

Preliminary Studies on Water Quality Assessment of Veeranna Cheruvu, Hasnapur, Mahabubnagar District, Telanagana State, India

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ABSTRACT

The present study was carried out on water quality of Veeranna Cheruvu, Mahabubnagar District, Telanagana State during 2011-2012, 2012-2013 and 2013-2014. The water spread area of 76ha at Full Storage Level(FSL) 36ha at the Dead Storage Level (DSL) and water is found slightly alkaline in nature. Water is useful for drinking, irrigation and fishing. Three sites were selected to study the Physico-Chemical parameters of water such as pH, Temperature, Dissolved Oxygen (DO), Total alkalinity, Total Hardness (TH), chlorides (Cl^-), nitrites (NO_2^-), nitrates (NO_3^-) and phosphates (PO_4^{3-}) and compared with standards of WHO and ISI. The results indicated that the water quality parameters were within the permissible limits of standards. The nutrient levels indicate that water is mesotrophic in nature. During the study period many water quality parameters were found minimum in monsoon and maximum in pre monsoon periods.

Keywords : Water Quality, Alkaline, Nutrient Levels, Mesotrophic, Veeranna Cheruvu.

I. INTRODUCTION

Water is an essential factor for existence of life on earth, that contains various minerals, important for humans as well as for aquatic life. Water is universal solvent as it dissolves more substances than any other liquid. Lakes and surface water reservoirs are the freshwater resources that provide infinite benefits. They are used for domestic and irrigation purposes and provide ecosystems for aquatic life especially fish culture. Water pollution now a day is conserved not only in terms of public health but also in terms of its conservation, aesthetics and preservation of natural beauty and resources. According to different surveys, 70 - 80 percent of Indian water resources are polluted and leads to different enteric diseases affect millions of biological organs. The impact of both non-point and point source of pollution degrade the water quality besides an excessive runoff leads to deposition of sediment in water bodies. The present assessment study provides inputs to review strategies for conservation and better utilization of reservoir.

II. MATERIAL AND METHODS

The water body selected for the present investigation is a man made tank. Veeranna Cheruvu is located in Mahabubnagar Dist. between $16^{\circ}43'60''$ N $77^{\circ}58'60''$ E Latitude and Longitude 9 kilometers away from Town and having area of 116.12 acres and the area is having 573.18 acres command. This Cheruvu water spread area of 76ha at Full Storage Level(FSL) 36ha at the Dead Storage Level (DSL). Climate is Tropical Wet and Dry with most rainfall from June to October. Veeranna Cheruvu water is basically useful for agriculture, fisheries and partially domestic activities. The average rainfall in the study area is 51.11% during the period from 2011-2012, 2012-2013 and 2013-2014 respectively.

The sample were collected in three station of the Cheruvu randomly from different stations in polythene plastic cans. The parameters like pH, water temperature, were analyzed with the help of

thermometer(digital equipment) and water analysis kit developed by EI-Products (Model-161-E). Samples were determined of dissolved oxygen was collected in 250 ml capacity BOD bottles and fixed by Winkler's A and B solutions at three different stations of the reservoir and analyzed for pH, Temperature, Dissolved Oxygen (DO), Total alkalinity, Total

Hardness (TH), chlorides (Cl⁻), nitrites (NO₂⁻), nitrates (NO₃⁻) and phosphates (PO₄³⁻) as per APHA. These parameters were analyzed bimonthly from 2011-2012, 2012-2013 and 2013-2014 reported seasonally.

III. RESULTS AND DISCUSSION

Table 1.The varies in Physico-Chemical parameters of Veeranna Cheruvu tank are depicted in table

