.1%,Agriculture-88%,Industry-2.47%. It is estimated that 31% rural and 75% urban population in India has access to potable water supply. Surface water is dominant source in organized urban and rural area ground water is the basic source. The nature of pollutants entered in water depends on composition of waste water, the raw material processed, the process and toxicity of anions, cations, hydrocarbons constituted in waste. Freshwater availability is a critical limiting factor in economic development and sustainability and directly impacts electric-power supply.

(a) **Physiography :**

Chandrapur[6] is located in the eastern edge of Maharashtra in 'Vidharbha' region. It is located between 19.30' N to 20.45'N Latitude and 78.46'E longitude. The district is bounded by Nagpur, Bhandara and Wardha on the northern side, Yavatmal on the western side, Gadchiroli on the eastern side and Adilibad district of the Andhra Pradesh on the southern side. Physiographically, the district is situated within the Wainganga and Wardha river basins, respectively, flowing on the eastern and western boundries of the district which are the tributaries of Godavari River. Chandrapur district is abundantly endowed with rich flora and fauna.

(b)Water Resources :

Wardha, Wainganga and Penganga are the important rivers in Chandrapur district. The Wardha river flows into the district from the western boundary and then flows along the boundaries of Warora, Chandrapur, Korapna, Rajura, Ballarpur and Gondpipri Talukas. Penganga and Irai rivers meet the Wardha river.

The drinking water supply projects in Chandrapur district includes 203 pipeline schemes, 171 tube wells, 4078 wells and 4514 Bore well/ Hand pumps in the entire district. Besides, the Municipal councils in Chandrapur district are depending on the various drinking water sources like Chandrapur municipal etc.

(c) Ground water sources :

About 85% of the state is covered by Deccan basalts whereas the rest of the state is covered by Quaternary alluvium. The total replenishable Groundwater Resource is of the order of 37.82 BCM/Yr. Provision for Domestic, Industrial & Other uses -12.40 BCM/Yr. Available Ground

Water Resources for irrigation- 25.47 BCM/Yr. Net Draft- 38 BCM /Yr.Chandrapur district shows ground water levels declining trend (more than 20 cm per year)in Pre-Monsoon (1995-2004)

(d) Study area :

The Chandrapur town is located on 19.57’ north latitude and 79.18’ east longitudes in the eastern Maharashtra, and situated at 189.90 meter above form the mean sea level. Area of the city region is about 70.02 km². The district is situated in the Wainganga and Wardha river basin. The climate of Chandrapur is mostly tropical. Summer months are mostly hot and humid while the winter season is moderate and pleasant.

EXPERIMENTAL SECTION

Water samples from rivers,tubewell and mining area from various locations from Chandrapur city were collected and analyzed.For qualitative assessment water samples were collected in precleaned polypropylene bottles with necessary precautions (Standard Methods, 1992)[7,8,9]. Samples for dissolved oxygen (DO) analysis were taken in BOD bottles. Glassware used in the study were of high quality borosilicate brand. Chemicals used were of AR/GR grade and obtained from Qualigen/ E-Merck/Hi-media. A total of 7 samples from different sites were collected covering all major parts of the town.

Table1. Description of water sampling sites :

S.No.	Sample code	Location
1	WS1	Irai river,WCL area
2	WS2	Wardha river
3	WS3	Tube well, GEC campus
4	WS4	Zarpat river
5	WS5	Ramala lake
6	WS6	Irai Dam
7	WS7	Mahakali Under ground coal mine settling tank

Table2. Values of physicochemical parameters of 7 sampling stations :

Parameters/ Locations	pH	COD	DO	Alkalinity	Total Hardness	Chloride	Fluoride	TDS	Iron
WS1	6.3	37	4.6	193	468	94	0.9	1026	0.49
WS2	6.93	20	6.5	151.7	321	45	0.51	469	0.23
WS3	6.92	19	4.8	205	413	43.8	1.01	528	0.19
WS4	7.2	22	5.7	208.6	390	101	0.83	463	0.15
WS5	8.9	53	7.0	376.3	689	66	1.98	528	0.3
WS6	7.05	11	5.0	149.2	307.8	45	0.865	354	0.13
WS7	5.6	35	3.0	186	577.3	25	0.2	1312	1.7
WHO ,1991	7-8.5	10 mg/l	4-6 mg/l	200 mg/l	500 mg/l	200 mg/l	1.5 mg/l	500 mg/l	0.3 mg/l

RESULT AND DISCUSSION

Analytical results as depicted in table.2 revealed physicochemical characteristics of water samples from 7 locations of study area in the month of May 2010.

