



**TO STUDY THE EFFECT OF SEASONAL VARIATION IN PHYSICO-CHEMICAL
PARAMETERS OF WATER OF GIRAMTHA POND, TA: DASCROI, DIST:
AHMEDABAD.**

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ABSTRACT

Giramtha is a village in Dascroi taluka in Ahmadabad district, Gujarat State. Giramtha pond is located at the northern side of the village. Rain water enters from the surroundings into the talav and water from the Narmada River also enters into the talav through canal. The samples were collected during morning hours and were analyzed monthly for different parameter. Analyses for physical, chemical parameter were carried out by using the method suggested by APHA (1985); Kumar and Ravindranath (1998) and Trivedy and Goel (1984).

KEYWORDS: Water, Giramtha pond, Ahmedabad, Physical, Chemical.

INTRODUCTION

Giramtha pond is located at the northern side of the village. It is natural talavin which the cattle used to drink and bath, local people are engaged in washing clothes and discharge soap water into the talav. The peripheral area of Giramtha pond is 1102.27 m. and depth is 22 feet. Its exact location is 2252' 53.69" N Latitude and 72 32' 57.47" E Longitude and 110 feet above sea level.

Analyses for physical, chemical and botanical parameter were carried out by using the method suggested by APHA (1985); Kumar and Ravindranath (1998) and Trivedy and Goel (1984).

MATERIALS AND METHODS

In the present study the sampling was done during morning hour. The water samples were collected in the polyethylene bottles. The closed bottle was dipped in the lake at the depth of 0.5 to 0.7 m, and then a bottle was opened inside and was closed again to bring it out at the surface. The samples were collected from five different points and were mixed together to prepare an integrated sample. From the time of sample collection to the time of actually analyses, many physical, chemical biochemical reactions would change the quality of the water sample; therefore to minimize this change the sample were preserved soon after the collection. The water samples were preserved by adding chemical preservatives and by lowering the temperature. The water temperature, pH, DO, EC and TDS were analyzed immediately on the spot after the collection, whereas the analyses of remaining

parameters were done in the laboratory. The study was carried for a period of different interval of time. The collected water samples were brought to the laboratory and relevant analysis was performed. pH was determined electrometrically using digital pH meter, electrical conductivity was measured by conductivity meter, dissolved oxygen is measured by DO meter, total dissolve solid was measured by using TDS meter and similarly turbidity is measured by Nephthalo turbidity meter. Alkalinity, chloride, TDS, calcium, magnesium, total hardness, nitrate and phosphate were determined by method suggested by APHA (1985); Kumar and Ravindranath (1998); Trivedy and Goel (1984).

RESULTS AND DISCUSSION

➤ **Temperature**

Desai (1995) suggested that the water temperature may depend on the season, geographic location and sampling time. The temperature plays an important role in physicochemical and biological performance of water ecosystem, Dwivedi and Pandey (2002).

The temperature recorded ranges from 17⁰C to 31⁰C. The minimum temperature 17⁰C was recorded, the maximum temperature was 31⁰C and average 23.9⁰C was recorded. The maximum temperature was noted in summer season, after that monsoon and winter, (Table No. 1).

The highest temperature in summer season might be due to better solar radiation, lower level of water, clean atmosphere and high atmosphere temperature.

Temperature variation noticed between the months may also be due to the difference in the incidence of radiation, freshwater discharge and precipitation. Similar outcome were also recorded by Surveet *al.*, (2005) and Grace (2006).

In monsoon the lowering in temperature was noted. It was due to the reduced solar radiation and the presence of cloudy weather. For the period of winter season the temperature become lower because of cold low ambient temperature and shorter photoperiod.

➤ pH

pH is a determine of the acidity and alkalinity of water, expressed in conditions of its concentration of hydrogen ions. The pH scale ranges between 0 to 14. A pH, 7 is considered to be neutral. Substances with pH less than 7 are acidic; substances with pH greater than 7 are basic.

