

STUDY OF PHYSIOCHEMICAL PARAMETERS IN TWO PONDS OF PADRA TALUKA, VADODARA

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ABSTRACT A study was conducted to study the physiochemical parameters of two ponds of Vadodara district in Gujarat. Many natural and man-made wetlands are there in the district. In this research paper two ponds from the sub taluka Padra is selected for the collection of sample and its physiochemical analysis. Conductivity, Total hardness, pH, turbidity, such 19 parameters are analysed by standard method .samples were collected in 2010 and 2011 in pre monsoon, monsoon and post monsoon for comparative study of them.

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INTRODUCTION

The Ramsar Convention defines - “Wetlands are areas of marsh, fen, peat-land or water, whether natural or artificial, fresh, brackish or salty, including area of marine water, the depth of which at low tides does not exceed six meters” (Ramsar, 2011).

Vadodara district is located in the eastern part of the Gujarat state .the district covers an area of 7549 sq.km .In total of all wetland category 1101 wetlands including 537 small wetlands (<2.25 ha) are mapped in the district (NWA, 2011). Vadodara has 1101 no of wetlands and almost all the sub district of Vadodara is blessed with the natural wetlands but urbanization and lack of awareness this natural water resource is in threat. Wetlands are one of the most productive ecosystem of world. Many researchers and workers worked in past and till working to create the importance about this very common but quite important ecosystem. The aquatic flora and fauna is dependent on the quality, quantity and sustainability of water in

wetlands. It even very important to the migratory birds and there importance in ecological cycle. Wetlands play a dynamic role in maintenance of ground water and its quality. Majority of the water resources of district are polluted by the sewage and improper industrial discharge. According to serve, Vadodara's wetlands are degrading gradually and it is effecting important ecological factor.

Gujarat Ecology Society (GES) has undertaken a centrally sponsored project on the 'Conservation of wetlands in and around Vadodara city (I E, 2008). As per the GES report, there are many reason behind the degradation of wetlands of Vadodara. By this study an effort has been made to analyse the physiochemical parameters of water to establish the data for study of water quality analysis .

STUDY AREA

Vadodara is located at 22° 20' 16.5" N latitude, 73° 13' 07.8" E longitude. There are about 12 sub-districts in Vadodara and Vadodara Is one of them. Padara is one of the sub district of Vadodara.

MATERIAL AND METHODS

Samples were collected from two different pond of same talukas in three different seasons 1- Pre Monsoon 2-Monsoon 3- Post Monsoon, in two consequent year of 2010 and 2011. Water samples were collected in clear polyethylene sampler bottle.

Samples were collected in three different seasons in morning time and were preserved and analysed according to standard method (APHA-1995)

Physic chemical analysis of samples were performed and result data of each is noted in tabular form. According to different parameters of different sites data is also presented in graphs for easy comparisons of complex observations. Comparison of two different years result data gives the clear idea about the sampling sites.

RESULT AND DISCUSSION:

The study of physical, chemical and biological parameter was carried seasonally from July 2011 to Jun 2012. The physical and chemical parameters included in the studies are colour, odour, temperature, pH, electrical conductivity, turbidity, total dissolve solid, total

alkalinity, total hardness, calcium, magnesium, dissolve oxygen, biochemical oxygen demand, chloride, nitrate and phosphate. The analysis of physical and chemical parameter were done based on APHA, Standard Methods (1995).

Temperature exerts a major influence on the biological activities and growth. To a certain point the increase in temperature leads to greater biological productivity, above and below which it falls and it's also govern the kind of organisms. Temperature influences water chemistry, e.g. DO, solubility, density, pH, conductivity etc. water holds lesser oxygen at higher temperatures. During present study the temperature recorded for all the four lakes ranges from 18⁰C to 32⁰C. The minimum temperature 18⁰C was recorded in both pond and the maximum temperature 32⁰C was recorded in all sites. The maximum temperature at both pond was recorded during summer season, followed by monsoon and winter. pH – potential of hydrogen, is the measure of the concentration of hydrogen ions. Its provide the measure of the acidity or alkalinity of a solution and is measured on a scale of 0- 14. The pH of water determines the solubility and biological availability of certain chemical nutrients such as phosphorus, nitrogen and carbon. The lowest pH 7.1, highest pH 8.14 and 8.17 in Vadu and Dabhasa and average pH were 7.5 at Vadu in 2011.

