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# Demand Analysis And Metal Analysis For Assessment Of Water Quality Index in Drinking Water Of Kada, Dist Beed

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## ABSTRACT

The water quality characteristics of aquatic environments arise from multiatitude of physical, chemical and biological interactions. The water bodies, lakes and estuaries are continuously subject to a dynamic state of change with respect to their geological age and geochemical characteristics. The physico-chemical characteristics of the aqueous phase have direct influence on the types and distribution of aquatic biota as well as on the health of the human being. With this pace the present study is carried out for determination of indicator parameters, in the ground water bodies of Kada town. It is a strongly drought prone area. Demand analysis as Biological Oxygen Demand, Chemical Oxygen Demand, has been carried out which are found to be within permissible limits. Throughout the city, drinking water is supplied through metal pipelines, hence metal analysis in drinking water forms important aspect to study potability. Cu(II), Ni(II), Fe(II) are determined by Indian Standard methods , spectrophotometrcally; which are found within permissible limits.

***Key Words*** *: Indicator parameters, Aquatic Environment, Demand Analysis*

## Introduction :

One of the most precious and important natural resource is water. It is essential for survival of all living beings from simplest herbs and microorganisms like bacteria ,viruses upto complex systems of human body(1-3). Physico - Chemical analysis is the first consideration of water quality for its best usage i.e. for drinking, bathing, fishing, industrial processing and soon. Kada Town comes under draught prone area. The weather of the town is dry. It is found that because of the reckless use & misuse of ground water resources as well as surface water, the water have become dangerously impure. River in the city is being used as dust-bin for the disposal of city refuse as well as industrial effluents. Drainage system in the city is open drainage system. The untreated domestic water from human settlement find their way into the river through outfall, drain etc. This in turn results in organic, bacterial, pollution of natural water resources and its aggravation day by day. Water which is to be utilized for human consumption should be free from pathogens as it may create epidemics also it should be free from hazardous chemicals as are risky to health. Demand analysis includes demand of oxygen to oxidize organic matter present in water bodies as pollutant. Thus the main aim of present study is to estimate the extent of water pollution and thereby to assess the water quality status of Kada Town.

**Experimental :**

Survey of the city have been done and on the basis of topography. Samples from four sources i.e. stagnant water bodies, flowing water bodies, open dug well and tube well, have been collected. Study has been carried out in the month of January. The water samples have been analysed for study of water quality assessment and physico-chemical parameters. The analysed values have been then compared with permissible standard according to the Indian Standards IS 10500 & IS 2490. The analytical methods applied for determination of indicator parameters were also according to these standards. Six samples from different parts of central region of the city were collected. These were respectively from Sample 1- Tap water (Residence of citizen), Sample -2 Tube well (Bhagini Nivedita School), Sample- 3 Dhariwal Pharmacy College Kada, Sample - 4 Z P School Kada, Sample-5, Gram Panchayat Office), Sample -6 Tanker (Hotel at ST Stand).

**METHOD AND REAGENTS:**

All Reagents used are of Anal R Grade, and Instruments like pH Meter , Spectrophotometer are Systronics Make Model.
Methods used for analysis are according to IS:10500 and IS: 2490

**Method for Calculation of sub index or quality rating** :

Let there be 'n', water quality parameters and quality rating or sub index ($q_0$) corresponding to nth parameters is a number reflecting the relative value of this parameters in the polluted water with respective to its standard permissible value.
The $q_n$ is calculated using following expression. $q_n = 100( V_n - V_{io})/ (S_n - V_{io})$
Where, $q_n$= Quality rating for the $n^{th}$ water quality parameter.
$V_n$= Estimated value of $n^{th}$ parameters at a given sampling station.
$S_n$ = Standard permissible value of the $n^{th}$ parameter
$V_{io}$= Ideal value of nth parameters in pure water, i.e 7.0 for pH, 14.6mg/L for DO, and 0 for all other parameters.
For instance, $q_{pH} = 100( V_{pH} -7)/(8.5 - 7)$ where $V_{pH}$ is the observed value of pH, and pH 7.0-8.5 is the permissible value of water.
Likewise $q_{DO} = 100(V_{DO}-14.6)/(5 – 14.6)$.
Calculation of Unit Weight : $W_n = K/S_n$ where $W_n$=unit weight for the $n^{th}$ parameters, K=constant of proportionality. The overall Water Quality Index was calculated by aggregating the quality rating ($q_n$) with the unit weight linearly,
$WQI = \Sigma q_n W_n / \Sigma W_n$

**Table 1 : Water Quality Rating For Drinking Purpose**

| WQI | Water Quality | Possible Usage |
|---|---|---|
| 0-25 | Excellent Quality | Drinking, Irrigation, Industrial |
| 26-50 | Good | Domestic, Irrigation Industrial |
| 51-70 | Fair | Irrigation and Industrial |
| 76-100 | Poor | Irrigation |
| 101-150 | Very Poor | Restricted use for Irrigation. |