The lowest pH 7.1, highest 7.75 and average pH were 7.37 were noted. (Table No. 1). Seasonal average of pH in monsoon was 7.37 mg/l, summer was 8.1 mg/l and winter was 7.15 mg/l.

During study water pH was high during summer months this is because of high photosynthetic activity similar result was noted by Vasumathi Reddy *et al.* (2009) and maximum pH in summer is reported in different water bodies by Kushwah (1989). Higher pH value in summer might be due to the uptake of CO₂ by phytoplankton Sanathanan, (1976). At site pH were neared to the permissible limit for pH as per BIS (1982) and WHO (1971) is 6.5–8.5.

pH is the scale of concentration of acidity and alkalinity of water. It measures the concentration of hydrogenions. Prapurna and Shashikanth (2002) also found the pH in alkalinity a line trend through out the study period. Most of the biological process and biochemical reaction are pH dependent. Higher pH during summer could be due to higher decay activities. Same result was recorded by Chaudharyetal. 2004 and Solanki, 2007. Saxena (1987) explained that the process, respiration, temperature exposure in to atmosphere, disposal of industrial waste material set convey fluctuation in the pH.

The pH of water also depends on the relative quantities of calcium, carbonate and bicarbonate.

➤ Turbidity

Turbidity in water is due to suspended matter like clay, silt, organic matter and other microorganisms.

The amount of light scattered by suspended particles in water body is known as its Turbidity. The components absent in the form of solution cause it. The size of the particle in a true solution is 10⁻⁹ meters. And any substance is having more than this size will produce turbidity. According to Das and Shrivastava, (2003) organic matter, silt, clay and other micro organisms

cause turbidity in pond water. Turbidity when caused (I) largely is considered as an index of productivity, but on the contrary, when caused (II) because of suspended matter it restricts the light penetration in water resulting in reduced primary production (photosynthesis).

During the present study minimum was 5 NTU and maximum was 26 NTU. (Table No. 1).

In monsoon the turbidity of water body increases due to deposition of sand, clay, silt, dunganda variety of other pollutants along with rain fall water from the near by region in to the pond. Similar results were also noted by Saxenaetal. (1966); Ansari and Prakash (2000) and Solanki (2001).

➤ Electrical conductivity (EC)

Electrical conductivity is the determination of total concentration of dissolved salts in water. While salts dissolve in water, they give off electrically fluctuation of ions that carry out electricity. The more ions found in the water, the better the electrical conductivity found in aquatic system. For the reason that there are approximately no ions found in distilled water, it has roughly no electrical conductivity. Hard water comprise extra salts and therefore additional ions, has a higher electrical conductivity.

Electrical conductivity measure the amount of total dissolved salts or the total quantity of dissolved ions in the water. There are so many sources of pollutants, which may be signaled by increased EC evaporation of water from the surface of lake water, concentrate the dissolved solids in the remaining water and so it has a high EC. Electrical conductivity was recorded between range 0.20mmho/cm to 2.82 mmho/cm. minimum at Giramtha pond. During present study at Giramtha pond the seasonal average of EC during monsoon was 0.54 mmho/cm, winter was 0.48 mmho/cm and summer was 0.51 mmho/cm. (Table No. 1).

➤ Total Dissolved Solids (TDS)

TDS refer to any minerals, salts, metals, anions or cations diluted in water. Salts like carbonate, bicarbonates, chlorides, sulphates, phosphates and nitrates of calcium, magnesium, potassium, sodium, iron etc. are dissolved in natural water. The higher content of dissolved solids increases the concentration of water and influences osmoregulation of fresh water organisms.

At Giramtha pond the minimum TDS was 310 mg/l during monsoon and maximum 375 mg/l during summer and average was 351 mg/l. (Table No. 1).

