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Assessment of Water Quality Index for Hipparga Lake in Solapur City

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ABSTRACT: Clean water is basic need of every living organism. All over the world 70% of water is available. In that 3% of water is fresh water out of which 0.3% of water is available on ground surface. Surface water is very important for every human being. Now days most of pollution observed in surface water because of exceeds of population, lack of awareness. Number of peoples dumps their waste directly in water body also the people used surface water for washing their clothes, animals and again use this water for drinking purpose. The quality of water mainly depends on some physiochemical parameters viz. pH, DO, Alkalinity, Chloride, Hardness. The present study was assessing water quality of Hipparga Lake in Solapur city. Large numbers of health issues are observed because of poor condition of water quality, large amount of industrial waste, domestic waste, etc. pored directly in water body and water get contaminated because of that assessment of water quality index is very important. Five different points at different position on lake were selected for sampling purpose, duration of October 2018 to April 2019. Quality of water in lake changes slightly from post monsoon season to pre-monsoon season because of increase of biological activity in water body. The water quality index (WQI) result shows that complete water quality class is "Medium". Indicate that water require treatment before it use.

KEYWORDS: Parameters, pH, DO, Alkalinity, Chloride, Hardness, Water Quality Index (WQI)

I. INTRODUCTION

Providing fresh, portable and sufficient clean amount of affordable water is big challenge of everyone. Water is very important element for every living cell. Among the all natural resources water plays very important role. Now days millions of people die because of polluted water main lacuna behind this is increase of population and lack of awareness. As population increases their basic need also proportionally increases. Demand of sources increased which effect on environment. Day to day increase of industries like chemical, pharmaceutical, machine industry, textile, dyes etc. are creating more pollution, which is very dangerous to all living organism. Most of the pollution is done on the surface area because direct dispose of polluted water on the surface is very easy. Direct discharge of sewage in any water body like lake, pond, river etc. that means excessive richness of nutrients in that water body which directly affected to the health of almost every component of ecosystem resulting the death of ecosystem. Industrial highly polluted or the unwanted water is mixed directly to any other surface water, which performing high BOD and causes dense growth of plant life which is very dangerous to aquatic life "Water quality index" is just shown in single number quantity which is helpful to know the exact water quality status. It shows the quality of water in quantitative form. It is easy to determine WQI in the laboratory by help of water quality parameters shows the exact water quality status which is helpful to find out WQI above ground surface and below the ground surface. Polluted parameters in the water body are also easy to known by test, which causes high BOD.

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Solapur is an historical place. Sixteen talukas are including in the Solapur City. Solapur is at boundary of Maharashtra State and near to Vijayapura (Karnataka) and Hyderabad (Andhra-pradesh) which helps to easily relocate and transport goods from Maharashtra to Karnataka and Andhra-pradesh. Solapur is well connected by road and rail with all the states of India. Solapur is located 402 kms SE of capital of Maharashtra State. It is in between $17^{\circ} 36'$ to $17^{\circ} 45'$ N latitude and $75^{\circ} 50'$ to $75^{\circ} 58'$ E longitude. According to census 2011 population of Solapur city is near about 11 lakh. Solapur region is mostly in the hot climatic condition. It acquire insufficient and jagged rainfall with annual standard of 550 mm. In the month of March to June first week climatic condition in Solapur city is much more hotter its around 46° - 49° Celsius.

Ekrukh tank (lake) is also called "Hipparga Lake" is look like an earthen dam having length of 2100 m and 25 m height and depth of water is around 20 m. Hipparga lake was built on Adila river at the time of British empire. Capacity of lake is approximately 62 mm^3 .

