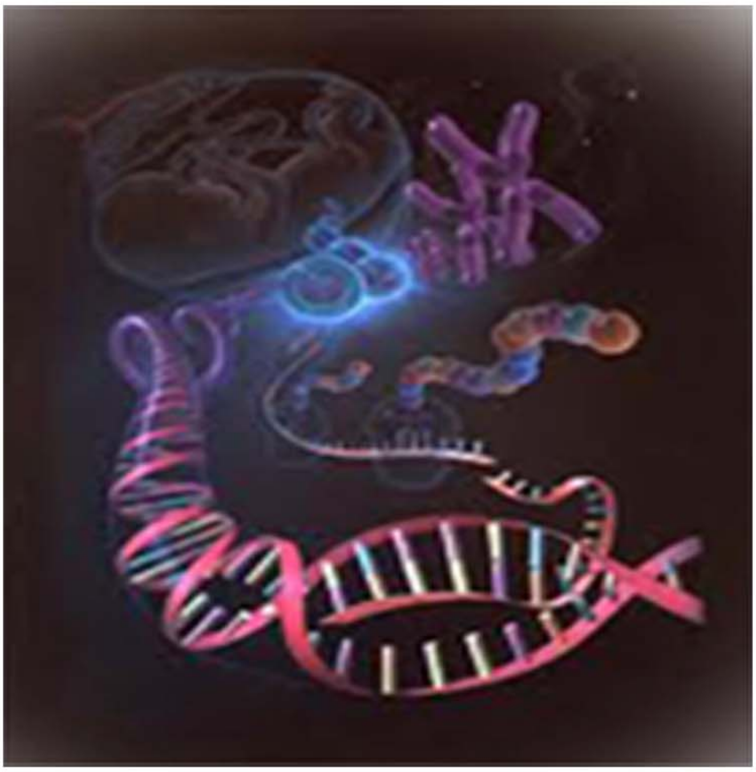
IJLBPR

ISSN 2250 - 3137
Vo1. I, No. 2, April 2012

International Journal of
Life Sciences Biotechnology and Pharma Research



www.ijlbpr.com

International Journal of Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA

Email : editorijlbpr@gmail.com or editor@ijlbpr.com

International Journal of Life Sciences Biotechnology and Pharma Research

ISSN 2250-3137 www.ijlbpr.com
Vol. 1, No. 2, April 2012

Research Paper

WATER QUALITY ANALYSIS OF SOURCE WAINGANGA RIVER FOR TIRORA TOWN

Asati S R[1]

*Corresponding Author: **Asati S R,** ✉ Email: s_r_asati@rediffmail.com

The main aim of this study is to check the suitability of the water for domestic and drinking purpose. The water quality is assessed with the objective to evaluate the Physico-Chemical characteristics & bacteriological quality of water before supplied to consumers. As there is dearth of literature on water quality, the present study analyze the faucet level water quality of existing untreated and intermittent chemical & distribution of Tirora town with special reference to suitability of water for drinking and domestic purposes. The practical approach shows its unsuitability for drinking without treatment. The investigation carried out on the spot has its own significance in relation to those undertaken in the laboratory. The samples of Wainganga River water supply was tested for physical, chemical and bacteriological parameters and their results were compared with I.C.M.R & W.H.O. drinking water standards.

Keywords: Water quality, Tirora, Physical, Chemical and Bacteriological parameters

INTRODUCTION

Water is the basic element of social & economic infrastructure, which is essential for healthy society and sustainable development. When 70% of the earth's crust is water, only 2.5% is fresh water but even here, including the frozen extremities of the globe and mountainous heights only 0.0085% is stated to be available for the vast humanity.

It is common knowledge that the management of water resources dates back to 5th century B.C. When,' Treatise on Air, Water and Place' became part of the Hippocratic corpus. Yet it is wonder that humanity realized only in the 19th Century A.D. that water is one of the important determinants of health & disease. Even of the important determinants of health and disease. Even in this computer Era of phenomenal scientific and technological developments, it is rather disconcerting that there are still constraints in achieving water-quality assurance especially in the developing countries. However poor water quality continues to pose a major threat to human-

1 Deptt. of Civil Engg., MIET, Gondia - 441 614 (MS).

health worldwide around 1.2 billion people lack access to improved water sources and 2.4 billion have no basic sanitation. 7 million people die each year of Water borne diseases including 2.2 million children under the age of five. 400 children in developing countries including India, die every hour due to water borne diseases.

