International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Analysis of Water Sample in Selected Villages in Shriwardhan Taluka

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Abstract: ***The study is based on analysis of water quality in different villages of Shriwardhan taluka & water samples are collected from different resources like river water, bore well water, open well water, sea water; then Physicochemical characteristics of each water samples are determined. Water reservoirs in India are maximumly depending on Monsoon to fulfil the water need. There is an increasing trend of pollution of water as well as environment because of industrialization, different kinds of agricultural fertilizers, pesticides, waste disposal management and adopting urban life style. These factors adversely affecting the water resources. The present research work deals with the study of some important physicochemical parameters of different water samples collected from river, bore water, lake water, sea water at Shriwardhan and diveagar village. All the types of water samples were subjected to analysis of physicochemical parameters such as pH, electrical conductivity, total dissolved solids, chloride, sodium, potassium, calcium, magnesium, sulphate. The obtained results are compared with WHO standard values. The results revealed that most of the physicochemical parameters such as fluoride were in high concentration at most of the drinking water sampling stations***

Keywords: Physicochemical parameters like acidity, pH, total hardness, TDS, conductance

1. Introduction

Shriwardhan is located at 18.056^0 N and 73.017^0 E. The current estimated population is projected to be 95,268 by Shriwardhan Tahsil. It is bounded by Mhasala taluka in the east. Arabian sea forms the western boundary having a length of about 2250 km.

Water accessibility refers that, how much water is physically available (water quantity) and whether that water is safe to use (water quality). Whether there is enough water for human ecosystem needs. It is a very important factor for sustainable development, for agriculture, industry, human health and for ecosystem. Water availability is influenced by various factors, including hydro-meteorological conditions, geological formations and population density. On earth 97% of the water is present in the form of saltwater and only 3% as drinking water of which 70% is in the form of glacier ice, that means usable water has a limited resource. Water is an essential element for survival of eco-systems and to fulfil the everyday need of human for economic and social development. Besides meeting basic human needs, it is a major source of energy in some parts of the world. Water is dire essential for agriculture and for many industrial processes.

In Shriwardhan taluka, Savitri River water used for agricultural, industrial purposes. Water availability in Shriwardhan taluka is seasonally and regionally variable, and is influenced by the intensity, timing, and duration of summer and winter monsoons. Climate change will lead to higher total precipitation and increased rainfall intensity.

Fresh water is the most important resources for survival of humans because they used fresh water for production of food. Growing concern over water shortage, efforts are now taken on enhancing the quality of existing water resources like lakes, constructing dam through proper characterization and restoration measures. [1]-[5]

2. Materials

Water samples are collected from different location are given in table -1. Standard bottles were used to collect samples of water by taking necessary precautions. Each bottle is labelled carefully and taken for the analysis of physicochemical parameters.

Table 1: Areas of sample collection

Sample no.	Sample Location	Source
WS-1	Savitri River	River Water
WS-2	Arathi Village	Well water
WS-3	Dighi Village	Bore Water
WS-4	Shriwardhan Beach	Sea Water
WS-5	Borli-Panchtan Village	Well Water
WS-6	Diveagar Beach	Sea Water
WS-7	Jasvali Village	Bore Water

3. Instruments

Digital pH meter, Digital Conductometer, UV-Visible Spectrophotometer, Digital Colorimeter instruments were used for the analysis.

Chemicals used for the analysis are analytical grade and solutions are prepared in distilled water.

4. Methods

4.1 Estimation of pH:

pH of all water samples was determined by using digital pH meter.

4.2 Estimation of Electrical conductivity:

Conductivity of all water samples was determined by using digital Conductivity meter.

4.3 Estimation of TDS

Filter the 100 ml of water sample through Whatman filter paper no.41. By determine the weight of empty evaporating dish transfer the filtrate into previously weigh evaporating dish. Then samples are allowing to stay in the oven at about 180^0C for 24 hours. On cooling the evaporating dish, weight of evaporating dish and residue is noted and then subtract the initial weight of empty evaporating dish with dried residue to obtained the increase weight. By using following formula concentration is determined.

Concentration (mg/L) = [(B-A)/C * (1000 mg/g) * (1000 ml/L)]
Where, A = Weight of empty evaporating dish (gm)
B = Weight of evaporating dish and residue (gm)
C = Volume of sample (ml)

4.4 Determination of Total hardness

The burette is filled with standard EDTA solution. Pipette out 50ml of water sample in Conical flask followed by addition of 1 ml of ammonia buffer solution and 5 to 6 drops of EBT indicator turns solution into wine red colour. Then titrate the solution against EDTA solution till the blue colour obtained. Using Total hardness determination of Ca and Mg metal ions can be determined.

4.5 Estimation of Chlorides

Pipette out 20ml quantity of water samples into 100ml volumetric flask and make up to the mark with distilled water, then pipette out 10 ml of water sample and add 1 ml of chromate indicator and then titrate the sample with 0.1 mol L^{-1} $AgNO_3$ solution forming white ppt changes to faint yellow colour.