II LITERATURE REVIEW

1.0 K. Ansari, N. M. Hemke (2013) "Water Quality Index For Assessment Of Water Samples Of Different Zones In Chandrapur City" have studied assign with examine of variety of seasonal water quality index of preferred places of Chandrapur city. Illustrative are collected from ground water in monsoon and post monsoon seasons from stipulate zones of city. Samples are collected from six different locations and samples are investigated and analyzed from weighted arithmetic index method and calculated water quality index of water for various parameters and identified water quality and standard for drinking water standards.^[7]

2.0 P. J. Puri , M. K. N. Yenkie (2015) "Application of water quality index(WQI) for assessment of surface water quality (Ambazari Lake)" according to literature review, water quality index (WQI) is deliberate for different lakes in Nagpur city for the every seasons of year in 2008 and contrast the result as per season changes. Location points were selected according to their importance. Water quality index was calculated here using by National Sanitation Foundation (NSF) information system. The results shows the fair water quality in rainy season and in winter it changes to medium and in the summer its completely poor. Gorewada Lake appear medium water quality status in all seasons. Futula, Ambazari and Gandhinagar Lake are also slightly drop their water quality from last many years. Large amount of hydrilla and marshy jasmine are in the lake, so that reasons to import water quality change and measures to be taken up in terms of surface water (lakes) quality management are required.^[9]

3.0 Rashmi C L, Sandesh N K, Shivkumar V B, Poornima K B (2017) "Water Quality Analysis of Shantisagar Lake" have studied water analysis of Shantisagar lake in that three sample station are selected for checking WQI of lake. Collect the samples for number of weeks sees the water quality changes with different parameter test. Water quality of this lake shows the result in excellent water quality status. Water is very soft and used for domestic purpose also good for industrial purpose also.^[10]

III. METHODOLOGY AND MATERIAL

The study was carried out for Hipparga Lake, which is situated at Solapur city. Hipparga Lake is also called as Ekrukh Lake. Ekrukh Lake is located near Solapur city, Tal. North Solapur, Dist. Solapur. The topo sheet number is 47 O/9 the latitude of site is $75^{\circ} 55' 00''$ and longitude is $17^{\circ} 44' 00''$. The latitude and longitude of every point chosen for sampling are shown in table 1

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Table No 1. - Latitude and Longitude of Ekrukh Lake^[3]

Sampling position	Latitude	Longitude
Point 1	75° 55' 22"	17° 43' 39"
Point 2	75° 54' 43"	17° 43' 22"
Point 3	75° 54' 21"	17° 43' 21"
Point 4	75° 54' 20"	17° 43' 34"
Point 5	75° 54' 26"	17° 44' 31"



Fig 1- Map Showing Location of Sampling Points^[3]

Method to Calculate WQI: Five different points at different position on lake were selected for the sampling purpose. Duration of sampling was October 2018 to March 2019 (six months). Total 5 physio-chemical parameters were tested for checking of Water quality index. Water samples were taken as per month wise.

The parameters were calculated by using standard procedure of weighted arithmetic index method. Water quality index was computed by using 5 parameters such as pH, DO, Alkalinity, Chloride, Hardness.

Weighted Arithmetic Index Method

The water quality status is determined by quality rating (Qi) and relative weight (Wi) expression

Quality rating,

$$Q_i = 100[(V_n - V_i) / (V_s - V_i)]$$

Where,

V_n = Actual amount of n^{th} parameter

V_i = The ideal value of this parameter

$V_i = 0$, excluding for pH and DO $V_i = 7.0$ for pH; $V_i = 14.6$ mg/L for DO

V_s = WHO standard of corresponding parameter

Relative weight (W_i) was calculated by a value inversely proportional to the recommended standard (S_i) of the corresponding parameter.

$$W_i = 1 / S_i$$

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Generally, WQI are discussed for specific and intended use of water. In this study the WQI for human consumption is considered and permissible WQI for drinking water is taken as 25. The overall WQI calculated by using equation.

Water Quality Index (WQI) = $\sum(Q_i) W_i / \sum W_i$

Table No 2. - Sample calculations of Water Quality Index for month of DEC

Parameter	Mean test result (Vn)	units	Standard permissible value (Si)	1/Si	K= (1/(1/Si))	Wi= $\sum K/Si$	QI (Rating)	WQI
PH	7.17		8.50	0.118	2.663	0.313	11.33	3.54
DO	4.21	ml	4.00	0.250	2.663	0.667	105.2	70.52
MPN	4.00	Mg/100ml	0.00	0.000	2.663	0.000	0.00	0.00
Alkalinity	170.4	Mg/l	200.00	0.005	2.663	0.0013	85.2	1.133
Chlorides	510.76	Mg/l	1000.00	0.001	2.663	0.0026	51.07	0.133
Hardness	269.82	Mg/l	600.00	0.0016	2.663	0.0044	44.86	0.2
SUM=				0.3756	2.663	1.2676	SUM	75.52
Total WQI=								75.52

Table No. 3-Water quality status for various WQI

WQI	Water Quality Status
0-25	Excellent
26-50	Good
51-75	Medium
76-100	Poor
Above 100	Very poor

IV. RESULTS AND ANALYSIS

Water quality index of the Hipparga (Ekrukh) Lake is evaluated from five physio-chemical parameters in pre-monsoon season and post-monsoon season. The result of physio-chemical parameters for pre-monsoon season and post-monsoon are presented in the Table No 4. and Table No. 5.

