Assessment of Pond for Aquaculture Development: A Case Study of Bhesan Village Pond, Surat, Gujarat, India

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Abstract - *The present study was made to assess the water quality of Bhesan pond, Surat, India during September 2018 to August 2019. To carry out the study, samples were collected on twice in monthly basis from the lake at 21°21'72.14"N and 72°75'71.55"E. Various parameters such as pH(6.20-7.96), Temperature(28-30.20), Dissolved oxygen(1.96-5.20 mg/L), Alkalinity(90-164 mg/L), Total hardness(36-106 mg/L), Calcium hardness(24-92 mg/L), Magnesium hardness(4-20 mg/L) ,Total dissolved solids(120-220 mg/L), Chlorides(9.94-21.90 mg/L) etc. were determined. The values of various parameters are compared with water quality standards for aquaculture development. Results of study indicated that the pond could be used for fisheries by managing DO level.*

Key Words: Bhesan pond, Water quality, Physico-chemicals, Aquaculture, Surat

1. INTRODUCTION

Water is most important natural and precious resource for every living organism on the earth. Unplanned urbanization, rapid industrialization and indiscriminate use of artificial chemicals cause heavy and varied pollution in aquatic environments leading to deterioration of water quality and depletion of aquatic fauna including fish. A healthy aquatic environment is one which supports a rich and varied community of organisms and protects public health (Ramachandra et al., 2002). Ponds are one of the most important sources of water for fish, wildlife and human being. However, the water of the ponds and other natural water bodies are polluted due to various anthropogenic activities viz., discharge of waste water from residential areas, sewage outlets, solid wastes, detergents, automobile oil wastes, fishing industries and agricultural pesticides from farmlands (Srivastava et al., 2003). The healthy condition of an aquatic system depends upon its physicochemical characteristics so the water quality of Bhesan pond of Bhesan village of Surat District of Gujarat was undertaken. The present study is an attempt to assess the water quality of Bhesan pond in a Surat district for sustainably use for fisheries and even recreation.

2. OBJECTIVES

The main objective of the present study was to give an idea about the pollution level of pond water in terms of physico-chemical characteristics. The values of various parameters were compared with water quality standards for aquaculture development.

3. RESEARCH METHODOLOGY

3.1 Study area

This investigation was carried out to evaluate the status of the Bhesan pond water in Surat district, Gujarat. Bhesan pond-Surat is situated between 21°21'72.14" North Latitude and 72°75'71.55" East Longitude (Fig.1). The present study was conducted to assessment of water quality in the period of September- 2018 to August-2019.

3.2 Materials & Methods

Surface water samples were collected twice in monthly basis from the Bhesan pond during period of September 2018 to August 2019. Total 24 samples of water collected. Water samples from the Bhesan pond were collected in clean bottles. All the precautions were taken during the sampling. The collected water samples were analyzed for different physico-chemical parameters such as for pH, Temperature, Dissolved oxygen, Alkalinity, Total hardness, Calcium hardness, Magnesium hardness, Total dissolved solids, Chlorides by following the standard protocols (Table 1).

Table -1: Methods followed for analysis of water samples

Sr. No.	Parameters	Apparatus/ Method
1	pH	pH meter
2	Temperature	Thermometer
3	Dissolved Oxygen	D.O. Meter
4	Alkalinity	Titration method

5	Total Hardness	EDTA Titration method
6	Calcium Hardness	EDTA Titration method
7	Magnesium Hardness	EDTA Titration method
8	Total Dissolved Solid(TDS)	TDS meter
9	Chloride	Silver nitrate Titration method

Figure 1: Map of Water Sampling

4. RESULTS AND DISCUSSION

Values of each parameter recorded during the study period are represented in table 2

Sr. No.	Parameter	Min.	Max.	Avg.	*Standard
1	pH	6.20	7.96	7.04	7 - 9
2	Temperature	28	30.20	29.28	25 - 32
3	DO	1.96	5.20	3.25	5 - 15
4	Alkalinity	90	164	126.33	50 - 300
5	Total Hardness	36	106	73.04	50 - 200
6	Calcium Hardness	24	92	61	5 - 100
7	Magnesium Hardness	4	20	12.33	5 - 100
8	TDS	120	220	170	< 500

