Studies on Physico-Chemical and Microbial Analysis of Drinking Water at Mahoba (U.P.) India

Rani Sonkar
Department of Zoology
Bundelkhand University Jhansi

Abstract—Assessment of physico chemical and microbiological factors surface water and ground water tube well water were determined in summer season in 2015. Samples were taken from six points in the entire city. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which include chemical and micro-biological such contaminant causes serious health problems. Due to this contaminant quality of the drinking water becomes poor. During the study it was found that maximum numbers of physical and chemical factors were within the desirable limit as suggested by WHO and BIS. The objective of the present research it to provide information on the physico chemical and microbiological characteristics of drinking water in order to discuss its suitability for human consumption it is hazardous for the entire populations in the present study at Mahoba.

Key words: Physico-Chemical, Microbiological Factors, ISI/WHO, Drinking Water

I. INTRODUCTION

The primary purpose of the guidelines for drinking water quality is the protection of public health. The availability and portability of drinking water is a great stress to the entire world so it is a burning problem at present. U.N.O has declared “Water for life” from the year 2005 to 2015. This decade for action further world water day is celebrated on 22nd March of Every year. Besides the water year was celebrated in the year 2007. The government of India launched the national rural drinking water quality monitoring and surveillances programed in February 2006. This envisages institution animation of community participation for monitoring and surveillance of drinking water sources at the grass roots level by gram panchayat & village water and sanitation committees followed by checking the positively tested samples at the district and state level laboratories. One major problem when it comes to addressing the problems related to water is that the provisions for water are distributed across various ministered and institutions.

Ground water is about 20% of the world resource of fresh water and widely used by industry irrigation and domestic purpose only about 1% of all of fresh water available from river, pond and Lakes. Ground and surface water also polluted by domestic waste industrial waste, Fertilizers ground water is ultimate and most Suitable fresh water resources for human consumption in both urban as well as rural areas. The important of ground water for existence of human society cannot be over emphasized. There are several states in India where more than 90% populations are depending on ground water for drinking and other purpose.

The contaminated drinking water is hazardous for human being & it may be fatal also. The undertreated water cause defects in nervous system organ damage, reproduction effects and cancer like fetal diseases. According to the central pollution Board (2000) 90% of the water supplied in Indian towns and cities are polluted out of which only 1.6 gets treated.

In Uttar Pradesh the total area is approximately 1.65 million hectare but lentic water is approximately 0.162% in rural ponds 0.133% in lakes and reservoirs contain 1.50% but the Bundelkhand region is facing great crises of drinking water and with contamination. In spite of it the drinking water quality assessment has not yet been done in Chitrakoot division. In the region especially the district Mahoba is facing great shortage of drinking water. It is not located on the river bank so drinking water for the city is supplied by the pond Madan Sagar some tube wells.

Mahoba city is located in between latitude 25 degree 15’N to 25 degree 18’N and longitude 49 degree 50’E to 79 degree attitude of 207 me, above mean sea level. It is situated in the rocky Vindhya Range of Bundelkhand which faces acute scarcity of Drinking water is summers. The drinking water supply in Mahoba city is pond Madan Sagar and tube wells ground water supply. The water Supply pipeline scheme of Mahoba City was executed during the year 1959-60 and commission in the year 1963. The water is supply system is treated with chlorine and also filtered as per the water work norms besides shortage of water in this area drinking water is also contaminated which is also contaminated which causes various water born diseases viz. Diarrhea Cholera, Typhoid, Hepatitis colic dysentery etc. As no physico chemical factors to assess the drinking water quality and proper measures are to be adopted for the suitable quality of water in distribution system. So this important work was carried out scientifically to find out the pollution problems along with the suggestion for proper management on the drinking water. In the present study at Mahoba City (U.P.).

II. MATERIAL AND METHODS

The physico Chemical factors along with microorganism Viz – MPN/SPC of coli form bacteria will be analyzed as per the standard. methods given in American Public health association (APHA), American water works association (AWWA) and water Environment Federation (WEF) 21st 2005.

Total Six (6) samples were collected in summer season 2015 from different location In Mahoba City. Selections of Six different stations were identified and six water samples were collected at sites and assigned as S1, S2, S3, S4, S5 and S6 sample sites are described in Table-I sample were collected from the sites in between 10.30 to 11.00 am sample for the analysis of Dissolved oxygen was collected in B.O.D bottle (250 ml) by Winkler “A” solution at site. The factors like Temperature and turbidity was
recorded at the site for the analysis of other chemical and microbiological factors. Sample were collected in Plastic can and carried to the laboratory on same day. Physico Chemical factors water temperature colour, taste, turbidity, PH, Total hardness total Alkalinity fluorides D.O. T.D.S iron Cl. etc