In 2001, 1.96 million people died from infectious diarrhea; 1.3 million were children under age of five and India accounts for approximately a third of this tragedy. In Southeast Asia, diarrhea is responsible for as much as 8.5% of all deaths. Worldwide typhoid fever affects about 6 million people (3 lacs from India) with more than 6 lacs deaths a year. Worldwide cholera affects about 1.47 lacs people (2768 from India) with more than 6274 deaths a year (16 in India). Hepatitis affects 0.01-0.05% world populations annually & is responsible for 10–25% hepatitis cases in children. (Dr.P.P.Bhave, 2004)

Such conditions does not promote healthy environment conditions, not be technically sound in design, but also aesthetically appeal to infuse confidence in the public that the water supplied to them is not fit for designated use.

As there is dearth of literature on water quality, the present study analyze the faucet level water quality of existing untreated chemical and distribution of Tirora township, with special reference to suitability of water for drinking and domestic purposes. The practical approach shows its unsuitability for drinking without treatment. The investigation carried out on the spot has it own significance in relation to those undertaken in the laboratory.

Many a times it is difficult to envisage the course of event taking place in the actual situation. Keeping this attempt is being made at this college to understand the various problems in the field of Environmental Engineering by carrying out investigation on the field.

OBJECTIVE

The prime objective of a water supply agency is to provide hygienically safe-water to its consumers. Further it is necessary that the water required for the need should-not contain unwanted impurities, harmful chemical compound and bacteria in it. Therefore it is extremely essential to purify the water before it is supplied to consumers. Distribution network supplying treated water but operating on intermittent basis offers results in certain engineering constraints. More so, when untreated water is directly being pumped to the distribution E.S.R. even though the bacteriological quality may be safe after complete conventional treatment, intermittent operation of untreated river water through the distribution system leads to public health risk, this can be attributed to infiltration in the distribution network during non-supply hours. It also causes inconvenience to consumers due to odd hours of supply and significant wastage of precious water. More so, in the case of untreated water, such a practice does not promote healthy environment conditions, hygienic practices and pose a risk to potable water-quality.

Physical, Chemical and Bacteriological standards set up by the ICMR committee and WHO for comparing the quality of water that is used for domestic and purposes are recommended in this assessment. Adequate, accessible and safe-water supply is a prerequisite for improved public health and socio-economic development. Provision of improved water-supply services can result in a number of substantial benefits as discussed below.

Health/ Economic/Social Benefits:

Village water supply contributed to reduces the mortality rate of children and to increasing life expectancy.

It reduces the suffering and hardship caused by water related diseases and results in significant benefit to individuals and to society. Such as saving in Medical treatment including cost of medicines, workdays & income due to reduction in sickness, Travel, costs & time required obtaining health care, increased productivity and extended life span.

- It helps is to draw maximum economic benefits as it helps in considerably in saving time and energy both, in the following ways;
- It improves opportunities for keeping livestock or growing subsistence crops.
- Communities with adequate water supplies attract small business & may reduce out migration.
- The development process for water supply may be extended to community projects.
- In case of larger communities with buildings and other valuable properties, water supply may be designed to periodic improved fire fighting capacity.
- Easier access to safe-water can improve family and social development. When women are free from water bearing, they have more time not only for income producing work but also for childcare.
- Least incidence of the Water-borne diseases and improved health and hygiene particularly of the poor, resulting into reduced infant and maternal mortality.
- Development of industries and industrial production due to availability of additional water which will not only give boost to the economic development and increased productivity but will also in a decade's time, increase the income level and affordability for the purpose of full cost recovery.

LITERATURE – REVIEW

Rathore S S *et al*. (1995), made an application of value engineering to W.T.P. The information given by them required for VE analysis of WTPs.