9	Chlorides	9.94	21.90	15.92	1 - 100

*Aquaculture standard as per Boyd (1998)

4.1 pH

The pH of Bhesan pond in Surat ranges from 6.20 to 7.96. The average pH value was found 7.04. For aquaculture development pH should be in the range of 7 - 9 prescribed for aquaculture (Boyd, 1998). In the present study pH was not found appropriate for aquaculture activities.
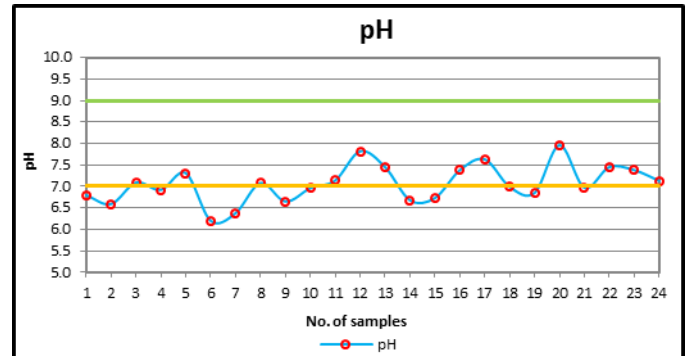
4.2 Temperature

Environmental temperature was found fluctuating both daily and seasonally which is an important physical parameter directly related to chemical reactions in aquatic ecosystem (Goel et al., 1986). Water temperature is important factors which control the behavior, physiology and distribution of organism in water bodies (Srivastav et al., 2009). The temperature of bhesan pond water is found to be in the range of 28 to 30.20 °C at the sampling time. The average value of water temperature was 29.28 °C. It is found within the permissible range 25 – 32 °C.
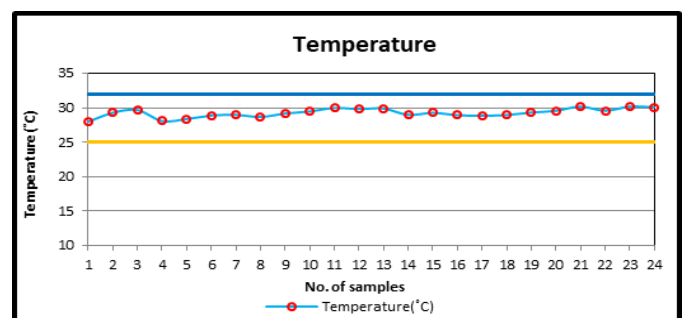
4.3 Dissolved oxygen

DO was negatively correlated with temperature (Kataria et al., 1996). Dissolved oxygen of Bhesan pond is found in ranges from 1.96 mg/L to and 5.20 mg/L. The average D.O value was found 3.25 mg/L. It is not found within the permissible range 5 - 15 mg/L.
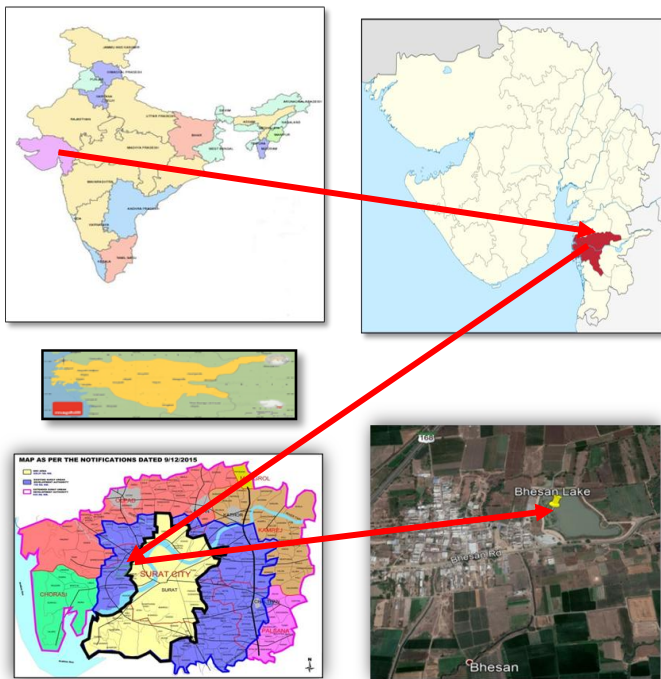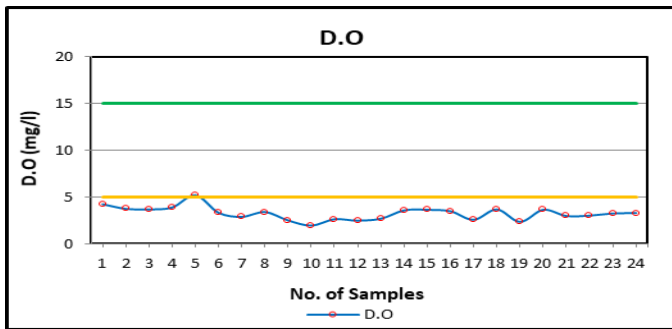
4.4 Alkalinity