The desirable limit for TD Sgiven by BIS (1982) and WHO (1971) is 500 ppm. The TDS recorded in Giramtha pond was desirable limit. According to Esmaeili and Johal, (2005) dissolve solid sare mostly composed of CO₃,HCO₃,Cl,SO₄²⁻, NO₃⁻,Ca, Mg, potassium, iron and manganese in natural water. The

eutrophication of water body is due to higher concentration of TDS. The human interference also contributed to the enrichment of dissolved solids, (Devi 1997) and P. U. Verma *et al.*, (2011).

➤ **Total Alkalinity**

Alkalinity of water is its capability to counter balance a strong acid and it is characterized by the occurrence of all hydroxyl ions able to combine with the hydrogen ion.

The change in alkalinity depends on carbonates and bicarbonates also. The CO₂ liberated from carbonates and bicarbonates is also used by aquatic vegetation for photosynthesis activities. But eventually, when organisms die, due to decomposition CO₂ is released, which forms carbonates and bicarbonates.

At Giramtha pond the range of alkalinity was 130 mg/l to 200 mg/l and average was 162 mg/l. As per the Bureau of Indian standards (BIS) the acceptable level of total alkalinity for drinking water is below 200 mg/l and permissible level in the nonappearance of alternate source is 600 mg/l BIS, (1992). During investigation alkalinity result of Giramtha pond were in permissible level, so water was not polluted with respect to alkalinity.

➤ **Total hardness (TH)**

When water passes through deposits such as limestone, the levels of Ca⁺⁺, Mg⁺⁺ and HCO⁻³ ions found in the water can very much enlarge and cause the water to be classified as hard water. Total hardness (TH) can also be defined as water that does not create lather with soap solutions, but produces white precipitate. Higher levels of TH are not measured a health concern. Calcium is a significant component of cell walls of aquatic plants and bones or shells of aquatic organisms.

At Giramtha pond minimum total hardness was 110 mg/l and maximum was 150 mg/l and average was 132.5 mg/l recorded. Seasonal average in monsoon was 144 mg/l, winter was 132.3 mg/l and summer was 140.2 mg/l. (Table No. 1).

As per the Bureau of Indian standards (BIS) the maximum permissible level of total hardness in the nonexistence of interchange source is 600 mg/l BIS, (1992), so water was not polluted with respect to total hardness.

➤ **Magnesium (Mg⁺⁺)**

Magnesium (Mg) is also found with calcium in natural water albeit in low concentration than calcium and has same source of entry. Magnesium tolerance capacity of human body is lower than calcium, the higher concentrations work as laxative and give disagreeable taste to water, it improves hardness. Mg is an essential micronutrient for both flora and fauna.

At Giramtha pond minimum Mg was 2.44 mg/l and maximum was 19.52 mg/l and average was 10.98

recorded. Seasonal average in monsoon was 9.73 mg/l, winter was 7.57 mg/l and summer was 9.71 mg/l. (Table No. 1).

As per the Bureau of Indian standards (BIS) the desirable maximum permissible level is 100 mg/l, during study period Mg⁺⁺ was found in permissible limit.

➤ **Calcium (Ca⁺⁺)**

Seasonal average in monsoon was 41.7 mg/l, summer was 34.8 mg/l and winter was 35.4 mg/l. Minimum Ca was 20 mg/l and maximum was 44 mg/l and average was 32.7 mg/l recorded at Giramtha pond. (Table No. 1).

Ansari and Prakash (2000) observed that calcium is a vital micronutrient for aquatic organisms. Calcium is normally found in all water bodies where it has usually quantity varying from trace to 100 mg/l. The amount of calcium is higher in summer period due to rapid oxidation or decomposition of organic matter. Comparatively high quantity of calcium in the adjacent soils and rocks might also be responsible for the more amount of Ca level in pond water. Calcium is found in water naturally, Udhayakumar *et al.*, (2006) and Angadi *et al.*, (2005) also observed similar results in their studies of water bodies. The death and decay of living organisms during summer and there was decomposition in lake may also be dependable for the rise in calcium value. In maximum water bodies the amount of calcium recorded are always higher than magnesium.