Graphical Representation of Various Parameters :

Fig 1

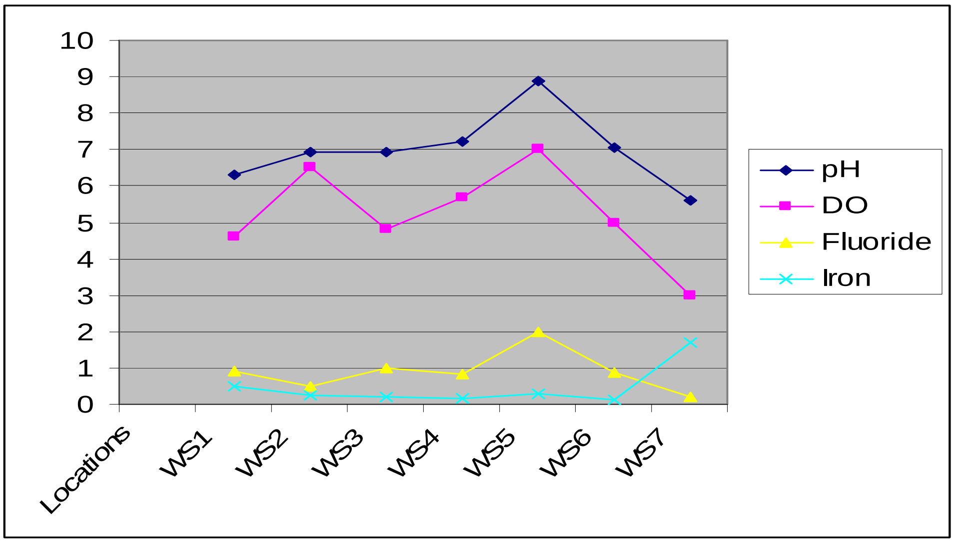


Fig 2

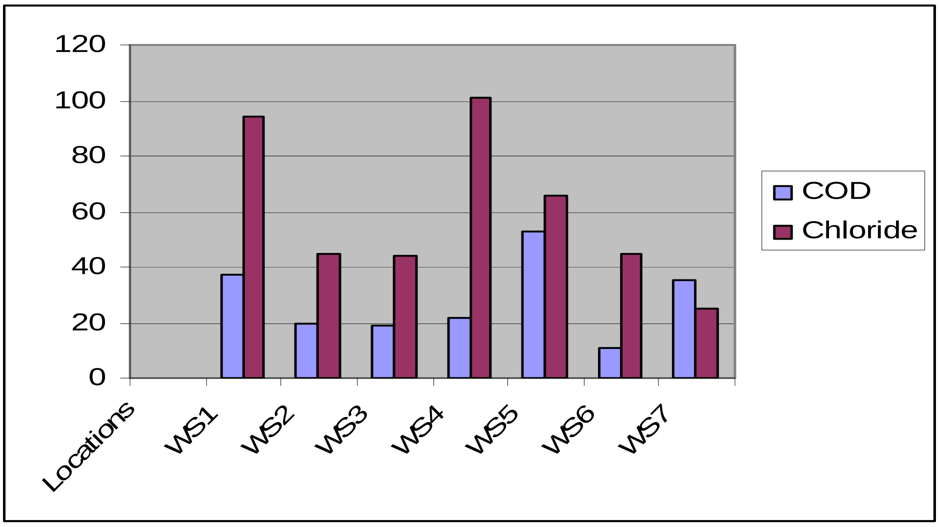


Fig 3

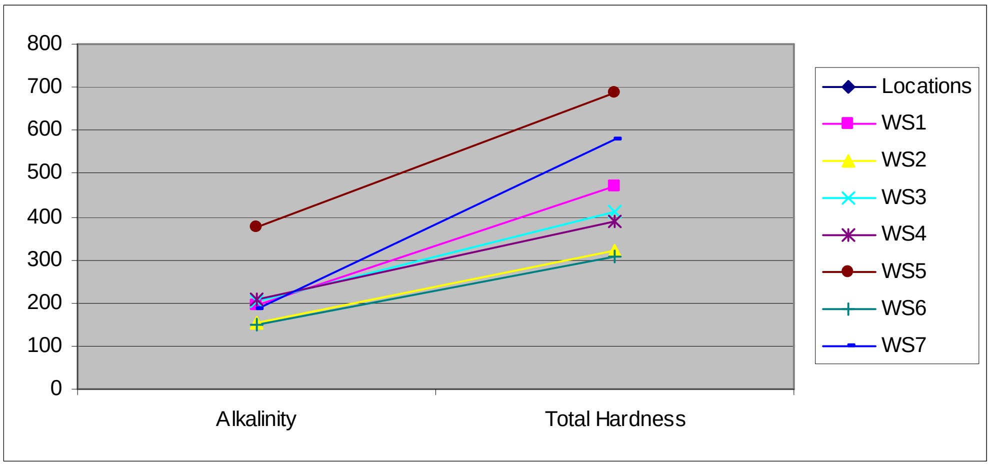


Fig 4

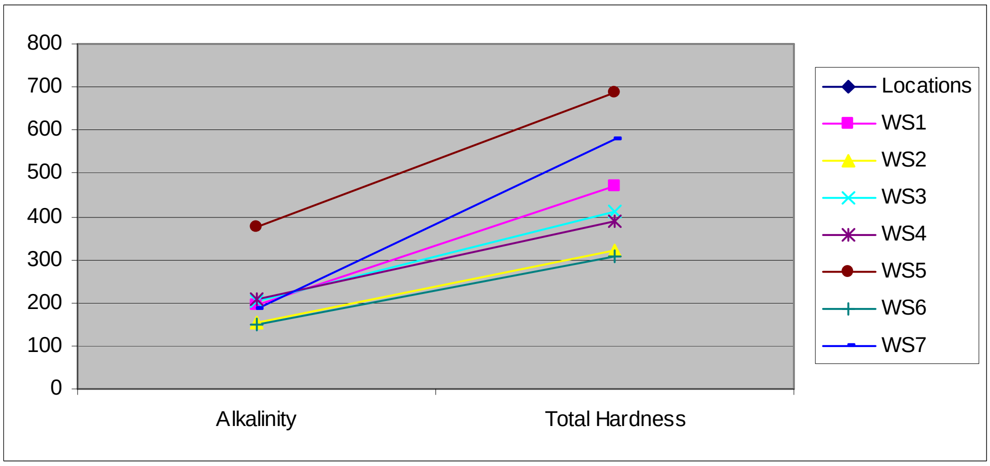
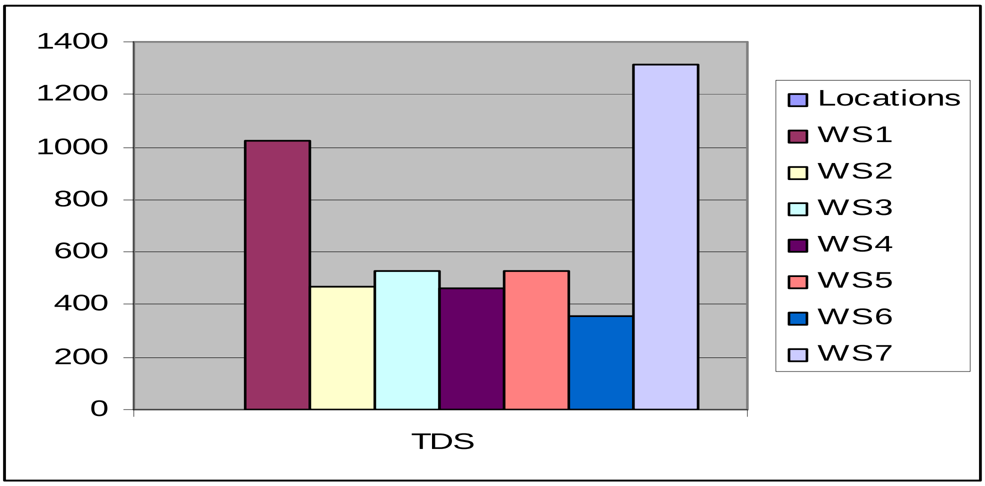


Fig 5



The results obtained were compared with their standards prescribed by WHO (1991 and BIS (1983).The value of pH was found in the range of 5.6-8.5 indicating alkalinity dominance. In WS1 and WS7 stations the acidic range may be due underground mining activities.High[10] pH indicates the free availability of heavy metals as a result of their precipitation in hydroxide form. Alkaline range of pH may be due to occurance of limestone in the surrounding region of sampling stations. Acid- base equilibrium is also a controlling parameter for change in pH of the sample.

Chemical oxygen demand (COD)values were found in the range of 11 -53 mg/l against its permissible limit of 10 mg/l.WS1,WS5 and WS7 possess high COD may be due to leaching of chemically degradable organic and inorganic matter from intensely populated surrounding area. Similar[11,12] findings were reported by earlier workers.

Chloride is one of the major inorganic anion of water. High concentration of chloride indicates pollution due to organic waste. Fluoride is important in human nutrition for normal development of bones. The required level is1.0-1.5 mg/l for drinking purpose. Excess[13] concentration of fluoride causes dental diseases in calcification stage of children. If Fluoride consumption is less than 0.6 mg/l, it can lead to dental caries, malformation of bones, among children. Raw[14] bauxite can be helpful in de- fluoridation of water with high fluoride value. Sampling station WS5 shows high fluoride concentration as compared to remaining stations.

The low concentration of Iron may be due to less percentage of pyrites. The concentration of iron was in the range of 0.13-1.7 mg/l.WS7 possess high iron content due to underground blasting in mines. It is also very important to human and other organisms, as it is partially responsible for transporting oxygen through the bloodstream. Iron is easily dissolved in water and can be found naturally occurring in water bodies.

A comparative study suggests that WS1 and WS7 shows high concentration of total dissolved solids as compared to other stations and WHO recommended limits. TDS is a general indicator of overall water quality. It is a measure of inorganic and organic materials dissolved in water. Increased TDS may impart a bad odor or taste to drinking water, as well as cause scaling of pipes and corrosion. High TDS level indicates water hardness in respective sampling station. It reduces the potability for drinking purposes in the region. The EPA's recommended maximum level of TDS in water is 500mg/L (500ppm).

CONCLUSION

From table 2 it can be concluded that most of the sampling stations shows permissible range of concentration in analysis meanwhile some of them are highly polluted. In mining area the regular monitoring is required because it is situated in populated area and hence can affect the health of local pupil of Chandrapur. For domestic utility the primary treatment on mining water is an essential step to be taken. It can be an alternative to other water resources in period of water shortage in the region .But treatment on discharge water is an essential aspect for the above purpose.

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