Dhindsa S S *et al*. (1997) analyzed that drinking water sample was collected from the Ghat gate and Gandhi Nagar areas at selected locations of Jaipur city indicates that all the 15 samples collected by them from different points in both the localities were safe for drinking, as they did not contain any biological life and coliform organisms.

Mirchandani N W (1998) made an attention to certain important factors that need to be considered to make a water treatment plant achieve certain important factors that need to be considered to make a water treatment plant achieve certain objectives as well as to make the operation and maintenance of the plant simple, safe and economical.

Dr. Vijayaraghavan N *et al*. (1999), manifest based on the stipulation of the world Health organization and USPH services, Bureau of Indian standards in there IS: 105000-1991 'Specification for Drinking Water' have exhaustively stipulated limits for water supply and monitoring authorities for adoption and certification to ensure clean and hygienically safe water for human consumption in order to achieve water of satisfactory quality, sources need careful selection to ensure adequacy, environmental safety and amenability for economical and effective treatment.

Sharma M R *et al*. (2002) indicated that there is no major pollution hazard in the spring water of Bilaspur area as the MPN count of coliforms in the water samples has been found to be zero. The water in the area is highly alkaline and is very hard the chloride, Iron and fluoride contents in the spring water of the area are low. The quality of ground water in most of the areas is suitable for drinking purposes.

Kelkar P S *et al*. (2001) collected samples from various city of India [Nagpur, Panaji, Ghaziabad and Jaipur] after the start of water supply (1^{st} flush) and after half an hour indicates during continuous water supply, samples negative for fecal coliforms were more than 90%. In case of Panaji, 100% samples were free from both coliforms and fecal coliforms whereas during IWS it ranged from 24 to 73%. In Ghaziabad, Positive samples for bacteriological quality a CWS were lower as compared to the IWS, similar observation were recorded for Nagpur and Jaipur cities. Thus, during IWS, the percentage of hygienically safe water samples was much less as compared to that during CWS. In Ghaziabad, low percent of samples negative for fecal coliforms during both modes of operation is attributes to direct supply from tube well water without chlorination. Wherever disinfection of water by chlorination was effective as indicated by the presence of adequate residual chlorine, the quality of water was safe irrespective of the mode of supply. During CWS, 90-100% of water samples collected from the distribution network where negative for fecal coliforms while in case IWS, only 24-73% of samples were negative. Thus, potential health-risk involved in IWS is of significantly higher magnitude.

Bhave P P *et al*. (2004) proposed a detailed design of a water supply system done for a design period of 30 years for the SCWSS (single conventional water supply system) and DPWSS (Dual purpose water supply system), for a suburb adjoining Mumbai from Thane District, Ambarnath. From the results it can be concluded that it is economically feasible to construct DPWSS with advanced water treatment plant for achieving high quality water for drinking and cooking purposes leading to saving of capital cost of WTP in SCWSS.

Indirabai W P S *et al*. (2005), Drinking water quality of tap water and bore well water involving physical, chemical and biological parameters showed considerable variation in the different characteristic studied. The water quality index calculated for the various parameters tested over a period of three months ranged between 63.13 and 69.50 for tap water and 65.58 and 73.52 for bore well water. It is axiomatic that all the samples tested were of medium (poor) quality for drinking except for two. Hence it is pertinent that water needs purification prior to its utilization, so as to control the outbreak of water borne health hazards. Necessary steps should be taken to ensure good quality and quality of drinking water.

Yogammoorthi A (2005) made an attempt to ascertain the quality of the Pondicherry coastal water. Four sampling stations-2 on the 1-fathom line and two on the 5-fathom line were fixed. The results revealed that the total coliforms bacterial population showed seasonal variation viz. between post- and pre-monsoon periods. Secondly, the stations near the coast showed very low counts of bacterial population when compared to the 5-fathom line i.e. about kilometer away from the coast on the sea. However, such incidence level is well below the admissible standard values indicated by W.H.O.

Asati S R *et al*. (2003, 2009) conducted the experimental study which found the water quality of ground water was acceptable from physico-chemical analysis while as far as the bacteriological standards was not at all fit for drinking purposes, it can be used after using disinfection system.