Total alkalinity is the measure of the capacity of the water to neutralize a strong acid (Trivedy and Goel, 1986). High values of total alkalinity may be attributed to the increase in organic decomposition during which CO_2 is liberated (Bharathi et al., 1973). Total alkalinity of Bhesan pond is found in ranges from 90 mg/L to and 164 mg/L. The average alkalinity value was found 126.33 mg/L. It is found within the permissible range 50 - 300 mg/L. In the present study alkalinity was found appropriate for aquaculture activities.
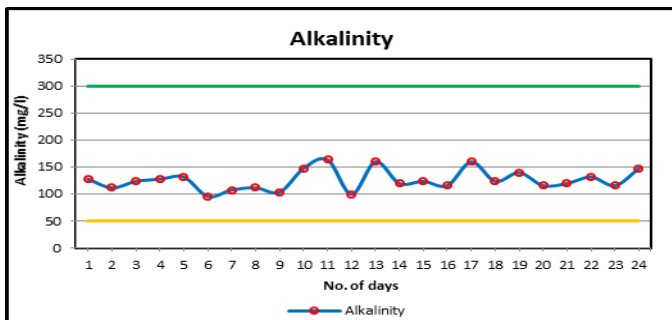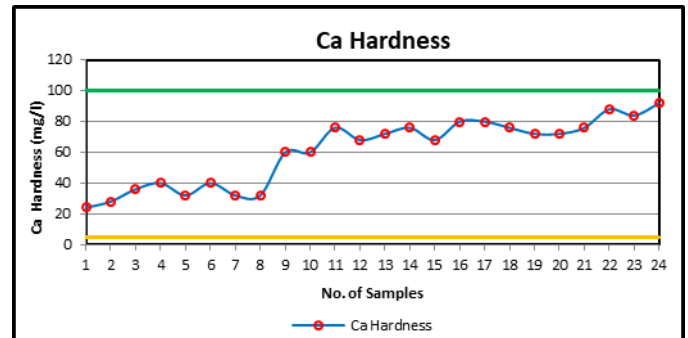

4.5 Total hardness

Total hardness is mainly due to the presence of calcium and magnesium. It also acts as buffers regulating the pH of the medium (Shinde et al., 2011). Total hardness of Bhesan pond is found in ranges from 36 mg/L to 106 mg/L. The average value of total Hardness was 73.04 mg/L. It is found within the permissible range 50 - 300 mg/L. In the present study total Hardness was found appropriate for aquaculture activities.
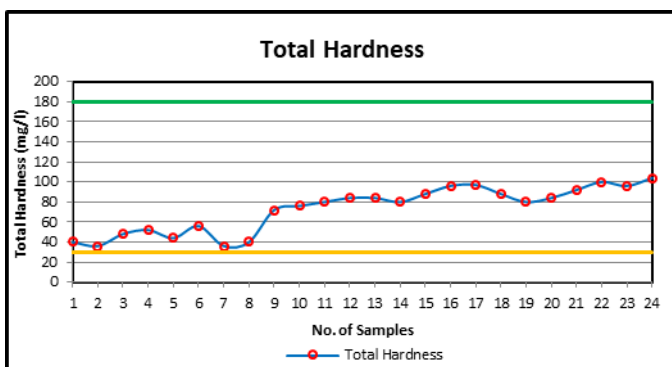

4.6 Calcium hardness

Calcium hardness of Bhesan pond is found in ranges from 24 mg/L to 92 mg/L. The average value of Calcium Hardness was 61 mg/L. It is found within the permissible range 5 - 100 mg/L. In the present study total Hardness was found appropriate for aquaculture activities.