Suspension of particles in water interfering with passage of light is called turbidity. Turbidity of water is responsible for the light to be scattered. Turbidity in natural water restricts light penetration thus limiting photosynthesis, which consequently leads to depletion of oxygen content. During the present study turbidity show range between 0.0 NTU to 14.9 NTU minimum was recorded at Dabhasa during Post monsoon) and maximum at Vadu 14.9 during Monsoon. Electrical conductivity in the water is due to salt present in water and current produced by them. Conductivity is thus a measurement of total dissolved solids in water. The EC value recorded throughout the year ranges from between range 1636 mmho/cm to 1710 mmho/cm at Dabhasa and in Vadu it is recorded between 1272 to 1341 mmho/cm. Total dissolved solid denote mainly the various kinds of mineral present in the water. In natural water dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, phosphates and nitrate of calcium, magnesium, sodium, potassium, iron and manganese etc. They give a particular taste to the water at higher concentration and also reduces it palatability. In the present study minimum TDS 320 mg/l was at Vadu in monsoon (2011)

and maximum 5254 mg/l at Vadu in pre monsoon(2011) was reported. The alkalinity was recorded in range 80 mg/l at Vadu pond in monsoon to 264 mg/l at Dabhasa pond in pre monsoon.

Hardness is commonly expressed as Mg and Ca carbonate equivalent per liter. Although hardness is caused by cations it may also be discussed in term of carbonate (Temporary) and non-carbonate (Permanent) hardness. The principle hardness causing ions are calcium and magnesium. In present study the highest total hardness was 948 mg/l at Vadu during Pre monsoon, and lowest 164 mg/l at Vadu pond during monsoon semiler observation were observed by Verma et al. 2010.

Magnesium is also present with calcium in natural water albeit in lower concentration than calcium and has similar source of entry. Magnesium tolerance by human body is lowered than calcium and the high concentrations work as laxative and given unpleasant taste to water; it also add to hardness. Here the value of magnesium recorded was between the highest Mg was 139 mg/l at Vadu during pre monsoon and lowest 22 mg/l at Vadu pond during Monsoon. Calcium is commonly present in all water bodies where it usually has quantity varying from traces to 150 mg/L. During present study at Vadu minimum Ca was 29 mg/l and maximum was 147 mg/l at Vadu during Pre monsoon.

Freshly polluted systems, especially by sewage contamination, show higher concentration of ammonia nitrogen, which in an aerobic environment is converted into nitrites and then to nitrates. Nitrate nitrogen is an indicator of past pollution in the process if stabilization. WHO has imposed a limit of 10 mg/l nitrate as nitrogen o drinking water to prevent the disorder of methemoglobinemia. During study period the range of nitrate 1.29 mg/l to 22.99 mg/l, where lowest at Dabhasa in mosoon and highest was at Vadu during premonsoon. During investigation minimum Sulphate was 4.0 mg/l at Vadu in Monsoon and maximum was 68 mg/l at Dabhasa during Pre monsoon. Fluoride ranges between 0.15 mg/l in Monsoon at Vadu to 0.29 at dabhasa in Pre monsoon. Sodium at both the ponds are higher in Pre monsoon while lovwer in Monsoon.

Biological Oxygen Demand depends on aquatic life; variation in BOD indicates dynamism in aquatic life present in the pond. BOD refers the oxygen used by the microorganism in the aerobic oxidation of organic matter. Therefore with the increase in the amount of organic matter in the water the BOD increases. During the investigation period BOD was observed 5

mg/l and 9 mg/l minimum was at Dabhas during all the seasons and maximum was recorded at Vadu during all the seasons. During investigation period among all sites minimum COD was noted 19 mg/l at Dbhasa in Post monsoon and maximum 45 mg/l at Vadu pond in Post monsoon and Pre monsoon.

The greater source of chlorides in pond water is disposal of sewage and industrial waste. Human body release very high quantity of chlorides through urine and faeces. The chloride concentration is used as an important parameter for detection of contamination by sewage. During the investigation period range of chloride was between 72 mg/l to 1944 mg/l the minimum was found at Vadu in Monsoon and maximum at Vadu during Pre monsoon this results similar with verma et al (2013).

Phosphorus occurs in natural waters and in wastewaters almost solely as phosphates. These are classified as orthophosphates, condensed phosphates and organically bound phosphates. They occur in solution, in particles or detritus or in the bodies of aquatic organisms. Orthophosphate is the phosphorus from that is directly taken up by algae, and the concentration of this fraction constitutes an index of the amount of phosphorus immediately available for algal growth. Here the value of phosphate recorded throughout the year ranges from not detected to 0.400 mg/l. The highest value of phosphate recorded was found in the Pre monsoon in Vadu pond and lowest value was recorded in monsoon in both the ponds.

The potassium value recorded throughout the year ranges from 15.8 to 26.00 mg/l the highest value recorded in the monsoon at Vadu of December and lowest value was recorded in the Dabhasa Pond. Oil is not detected in both the ponds during all the seasons.

After completing detail investigation for physical and chemical parameter of all the ponds, it was found that most of physico-chemical parameters are more than maximum desirable limit, it is due to human activity and rain water.