A. Microbiological Examination
- Total bacterial density by standard plate count (SPC) after counting the bacterial colonies by “Quebec colony counter “SPC/ml will be calculation by the following formula colony counted.
- Most Probable number of coli forms – it will be calculated by conducting three following tests.
- MPN fecal form it will be calculated by MC grandly table published in chemical and biological methods for water pollution studies “Trivedi and Goel (1986)”
1) Presumptive tests
2) Confirmatory Test
3) Completed Test

III. RESULT AND DISCUSSION

The examined Physico chemical and bacteriological factors should considerable variations in different samples. The observation are depicted in table 2 and 3 Colour Drinking water should ideally have no visible colour. Colour in water may be to the organic ions, such as iron and managers, human and pet, materials, plank on, and weeds industrial waste. In the present study the colored water was observed as stations.

A. Taste/ Odour
It was found satisfactory in the tube well in summer’s seasons, brackish taste was found in and unsatisfactory taste was found in the month of June in surface water. Taste and odour may also develop during storage and distribution due to microbial activities odour less water was in all the stations.

B. Water Temperatures
PH The effect of PH on the chemical and biological nature of water makes for different is very important. It is defined as log (H) and measured as intensity of acidity or alkalinity on a scales ranging from O-14. The free H are more it is expressed acidic (i.e. PH < 7) while more OH ions is expressed as alkaline (i.e. PH >7) PH value of surface and ground water ranged from. The acidic medium of water is quite harmful. Whereas alkaline medium above. 7 to 9.5 are suitable for fish culture and other bio-data.

C. Turbidity
Turbidity varied form 1.5 to 2.9 NTU in summer season in these stations. It shows light transmitting properties of water and I comprised of suspended ad colloidal material which is concerned with health. This is unsafe for consumption and industrial use also.

D. T.D.S.
T.D.S. varied from 260 mg to 740 Mg/l in the course of study in summer season. T.D.S increases the conduct value due to vegetable decay, evaporation, disposed off effluents and chemical wreathing of rock & High T.D.S water has salty taste and produce scaling on water heater and cooking utensils T.D.S denotes the suspended impurities.

E. Total hardness
It varied from 128 Mg/ to 460 Mg/l in summer season in the surface and ground water. It was observed that total hardness is directly affected by alkalinity and PH. It is important parameters in decreasing the tonic effect.

F. Total Alkalinity
During the course of study it was found to be in the range of 175 to 358 Mg/lit. The alkalinity in the water is generally due to salts of carbonates, bicarbonates and phosphates.

G. D.O.
Dissolved oxygen ranged from 5.3 to 7.8 Mg/lit if may be present in water due to direct diffusion from are and photosynthetic activity of autographs in surface water concentration of D.O. is one of the most important parameters of indicate water purity

H. Fluoride
It High concentration causes dental fluorosis and lower concentration (<0.8 Mg/l) causes dental carries, sources fluoride are found in cake, glass and ceramic, electronic, push and fertilizer fluoride of all the samples were in range 0.14 – 0.45 mg/l. the prescribed limit.

I. Iron
Iron of all the samples were in range 0.26 to 0.67 mg/l. Which is very high compared to standard values. Water sample from the sites in Mahoba City contain high value sample stations.

J. Nitrate
Nitrate varied from 25 to 48 ml in summer season BIS is and Indian standard has set a desirable limit 45.0 mg/l. Nitrate in drinking water. The higher value of nitrate was observed in summer due to much excretory matter domestic sewage.

K. Bacteriological Taste
1) Total Coli form
Total coli form Bacteria in the present study of total coli (MPH) in drinking water it was counted from 610 to 876/100 ml W.H.O. has set a desirable limit of total coli form organism in drinking water (Most probable number)

2) E. coli
In the present study the MPN of Escherichia coli in water, it was counted from 685 to 995/100 ml. The source and occurrence E. coli in high numbers in human and animals faces sewage, BIS/WHO, has set a desirable limit of E. coli – from in zero number/100 ml in drinking water BIS has not set any standard of coli form organism in drinking water as per the WHO desirable limit both types of water under study are not potable which needs proper treatment for distribution.

<table>
<thead>
<tr>
<th>Sampling Code</th>
<th>Sources</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Charkhari By pass</td>
<td>Ground Water</td>
</tr>
<tr>
<td>S2</td>
<td>Batipura</td>
<td>Ground Water</td>
</tr>
<tr>
<td>S3</td>
<td>Bajariya</td>
<td>Ground Water</td>
</tr>
<tr>
<td>S4</td>
<td>Ram Lila Maidan</td>
<td>Ground Water</td>
</tr>
</tbody>
</table>
In the present study Physico-chemical and microbiological factors in water at its source and consumers points areas were assessed because contaminated water may lead to the various health related problems. The present study emphasized on the two major handling firstly chlorination is much to reduce the microbiological load of water secondly turbidity load at consumer pounds areas indicates that water become contaminated. Secondly point load at consumer points areas indicates that water become contaminated when it is supplied to these areas. As per the result the water of Mahoba city which have excess of isron, fluoride and bacteria mainly on the basis it should be treated to remove these following the critic of W.H.O. and BIS method they are also quite harmful for the human body some of locations in study area are unfit for draining as well other domestic purpose.