MATERIALS AND METHODS

Tirora town is a Tehsil of Gondia District (MS) situated at the latitude of 21.24° N and a longitude of 79.56° E, on Gondia-Tumsar state highway and Nagpur-Howrah Railway line. It is about 32 km away from its district head quarters both by road and rail. It receives maximum, minimum and average rainfall of 1640 mm, 1007 mm, and 1580 mm respectively. It was created a municipality in the year 1956. Now Tirora town is also well known for generation of 2200 megawatt thermal power plant of Adani group.

The main source of water supply to the town is the Wainganga River located 4 km away from E.S.R., two deep-well Turbine pumps supply 1, 00,000 liters/hrs. of water to the ESR against the total head of from and the pumping is carried out for 20 hrs/day. The E.S.R. has supply capacity of 8,00,000 liters and discharge of the ESR is 1.60 MLD. The distribution of water to the town is only for two hours in morning and two hours in evening. This supply remains only for 40% of the total present population of 25,637 souls (as on year 2005). Any other consumed are not interested in having connection of municipal water supply and some of them have discontinued their connections because of the bad quality of water, as there is no provision of treatment for the water supply in the town.

Wainganga River is the most important river of this zone. It originates from the hill above Partabpur near Mundara in Seoni district (M.P.). The length of the river in the district is 98 km. and the average width is about 250 m. the main tributary of the Wainganga River is Bagh River. The river flows pass the district town and crosses the southern boundary at Borinda. The water of the Wainganga is utilized for drinking purpose.

The water quality variables are broadly classified into three categories –

1. Physical: The physical parameter includes general appearance, temperature, turbidity, color, taste and odor, etc.
2. Chemical: Chemical parameter include all possible inorganic and organic substances such as pH, acidity, alkalinity, hardness, conductivity, chlorides, sulphates, nitrates, BOD, COD, DO, etc.
3. Bacteriological: The bacteriological parameters includes coliform, MPN, Total plate count (TPC), bioassay counts or species diversity, etc.

The water samples collected from study area depend upon the method of sampling. All samples of water were properly labeled and are accompanied by complete and accurate identifying and descriptive data. Data collected include date and time of collection, type of source of the sample and temperature of water at the time of collection. When samples collected from the same sampling point for different analysis, it is essential that the sample for bacteriological examination be taken first. Samples were collected in polythene material based plastic bottle. Sample bottles were carefully cleaned before use and rinsed with a chemical-acid cleaning mixture by adding one liters of concentrated sulphuric-acid slowly with stirring of 35ml saturated sodium dichromate solution. After having been cleaned, bottles are rinsed thoroughly with tap water and then with distilled water.

About 2 to 2.5 liters of the samples was required for analysis. Prior to filing the sample bottle was rinsed out two or three times with water to be collected. Proper care taken to obtain a sample from of existing conditions and to handle it in such a way that it does not determinate or become contaminated before it reached the laboratory.

The samples were reached the place of analysis as quickly as possible within 2 hrs of collections. The time elapsed between collection and analyses were recorded in the laboratory report. Parameters like temperature were carryout only at spot because it may change their characteristics significantly during transport. For Physico – chemical and biological examine of water a proper sampling procedure (grab sample) was adopted.

The frequency of collection of samples for chemical analysis depends on the variability of the quality of tested water, the type of treatment processes used and other local factors. Samples for chemical examination should be collected at least once every three months in supplies serving more than 50,000 inhabitants and at least twice a year or supplies nearly 50,000 inhabitants. More frequent sampling for chemical examination may be required for the control of water treatment processes.

It is necessary to collect samples of both raw and treated water for examination of toxic substances at least every three months and more frequently when sub tolerance-levels of toxic substances are known to be generally present in the source of supply or where such potential pollution exists.

For bacteriological sampling which controls the safety of supply to the consumer, the frequency of sampling and the location of sampling points of pumping stations, treatment plants, reservoirs as well as the distribution system, should be such as to enable a proper evaluation of the bacteriological quality of entire water-supply.