4.7 Magnesium hardness

Magnesium hardness of Bhesan pond is found in ranges from 4 mg/L to 20 mg/L. The average value of Magnesium Hardness was 12.33 mg/L. It is found within the permissible range 5 - 100. In the present study total Hardness was found appropriate for aquaculture activities.
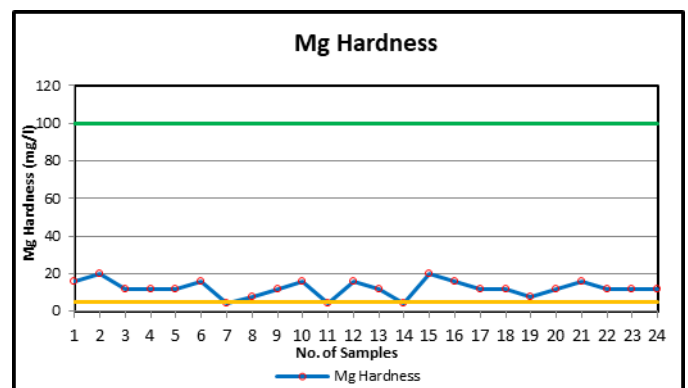

4.8 Total dissolved solid

Total dissolved solid of Bhesan pond is found in ranges from 120 mg/L to 220 mg/L. The values are found to be in the range of desirable limit 500 mg/L and permissible limits 2000 mg/L and 1000 ppm as per WHO standards.
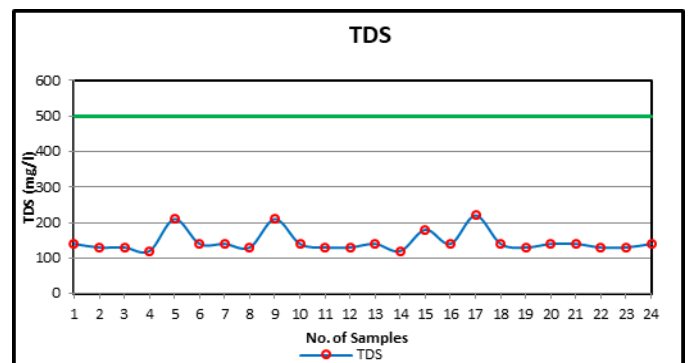
4.9 Chlorides

Total dissolved solid of Bhesan pond is found in ranges from 9.94 mg/L to 21.90 mg/L. The values are found to be in the range of desirable limit 250 mg/L. and permissible limits 1000 mg/L given by IS 10500-1991 for drinking water quality.
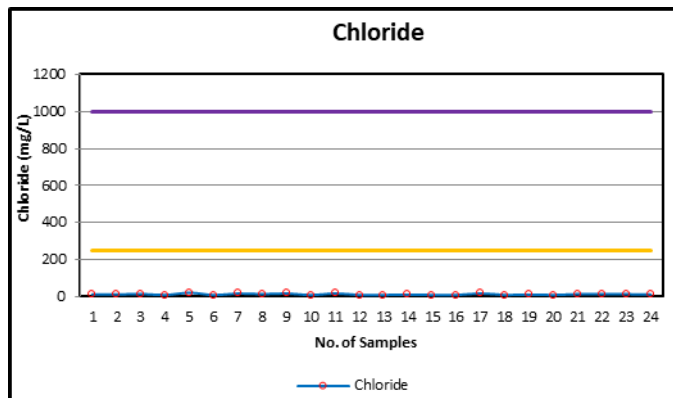
5. CONCLUSION

The present analysis results of Bhesan pond various parameters reveals that the pond water showed majority parameters were within the tolerance limits suggested by the WHO and ISI standards. The DO in inland surface water tolerance limit should be minimum of 4mg/L. The sample sites have shown low DO value were the aquatic living organisms may have threat to their life.

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