➤ **Nitrate**

Nitrate (Nit.) is the highest oxidized form of nitrogen and in water its most significant source is biological oxidation of nitrogenous organic substances of both autochthonous and allochthonous origin. Domestic sewage and agricultural runoff are the chief sources of all allochthonous nitrogenous organic matter. Metabolic waste of aquatic community and dead organisms add to the autochthonous nitrogenous organic matter. Nitrifying bacteria (Nitrosomonas, Nitrobacter) play an important role in oxidation of such organic matter. Certain nitrogen fixing bacteria (Azobacter) and some blue green algae have capability to fix molecular nitrogen in nitrates. The high concentration of nitrate in water is an indication of pollution.

At Giramtha pond minimum was 0.03 mg/l, maximum 0.03 mg/l and average was 1.42 mg/l was noted. At Giramtha pond seasonal average in monsoon was 0.032 mg/l, summer was 0.031 mg/l and winter was 0.031 mg/l. (Table No. 1).

The desirable limit for nitrate as per BIS, (1992) and WHO (1971) is 45 ppm. Here in the present study the value of nitrate recorded for all the four lakes remain within desirable limit.

➤ **Phosphate**

Algae require only a little amount of phosphate. Excessive quantity of PO₄³⁻ resulted in eutrophication leading to

algal blooms. Total phosphates in water include both organic and inorganic phosphates. Phosphates are generally found in natural water as phosphates.

Giramtha pond shows minimum phosphate 0.09 mg/l, maximum 0.155 mg/l and average was 0.11 mg/l observed.

At Giramtha pond seasonal average in monsoon was 0.13 mg/l, summer average was 0.138mg/l and winter average was 0.15 mg/l. (Table No. 1).

➤ Dissolved Oxygen (DO)

Dissolved oxygen in water is an index of physical and biological processes going on, non-polluted surface water normally saturated with dissolved oxygen. There are two main sources of dissolved oxygen in water. (1) Transmission from air/ absorption from air. (2) Photosynthetic activity within water by vegetation etc. DO is possibly the most crucial and essential water quality variable in freshwater body. DO analysis is determine the amount of gaseous oxygen (O₂) dissolved in an aqueous medium.

During investigation period at Giramtha pond the minimum DO was 5.27 mg/l, maximum 15.02 mg/l and average was 11.26 mg/l noted. At Giramtha pond seasonal average in monsoon was 4.2 mg/l, summer

average was 9.8 mg/l and winter average was 7.04 mg/l. (Table No. 1).

➤ Biochemical oxygen demand (BOD)

BOD is a determination of the organic substance found in the ambient water. It is not a specific quantitative test, although it is extensively utilized as a signal of the organic quality of water. It is most regularly expressed in milligrams of oxygen utilized per liter of sample during 5 days of incubation at 20°C and is frequently utilized as a robust surrogate of the degree of organic pollution of water. It is used as a measure of the degree of water pollution also called biological oxygen demand.

Sr. No.	PARAMETERS	Monsoon Mean ± S.E.	Winter Mean ± S.E.	Summer Mean ± S.E.
1	Temperature (0C)	28.5 ± 0.50	25.7 ± 2.32	31 ± 3.39
2	pH	7.37 ± 0.18	7.15 ± 0.19	8.1 ± 0.22
3	Turbidity (NTU)	26 ± 3.00	22.1 ± 0.44	22.95 ± 1.14
4	EC (mmho/cm)	0.54 ± 0.02	0.48 ± 0.03	0.51 ± 0.01
5	TDS (Mg/l)	375 ± 4.79	361.3 ± 5.77	351 ± 2.50
6	Alkalinity (Mg/l)	145 ± 8.54	152.3 ± 10.00	151.9 ± 5.77
7	TH (Mg/l)	144 ± 4.79	132.3 ± 9.46	140.2 ± 7.07
8	Mg ++ (Mg/l)	9.73 ± 3.64	7.57 ± 2.82	9.71 ± 2.31
9	Ca ++ (Mg/l)	41.7 ± 4.43	35.4 ± 3.61	34.8 ± 4.32
10	Nitrate (Mg/l)	0.031 ± 0.00	0.031 ± 0.00	0.031 ± 0.00
11	Phosphate (Mg/l)	0.13 ± 0.00	0.15 ± 0.00	0.138 ± 0.00
12	DO (Mg/l)	4 ± 2.90	7.04 ± 0.73	9.8 ± 1.27
13	BOD (Mg/l)	130 ± 0.29	180 ± 0.41	171 ± 0.25
14	Chloride (Mg/l)	72.4 ± 4.08	65.5 ± 1.66	76.8 ± 5.15