The sample was being taken from the different points on each occasion to enable overall assessment. Since the population of Tirora Town is more than 20,000, the samples were collected from the study area once in a week. Total sixteen numbers of water samples were collected from two different locations such as near pumping station and where water is collected before discharging to consumers. The distance between two consecutive locations is about 4 kms. The water samples were analyzed for pH, turbidity, total hardness (calcium and magnesium), chloride, alkalinity and coliforms. All these parameters were carried out at laboratory by suitable method of analyzed.

RESULTS AND DISCUSSION

The samples of Wainganga River water supply was tested for physical, chemical and bacteriological parameters and their results were compared with I.C.M.R & W.H.O. drinking water standards.

After performing Physical, Chemical and Bacteriological tests on water sample taken at the faucet-points of the Tirora water supply, the calcium hardness, Magnesium hardness, Total hardness and pH were found nearer to intolerable concentration are found to be safe for domestic and drinking purposes. Chloride, alkalinity and turbidity were found within the permissible limit.

Excessive hardness in water does not cause any health hazards, however water should contain some amount of hardness because calcium salts are required for the growth of children. The soft water dissolves lead much more readily than the hard-water and hence there is less chance of lead poisoning with hard-water than with soft water.

Presence of coliforms in water sample is found hazardous for human health; it may because water-Borne diseases such as cholera, dysentery, Para-Typhoid, Polio and Jaundice are viral-diseases due to untreated drinking water, which may be contaminated due to fecal matters of waste product of affected persons. And there is also a need to control Ca & Mg hardness in the water as they are in intolerable level.

From the above observation (Tables 1 and 2), it can be concluded that the water supplied to Tirora town from Wainganga River is not good for the health of consumers and hence its proper and immediate treatment is very much essential.

Table 1: Water Quality Results from Tirora Town, Location 1

S. No.	Date of Collection Sample	pH	Phenolph-thalein Alkalinity Mg/Lit	Methyl Orange Alkalinity Mg/Lit	Total Alkalinity Mg/Lit	Chloride Mg/Lit	Calcium Hardness Mg/Lit	Total Hardness Mg/Lit	Magnesium Hardness Mg/Lit	Turbidity PPM	Colifom (MPN index)
1	15-02-07	7.1	0	150	150	35	330	470	140	20	130
2	20-02-07	7.2	0	180	180	38.5	336	480	144	20	125
3	28-02-07	7.5	0	132	132	35.45	336	480	144	20	128
4	13-03-07	7.6	0	132	132	39.7	328	364	36	22	125
5	20-03-07	7.5	0	160	160	35.5	446	578	132	22	130
6	29-03-07	7.5	0	165	165	38	410	535	125	20	110
7	5/4/2007	7.5	0	144	144	40	264	340	74	22	120
8	13-04-07	7.7	0	164	164	46.8	464	548	84	22	130
9	28-04-07	7.5	0	120	120	42	500	564	64	20	125
10	15-05-07	7.6	0	128	128	38	688	760	72	20	128
11	24-05-07	7.7	0	160	160	35	560	640	80	20	120
12	5/6/2007	7.5	0	105	105	35.5	520	635	115	22	230
13	18-06-07	7.5	0	88	88	42	530	670	140	30	220
14	28-06-07	7.5	0	100	100	44	490	610	120	35	220
15	9/7/2007	7.8	0	110	110	48	530	680	150	35	230
16	20-07-07	7.9	0	115	105	48	535	690	155	35	232
ICMR & WHO		Permi-ssible	–	–	–	Permi-ssible	Intolerable	Excessive	Intolerable	Excessive	Excessive