**Table 2 : Drinking Water Standards Recommended by Standard Agencies and Unit Weights**

| Standards ($S_n$) | Standards($S_n$) | Recommended | Unit |
|---|---|---|---|
| 1. Conductance | 300 | WHO | 0.00095 |
| 2. TDS | 500 | ICMR | 0.00057 |
| 3. pH | 7 – 8.5 | ICMR | 0.03365 |
| 4. Chlorides | 250 | ICMR | 0.00114 |
| 5. Nitrates | 45 | WHO/ICMR | 0.00636 |
| 6. Phosphates | 25 | USPH | 0.01144 |
| 7. Sodium | 20 | ISO | 0.01430 |
| 8. Potassium | 20 | USPH | 0.01430 |
| 9. Sulphate | 150 | ICMR | 0.00191 |
| 10.Alkalinity | 120 | ICMR | 0.00238 |
| 11.Hardness | 300 | ICMR | 0.00095 |

**Result and Discussion**:

The collected water samples have been tested for determination of indicator parameters and the results obtained for six samples were tabulated as below. The ratio of BOD:COD describes organic toxicity because COD is a measure of total of i.e toxic and non – toxic organics and BOD is a measure of nontoxic organic load. because COD is a measure of total (toxic and nontoxic) organics and BOD is a measure of nontoxic organic load.

**RESULTS -**

| Parameters | Sample I | Sample II | Sample III | Sample IV | Sample V | Sample VI |
|---|---|---|---|---|---|---|
| Temperature $^0$C | 26 | 22 | 25 | 23 | 21 | 22 |
| Turbidity (NTU) | 4.5 | 7.0 | 5.7 | 7.7 | 8.56 | 11.9 |
| pH | 7.6 | 7.42 | 7.7 | 6.9 | 6.8 | 6.8 |
| Acidity (mg/L) | 14 | 22 | 16 | 28 | 30 | 60 |
| Alkalinity (mg/L) | 1765 | 1210 | 1240 | 2220 | 2600 | 2350 |
| D O (mg/L) | 8.78 | 6.4 | 6.0 | 4.8 | 4.4 | 3.6 |
| COD (mg/L) | 177.8 | 211.2 | 192 | 220.8 | 263.2 | 760 |
| BOD (mg/L) | 29 | 37 | 24 | 44 | 39 | 60 |
| Suspended Solids (mg/L) | 20 | 16 | 14 | 18 | 19 | 23 |
| TDS (mg/L) | 566 | 440 | 600 | 880 | 720 | 520 |
| Chloride (mg/L) | 96.27 | 42.54 | 141.82 | 99.3 | 85.1 | 212.7 |
| Total Hardness (mg/L) | 269 | 470 | 385 | 578 | 644 | 835 |

| Parameters | Sample I | Sample II | Sample III | Sample IV | Sample V | Sample VI |
|---|---|---|---|---|---|---|
| Sulphate (mg/L) | 337.5 | 445 | 360 | 331 | 409 | 466 |
| Sulphide (mg/L) | 0.225 | 0.375 | 1.27 | 1.4 | 2.57 | 3.9 |
| Nitrate (mg/L) | 1.0 | 1.3 | 1.5 | 2.1 | 2.3 | 2.2 |
| Fluoride (mg/L) | 0.298 | 0.22 | 1.1 | - | - | - |
| Phosphate (mg/L) | 0.90 | 1.06 | 1.09 | 0.98 | 1.36 | 1.45 |

**CONCLUSION :**

Drinking water is found to be potable except hardness and phosphate which is found to be on slight higher side. Tube well water sample (II) has shown high COD & less DO, high hardness and phosphate content. Trace metal content is quite low. Some samples have shown high content of suspended and dissolved solids. Low DO content and high COD content shows that water is to be treated for proper oxygenation and organic load should be decreased. In samples from tanker , has shown quite higher BOD,as permissible limit for BOD is 30ppm while that of COD is 250ppm. Biological oxygen demand, i.e BOD, which is oxygen demand for nontoxic organic waste , but still indicates higher organic load pollution, as large amount of garbage has been found on the site. Hence, sewage treatment has ben suggested so that ratio of BOD:COD, should be reduced. Samples from Tanker Water has shown even high amount of trace metals due to discharge of industrial waste in it. This water is supposed to be highly polluted water & needed proper treatment before its re-use and thus necessary treatment was suggested. The main source of fluoride for human body is drinking water. Water containing fluoride in optimum levels prevent 'dental caries.' It also causes fluorosis. Fluoride content in drinking water sample is found to be within permissible limit. Only in one of the sample, sample (III) it has exceded the limit. Such water is not advisable to be used for domestic purposes or it is advisable to treat it before use.

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