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Table No. 4-Water quality status for pre-monsoon season

Post-Monsoon season		
SR. No.	Parameters	Results
1	Ph	7.4
2	DO	4.5
3	MPN	4.2
4	Alkalinity	185
5	Chloride	435
6	Hardness	252

Table No. 5-Water quality status for post-monsoon season

Pre-Monsoon season		
SR. No.	Parameters	Results
1	Ph	7.5
2	DO	4
3	MPN	9
4	Alkalinity	255
5	Chloride	650
6	Hardness	340

Assessment period of project was from October 2018 to March 2019. The water quality index was developed from various water parameters like pH, DO, MPN, Hardness, Alkalinity, Turbidity and Chloride test. After exploration of test MPN was found excess in Lake, along with excessive pollution

Table No. 6-seasonal variations of average value of WQI

SR. No.	Seasons	WQI
1	Post-Monsoon	79.85
2	Pre-Monsoon	75

Water quality index (WQI) is showing the exact quality of water in the water body as per seasonal variation or climatic changes. Samples were taken monthly and calculated WQI according to standard procedure.

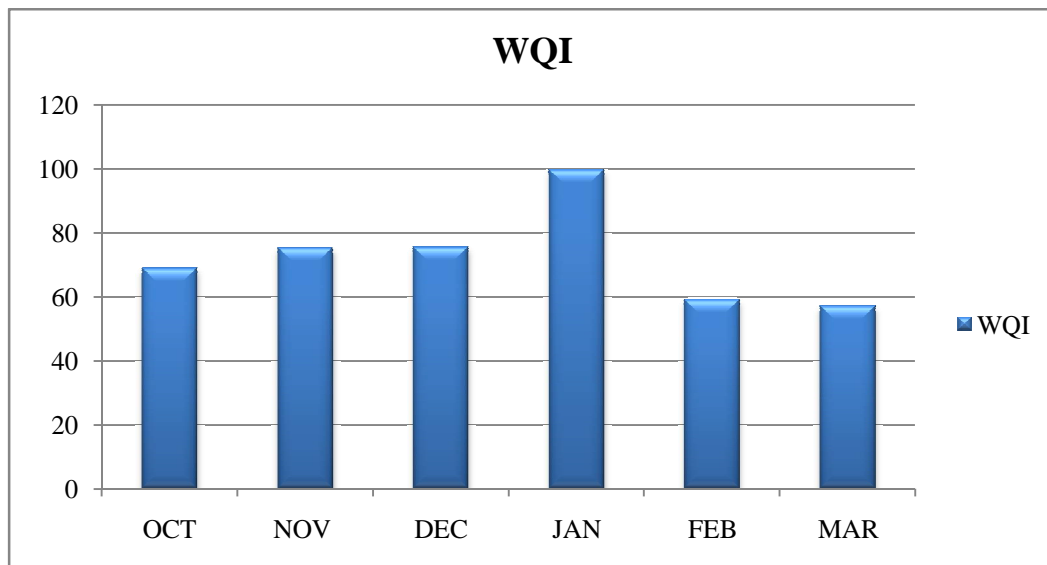
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Fig 2-Showing graphical representation of WQI from month of Oct to March



V. CONCLUSION

Water quality index is 75 for Hipparga Lake. Excessive pollution rate alarming to people of Solapur. Refuse and garbage from Farmers and civilians was dumped at specific location in Lake. This has impact on pollution of lake. Considering existing Scenario it has been essential for authority of Solapur to have a look at this situation and take appropriate measure to stop pollution of Hipparga Lake which will serve as with good water quality so, high level efforts are needed to preserve the water quality of Hipparga Lake.

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