| | 2011-12 | | | 2012-13 | | | 2013-14 | | |
|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | Pre monsoon | monsoon | Post monsoon | Pre monsoon | monsoon | Post monsoon | Pre monsoon | monsoon | Post monsoon |
| RAIN FALL | 13.45±2.93 | 130.45±104.47 | 10.95±4.99 | 14.23±3.33 | 128.56±50.55 | 11.89±2.22 | 13.99±2.23 | 132.22±34.44 | 13.33±1.22 |
| pH | 8.050±0.324 | 6.750±0.620 | 7.617±0.232 | 8.100±0.141 | 6.700±0.516 | 7.550±0.300 | 8.325±0.690 | 7.200±0.337 | 7.525±0.250 |
| TEMPERATURE ° C | 35.975±5.538 | 34.675±2.419 | 34.700±2.412 | 30.100±2.030 | 35.650±5.545 | 34.125±1.372 | 36.000±5.494 | 34.700±2.412 | 30.050±1.942 |
| DO(mg/l) | 5.375±0.685 | 7.750±0.526 | 7.725±0.435 | 5.275±0.797 | 8.025±0.629 | 7.675±0.403 | 5.375±0.685 | 7.750±0.526 | 7.725±0.435 |
| TOTAL ALKALINITY (mg/l) | 227.175±42.794 | 113.850±13.211 | 124.300±20.989 | 221.800±35.162 | 108.500±13.238 | 124.875±25.538 | 225.125±44.280 | 114.100±13.700 | 126.000±20.839 |
| TOTAL HARDNESS (mg/l) | 227.900±13.448 | 174.175±17.420 | 189.100±18.934 | 235.600±10.509 | 186.075±21.874 | 205.075±15.475 | 227.900±13.448 | 177.675±22.657 | 189.100±18.934 |
| NITRATES(mg/l) | 4.300±0.0490 | 4.625±0.150 | 4.550±0.311 | 4.450±0.896 | 0.150±0.473 | 4.225±0.287 | 4.275±0.695 | 5.225±0.492 | 4.800±0.523 |
| NITRITES (mg/l) | 0.550±0.100 | 0.725±0.096 | 0.375±0.189 | 0.600±0.082 | 0.725±0.096 | 0.425±0.096 | 0.575±0.096 | 0.675±0.126 | 0.575±0.096 |
| PHOSPHATE S (mg/l) | 6.700±0.535 | 7.100±0.535 | 7.425±0.618 | 7.000±0.374 | 6.525±0.877 | 6.825±0.538 | 6.800±0.529 | 6.850±0.443 | 7.325±0.512 |

Rainfall:

Carter (1960) stated that in tropics, the amount of rainfall plays a significant role in regulating the seasonal biological rhythms. Seasonal variations in rainfall during the study period influences other hydrological features. Fluctuations in the quantity of nutrient due to rain water are at great importance in tropical regions. The climate of Mahabubnagar Dist. is semi arid characterised by precipitation during South West monsoon (July-October). Average rain fall is observed during three years 2011-2012, 2012-2013 and 2013-2014 is about 52.11%.

pH:

pH is an important limiting factor in fish culture. It indicates the acid base balance of the water. The

survival and growth of fish is also depending on pH of the water. The ideal pH for growth of fishes is between 7.5-8.5 above and below this is stressful to the fishes. In monsoon most of biochemical and chemical reactions are influenced by the pH. The reduced rate of photosynthetic activities reduces the assimilation of CO₂ and HCO₃⁻ which are ultimately responsible for increase in pH. The low O₂ values considered with high temperature during the pre monsoon month (Kambles S.M *et al*, 2009). The factors like air and temperature bring about changes the pH of water. The higher pH values observed suggests that CO₂, CO₃²⁻, HCO₃⁻ equilibrium is affected more due to change in Physico-chemical condition (Karanth, 1987; Tiwari et al, 2009). In present study,

pH the radiation was between 6.7 - 8.3. Minimum recorded during monsoon, maximum in pre-monsoon.

Temperature:

Temperature is an important factor of the environment. The water temperature increased during warmer months and decrease during colder months. Similar seasonal variation was also observed by (Surve et al, 2005). It effects some of the vital activities of organisms or indirectly through various physical and chemical factors of the environment such as the dissolved gases and organic matter. Temperature directly controls the rate of biochemical reactions in the tissues of organisms. Normal life activities go on smoothly at optimum range of temperature(24°C-30°C). Fluctuations from the optimum range of temperature results in changes in the community structure of organisms. Ideal temperature 24°C to 30°C holds good for fish culture in pond. In present study Temperature ranged between 29.875± 2.394 - 36.000±5.494 during entire period of study, minimum recorded during post-monsoon, maximum in pre-monsoon.

Dissolved Oxygen(DO):

Dissolved oxygen is an amount of gaseous oxygen dissolved in an aqueous solution that plays a vital role in biology of cultured organisms of all the dissolved gases in water. Oxygen is the most important for the survival of organism under aquaculture. The Oxygen content of water can be used as the best chemical indicator of water pollution. Dissolved Oxygen ranged between 5.275± 0.797 – 8.025± 0.629 mg/l favour good growth of flora and fauna(Das,2000). High DO during post-monsoon and monsoon as wind aeration, low in pre monsoon as temperature increases the holding capacity of O₂ with water is reduced. The D.O ranged from 3.41-6.21 mg/l in Seetadwar lake (Tewari and Mishra,2005), 5.3-9.00 mg/l in Deoriatal (Rawat and Sharma,2005) and 3.0-6.0 mg/l in Kandhar dam (surve et al,2005).