Table 2: Water Quality Results from Tirora Town, Location 2

S. No.	Date of Collection Sample	pH	Phenolph-thalein Alkalinity Mg/Lit	Methyl Orange Alkalinity Mg/Lit	Total Alkalinity Mg/Lit	Chloride Mg/Lit	Calcium Hardness Mg/Lit	Total Hardness Mg/Lit	Magnesium Hardness Mg/Lit	Turbidity PPM	Colifom (MPN index)
1	15-02-07	7.2	0	155	155	36	335	480	145	20	130
2	20-02-07	7.5	0	170	170	38	335	482	145	20	130
3	28-02-07	7.5	0	130	130	36	340	485	145	20	130
4	13-03-07	7.6	0	135	135	40.1	330	370	40	22	125
5	20-03-07	7.5	0	165	165	38	450	575	135	22	140
6	29-03-07	7.5	0	160	160	38	410	535	125	20	110
7	5/4/2007	7.5	0	140	140	40	260	335	75	22	120
8	13-04-07	7.8	0	160	160	45	460	545	85	22	135
9	28-04-07	7.5	0	120	120	40	500	565	65	20	127
10	15-05-07	7.8	0	125	125	38	690	760	70	20	130
11	24-05-07	7.8	0	160	160	35	565	665	100	20	125
12	5/6/2007	7.6	0	105	105	36	525	645	150	22	235
13	18-06-07	7.5	0	85	85	42	525	685	160	30	225
14	28-06-07	7.6	0	105	105	45	500	625	125	35	221
15	9/7/2007	7.9	0	110	110	48	530	680	150	35	237
16	20-07-07	7.9	0	120	120	50	540	700	160	35	238
ICMR & WHO		Permi-ssible	–	–	–	Permi-ssible	Intolerable	Excessive	Intolerable	Excessive	Excessive

REFERENCES

1. Asati S R *et al*. (2009), "Report on the Study Conducted in the Campus of M Patel Institute of Engg. & Technology In Gondia Distt. of MS on Physico-Chemical and Bacteriological Parameters of Water Samples From Different Sources", *Journal of IPHE India*.

2. Bhatia K K S (2007), "Water Quality and Water Quality Modeling", *Journal of All India Council of Technical Education*, New Delhi pp. 01-28.

3. Birde G S (1994), 'Water Supply and Sanitary Engineering', II Edition Published by India Publishing House, New Delhi.

4. Dixit A J *et al*. (2003), "Evaluation of Suitability of Ambanala Water Amravati", for *Irrigation Journal of IWWA*, pp. 230-247.

5. Dutta A K et al. (1994), "Water-Borne Diseases and Drinking Water", *Journal of IWWA*, pp. 39-46.

6. Dhindsa S S *et al*. (1997), "Biological and Bacteriological Investigation on Contamination of Drinking Water in Jaipur: A Case Study', *Journal of IWWA,* pp. 243-249.

7. Elizabeth K M *et al*. (2005), "Physico-Chemical & Microbiological analysis of water

from Lake Hussain-Sagar", *Journal of IWWA,* pp. 96-102.

8. Fukmare Anil K *et al*. (2002), "Bacteriological status of drinking water in Akola City of M.S.', *Asian Journal of Microbial Biotech., Environment Science*, Vol. 4, p. 2.

9. Goyal V K (1999), *Water-Pollution,* III Edition, Published New Age International Publication Ltd., New Delhi.

10. *Guidelines for Drinking Water Quality,* II Edition, Wito, Geneva (1990), pp. 97-100.

11. Kelkar P S *et al*. (2001), "Water Quality Assessment in Distribution System Under Intermittent & Continuous Modes of Water Supply", *Journal of IWWA,* pp. 39-45.

12. Kudesia V P (1990), *Water Pollution*, III Edition, Published by K K Mittal and Pragati Publication, Meerut, pp. 285 -290.

13. Mirchandani N W (1998), "Planning and Layout of Water-Treatment Plants", *Journal of IWWA,* pp. 255-264.

14. Manual on Water Supply & Treatment (1991), (Third-Edition), Central Public Health & Env. Engg. Organization (CPHEEO), Ministry of Urban Development New Delhi.

15. Padolkar A T *et al*. (2004), "Dual Purpose of Water-Supply System", *Journal of IWWA,* pp. 281-285.

16. Parvate A V R *et al*. (2001), "Operation & Maintenance Problems in Water-treatment Plant: A Case Study", *Journal of IWWA,* pp. 23-27.

17. Rathore S S *et al*. (1995), "Value Added Engineering Study of Water Treatment Plants", *Journal of IWWA,* pp. 19-23.

International Journal Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlbpr@gmail.com or editor@ijlbpr.com
Website: www.ijlbpr.com

ISSN 2250-3137