At Giramtha pond minimum BOD 110 mg/l was recorded and maximum was 190 mg/l. At Giramtha pond seasonal average in monsoon was 130mg/l, summer average was 171 mg/l and winter average was 180 mg/l. (Table No. 1).

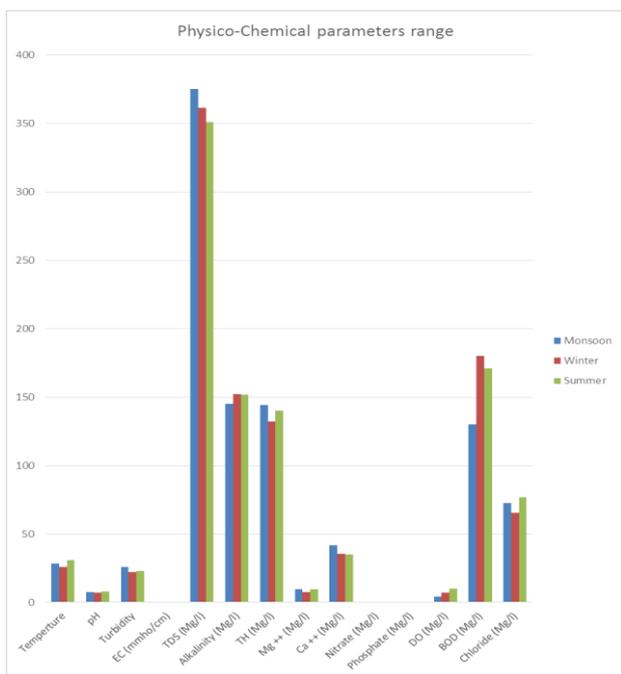
➤ Chloride (Cl)

Minute quantities of chlorides are necessary for normal cell functions in plant and animal life. Chloride is stored in plants and animal bodies as sodium chloride (NaCl). Natural source of chlorides in waters are the dissolution of salts deposits such as MgCl₂ (Magnesium chloride),

KCl (potassium chloride), NaCl (Sodium chloride) and weathering of sedimentary rocks Solanki, (2001). Chloride in drinking water is generally not harmful to human being. NaCl can convey a salty taste at 250 mg/L; on the other hand, CaCl₂ or MgCl₂ is not regularly detected by taste until levels of 1000 mg/l are reached.

At Giramtha pond seasonal average in monsoon was 72.4 mg/l, summer was 76.8 mg/l and winter was 65.5 mg/l. (Table No. 1).

During analyses chloride was gradually increased after monsoon season and highest values were recorded in summer and winter. During summer chloride values were high and during monsoon it were low recorded it may be due to inflow of rain water and similar results were reported by Koorosh, Jalilzadehet al., (2009). Higher chloride content during summer could be due to continuous evaporation of water especially during summer season Nair et al., (1983), Harikantra and Paruleker, (1990), Sampathkumar and Kannan, (1998), Borase and Bhawe, (2001). The desirable maximum permissible level for Chloride as per BIS, (1992) is 1000 Mg/l. At the time of investigation Chloride was in desirable maximum permissible level.



CONCLUSION

During investigation period most of the physico-chemical parameters were in permissible limit as per BIS and WHO hence water of Giramtha pond is not bad.

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