Total Alkalinity:

Alkalinity is the sum of negative ions reacting to neutralize hydrogen ions when an acid is added to water. Concentration of alkalinity will be taken care by proper limiting. Total Alkalinity (CO₃²⁻, HCO₃⁻) in the present study ranged between 108.500± 13.238 – 227.175± 42.794 mg/l. Maximum in pre-monsoon due to decreased water level and leaching of soil and rocks and minimum in monsoon.

Total Hardness:

Hardness of water depends gives a measure of the total concentration of the divalent metallic cations like calcium, Magnesium and strontium. Proper limiting can rectify the hardness. Hardness of water depends on the dissolved solids and pH. The ideal value of hardness for fish culture is 30-180mg/l. Total Hardness (Ca⁺⁺, Mg⁺⁺) in the present study ranged between 174.175± 17.420 – 207.6± 10.509 mg/l respectively. According to Sawyer (1960) classification, this reservoir falls in the category of moderately hard (75-175 mg/l). The high hardness of aquatic ecosystem points but towards eutrophication.

Nitrates and Nitrites:

Nitrogen is the most important element necessary for biological activities and building up the body of all organisms. It is present in organisms in different forms. It is cycled in the ecosystem through different phases. Nitrates represent the most highly oxydized phase in the nitrogen cycle and reach considerable concentrations in the final stages of biological oxidation. Nitrate content of water depends to a large extent on the nature of biological activity in the water body, temperature other forms of nitrogen, oxidizable organic matter, DO and the degree of pollution prevailing in the tank/lake/pond. Pollution increase the nitrate content of water in aquatic habitats. Nitrite is an important constituent in the aquatic ecosystem. It is an intermediate stage in the nitrogen cycle. It is brought into water by biological decomposition of

proteinaceous matter and by the action of bacteria on ammonical nitrogen. Population also determines the content of nitrites in tank/lake/pond water. The water polluted by sewage and animal wastes rich in nitrites. In present study Nitrates & Nitrites ranged between 4.225 ± 0.287 – 5.225 ± 0.492 mg/l and 0.375 ± 0.189 – 0.725 ± 0.096 mg/l respectively due to changes in the temperature leads to fluctuations in the concentration. In monsoon due to influx nitrogen rich flood water and bring about large amount of sewage. The rainy season of period with the highest nitrate nitrogen concentration which is known to support the formation of blooms (Shai and Sinha 1969; Anderson et al, 1998).

Phosphates:

Phosphate although present in very small quantity in water is important for the production of phytoplanktons, which forms food for fishes (Hemalatha *et al*, 2014). In present study phosphates ranged between 7.425 ± 0.618 – 6.525 ± 0.877 mg/l respectively. The maximum phosphate value was recorded in monsoon and minimum value in post monsoon due to rain, surface water runoff, agriculture runoff, washer man activity could have also contributed to the inorganic phosphate content. All the Physico-Chemical components are well within permissible limits suggested by ICMR, WHO & ISI.

IV. CONCLUSION

Average rain fall is observed during the three years study period is about 52.11%. pH ranged between 6.7 – 8.3mmg/l during entire period of study, minimum recorded during monsoon, maximum in pre-monsoon. Temperature ranged between 29.8 – 36.0mg/l during entire period of study, minimum recorded during

post-monsoon, maximum in pre-monsoon. Dissolved Oxygen ranged between 5.2– 8.0 mg/l is in normal limits. High DO during post-monsoon and monsoon as wind aeration, low in pre monsoon as temperature increases the holding capacity of Oxygen with water is reduced. Total Alkalinity (CO_3^{2-} , HCO_3^-) ranged between 108.5 – 205.1 mg/l. Maximum in pre-monsoon due to decreased water level and leaching of soil and rocks and minimum in monsoon. Total Hardness (Ca^{++} , Mg^{++}) between 174.1 – 203.6 mg/l respectively. Do showed significant positive correlation with total hardness. Nitrates & Nitrites between 4.2 – 5.2 mg/l and 0.37 – 0.72 mg/l respectively due to changes in the temperature leads to fluctuations in the concentration. All the Physico-Chemical components are well within permissible limits suggested by ICMR, WHO & ISI. The result indicates that the water is alkaline in nature and low productive. Water is mesotrophic with slightly rich amount of nutrients which may be due to agricultural practices being done by farmers in surrounding catchment areas in nature. All water quality parameters are within the permissible limits Reservoir is not polluted. The water is useful for drinking, irrigation and fishing activities. The veeranna cheruvu is a mesotrophic water body which is slightly inclined towards eutrophication. The present trophic levels indicates a proper conservation and management strategies are to be needed for best possible use.

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Figure 1. Veeranna Cheruvu Google Map



Figure 2. Veeranna Cheruvu

VI. REFERENCES

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