CONCLUSION :

The fact revealed that wide variation in different physicochemical parameter was observed throughout the year. Here all the parameters were above the permissible limit of WHO. This indicates that water shows some level of pollution.

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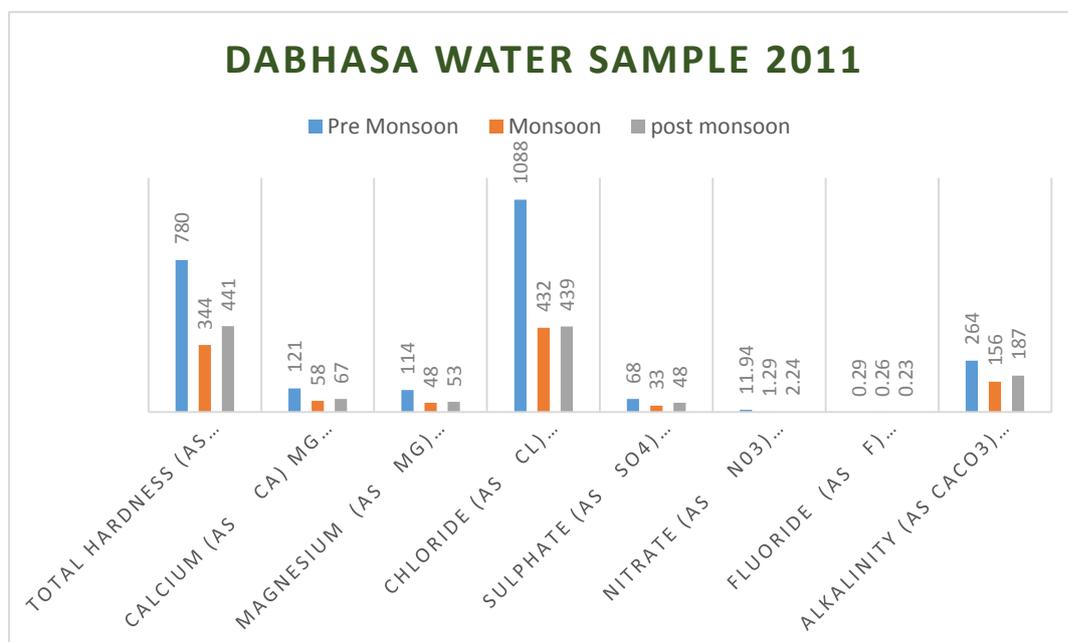
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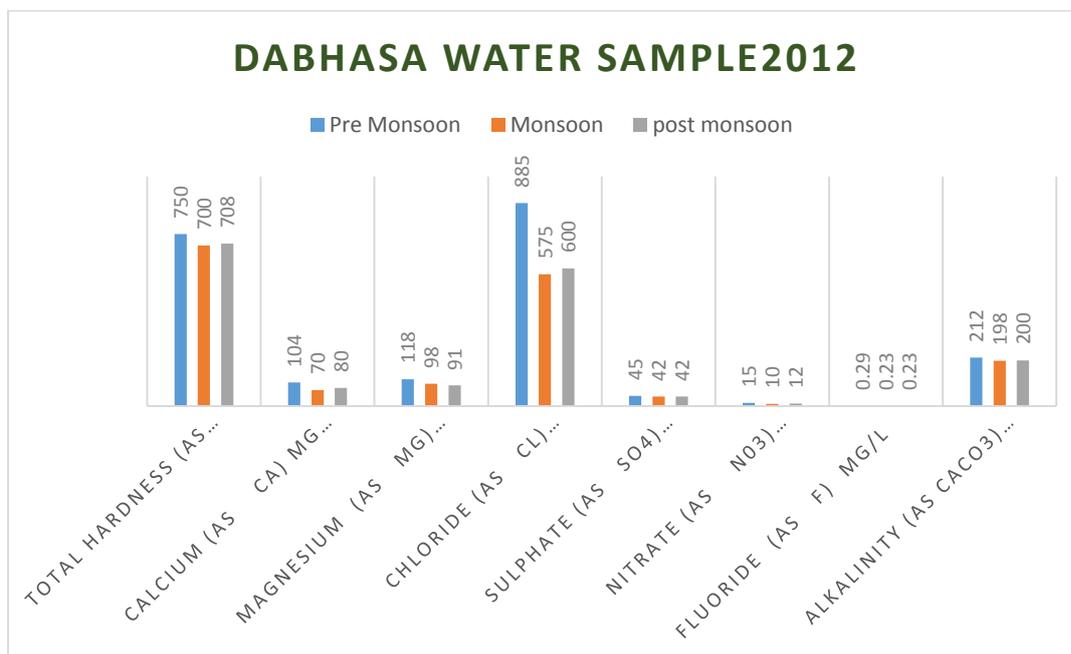
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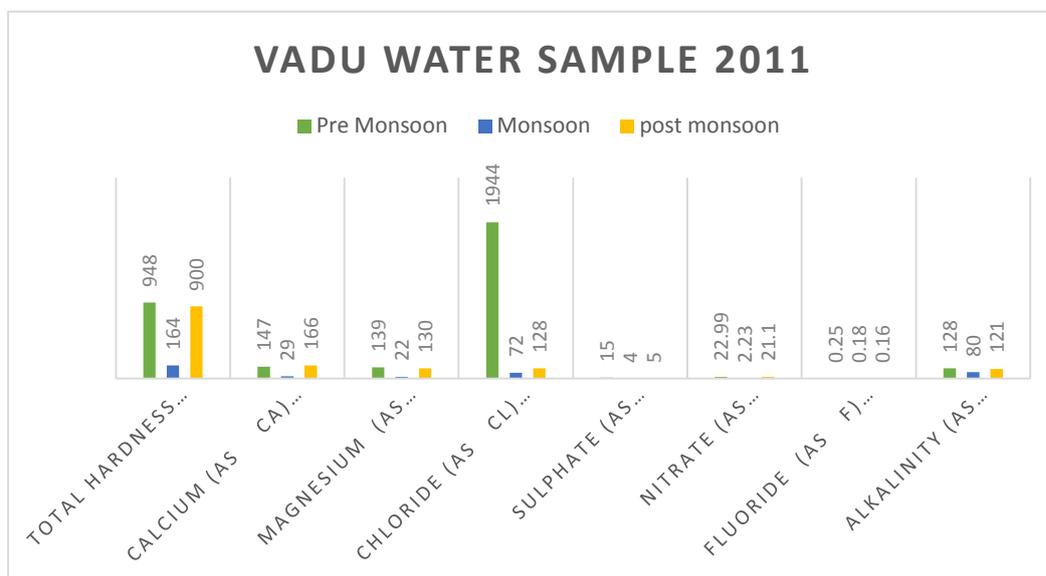
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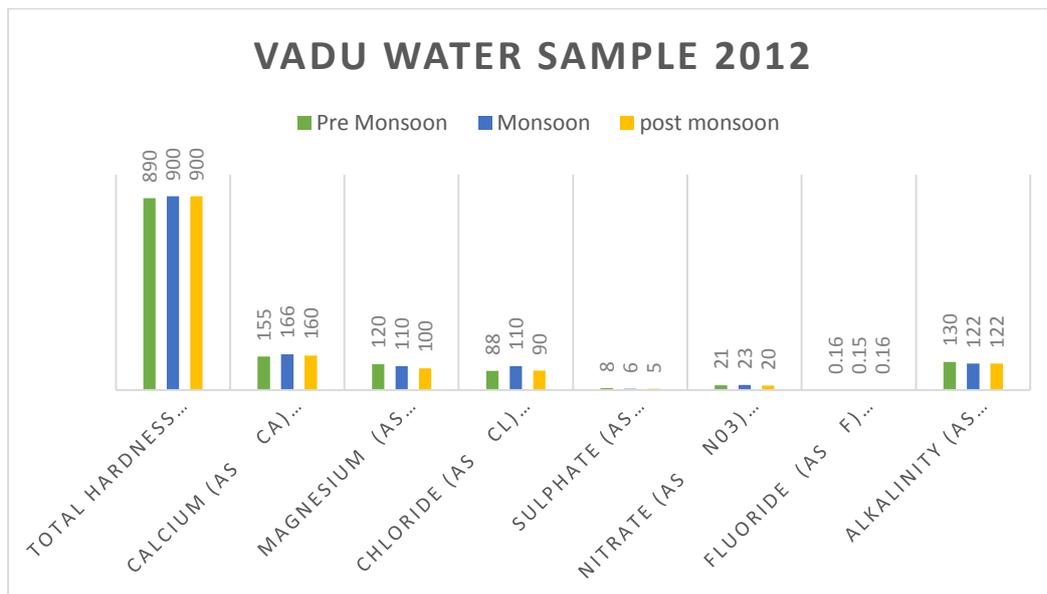
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Graph shows that the Cl is at higher concentration in both year, F concentration is comparatively low in 2011. not much difference in alkalinity in three seasons but in pre monsoon total hardness is little higher in 2011





Graph shows that compare to 2011 in 2012 total hardness increases, simultaneously Ca & Mg also increases. 2012 there is no much difference in results of all three seasons but in 2011 very high level of Cl in pre monsoon and low total hardness in monsoon.



Plate 1: Vadu pond in Summer



Plate 2:Dabhasa pond in summer