### Table 1: Sources of different water samples collected in Mahoba City

<table>
<thead>
<tr>
<th>Sample No</th>
<th>Taste</th>
<th>Odour</th>
<th>Colour</th>
<th>Turbidity</th>
<th>PH</th>
<th>TDS</th>
<th>T.H. (mg/l)</th>
<th>T.A. (mg/l)</th>
<th>Cl (mg/l)</th>
<th>D.O (mg/l)</th>
<th>FL (mg/l)</th>
<th>Iron (mg/l)</th>
<th>NO₃ (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁</td>
<td>Satisfactory</td>
<td>Odour-less</td>
<td>Colour-less</td>
<td>1.5</td>
<td>7.2</td>
<td>142</td>
<td>630</td>
<td>167</td>
<td>175</td>
<td>5.8</td>
<td>0.24</td>
<td>0.53</td>
<td>25</td>
</tr>
<tr>
<td>S₂</td>
<td>Satisfactory</td>
<td>.. ..</td>
<td>.. ..</td>
<td>2.0</td>
<td>7.3</td>
<td>128</td>
<td>668</td>
<td>144</td>
<td>134</td>
<td>6.6</td>
<td>0.21</td>
<td>.48</td>
<td>32</td>
</tr>
<tr>
<td>S₃</td>
<td>Satisfactory</td>
<td>.. ..</td>
<td>.. ..</td>
<td>1.8</td>
<td>7.1</td>
<td>126</td>
<td>280</td>
<td>128</td>
<td>126</td>
<td>6.98</td>
<td>0.45</td>
<td>0.67</td>
<td>48</td>
</tr>
<tr>
<td>S₄</td>
<td>Slightly Brackish</td>
<td>.. ..</td>
<td>.. ..</td>
<td>2.5</td>
<td>7.9</td>
<td>180</td>
<td>740</td>
<td>460</td>
<td>358</td>
<td>5.3</td>
<td>0.31</td>
<td>0.45</td>
<td>36</td>
</tr>
<tr>
<td>S₅</td>
<td>Satisfactory</td>
<td>.. ..</td>
<td>.. ..</td>
<td>2.1</td>
<td>7.6</td>
<td>156</td>
<td>516</td>
<td>320</td>
<td>259</td>
<td>6.1</td>
<td>0.14</td>
<td>0.58</td>
<td>29</td>
</tr>
<tr>
<td>S₆</td>
<td>Unsatisfactory</td>
<td>.. ..</td>
<td>Green</td>
<td>2.9</td>
<td>8.0</td>
<td>172</td>
<td>290</td>
<td>205</td>
<td>178</td>
<td>7.8</td>
<td>0.32</td>
<td>0.26</td>
<td>36</td>
</tr>
</tbody>
</table>

### Table 2: Physico-chemical factors of different water samples

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Coliform</th>
<th>E. Coli</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁</td>
<td>715</td>
<td>731</td>
</tr>
<tr>
<td>S₂</td>
<td>819</td>
<td>803</td>
</tr>
<tr>
<td>S₃</td>
<td>610</td>
<td>685</td>
</tr>
<tr>
<td>S₄</td>
<td>748</td>
<td>701</td>
</tr>
<tr>
<td>S₅</td>
<td>809</td>
<td>764</td>
</tr>
<tr>
<td>S₆</td>
<td>876</td>
<td>995</td>
</tr>
</tbody>
</table>

### Table 3: Microbiological factors of different water samples

### IV. CONCLUSION

In the present study Physico-chemical and microbiological factors in water at its source and consumers points areas were assessed because contaminated water may lead to the various health related problems. The present study emphasized on the two major handling firstly chlorination is much to reduce the microbiological load of water secondly turbidity load at consumer pounds areas indicates that water become contaminated. Secondly point load at consumer points areas indicates that water become contaminated when it is supplied to these areas. As per the result the water of Mahoba city which have excess of isron, fluoride and bacteria mainly on the basis it should be treated to remove these following the critic of W.H.O. and BIS method they are also quite harmful for the human body some of locations in study area are unfit for draining as well other domestic purpose.

### REFERENCES


[8] Environmental Protection Agency (USEPA) (2003), Chemical contamination in drinking water. Technical lost sheet on microbes EPA 816-03-016