4.6 Estimation of Sulphates

Sulphate content in water samples is determined by using Spectroscopic technique.

Conditioning reagent is prepared by mixing 25 ml glycerol with 15 ml conc. HCl, 300ml water, 50 ml ethyl alcohol or isopropyl alcohol and 37.5 gm NaCl.

Standard sulphate solution was prepared by dissolving 1.479gm of anhydrous sodium sulphate in distilled water and dilute the solution to 1000ml in volumetric flask.

In four 50ml standard volumetric flask add standard sulphate solution in order of 10 ml, 20 ml, 30ml and 40 ml. In another 50ml volumetric flask add 20ml of water sample. Use another volumetric flask for blank in which distilled water is present. In all six volumetric flask 5 ml conditioning reagent was added and dilute each flask up to the mark. Absorbance was determined at 420 nm wavelength using UV-Visible spectrophotometer.

4.7 Determination of fluoride ion by complexometric titration

The colorimetric method used for the determination of fluoride with Ferric Chloride is based on the observation that the intensity of the colour produced in the sample with thiocyanate by a given amount of iron in the presence of fluoride is less than that produced in the absence of fluoride. By colorimetric determination of the excess of iron reacting with ammonium thiocyanate, the quantity taken up by the fluoride from a given amount of iron may be calculated or determined by difference and its equivalent in fluoride read from a curve which can be constructed by plotting known amounts of fluoride against the iron they take up from the amount of ferric chloride used in the determination process.

4.8 Determination of alkalinity of water sample

20 ml of water sample is taken into conical flask by adding 1-2 drops of phenolphthalein indicator and titrating this solution against standard H_2SO_4 solution until pink colour disappears. Into the same solution 2-3 drops of methyl orange indicator and the titration is continued until solution becomes orange.

5. Results and Discussion

Table 2: Physical Characteristics of water samples

	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7
Turbidity	No	No	No	Low	No	Low	No
Colour	Clear transparent	Clear transparent	Clear transparent	Blackish White	Clear transparent	Yellowish White	Clear transparent
Odour	No	No	No	Salty aroma	No	Salty aroma	No
Temperature	30.2	31.7	35.8	36.1	31.2	35.3	30.7

Table 3: Chemical Characteristics due to chemical impurities

	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7
pH	7.65	7.12	7.06	7.9	7.15	7.8	7.02
Electrical Conductivity (mmhos/cm)	0.25-0.29	1.5-1.8	3.2-3.5	47-50	1.6-2.0	47-50	3.8-4.0
TDS (mg/L)	658-670	745-749	1125-1130	31000 - 32500	855-865	31000 - 32500	1093-1100
Ca^{2+} (mg/L)	85-90	107-110	137-141	410- 420	118-125	413-420	155-165
Mg^{2+} (mg/L)	32-35	20-23	18-20	1200-1300	15-19	1200-1300	21-27
Cl^- (mg/L)	75-80	235-240	90-100	19000-19500	232-240	19000-19500	90-100
SO_4^{2-} (mg/L)	45-50	115-120	162-170	2540-2550	122-125	2540-2550	153-160
F^- (mg/L)	0.03-0.05	0.3-0.5	0.8-1.0	1.0-1.2	0.5-0.6	1.0-1.2	0.8-1.1
Alkalinity	118-120	210-214	201-205	93-97	209-215	90-97	215-220

pH: The range of pH of all water sample water samples was found within the acceptable range 6.5-8.5 indicated by World Health Organization (WHO). pH analysis of different water samples indicates that pH of sea water sample is slightly basic than other samples [6].

Electrical Conductivity and TDS: The measurement of EC of water gives an idea about the ion's concentration in the water. As the concentration of dissolved ions increases, the water becomes more conductive. EC and TDS are interrelated as mostly inorganic substances are dissolved in ground water. The TDS is computed as sum of ions concentration in ground water. It is also an important parameter to assess the quality of water. Bureau of Indian Standards (BIS) suggest that the average values of EC and TDS of the different water samples water are within permissible limit [6, 9].

Alkalinity: Means its acid neutralizing capacity and detection of carbonate, bicarbonate and hydroxide content in water samples. It is also expressed in terms of $CaCO_3$. Alkalinity of bore and well water samples are more than desirable limit of 200 mg/L but within the maximum permissible limit of 600 mg/L [10. 11].

Total Hardness: The total hardness (TH) is the sum of calcium (Ca) and magnesium (Mg) concentration expressed in terms of CaCO3 in mg/L. The carbonate and bicarbonate salts of Ca and Mg give temporary hardness to ground water while a chloride and sulphate salt gives permanent hardness. Analysis of hardness data indicates that, Total hardness values are more than the range of desirable limit of 200 mg/L [7, 13].

Chloride (Cl^-) and Sulphate (SO_4^{2-}): in Shriwardhan taluka is mainly covered by Jambha rock, that contain more concentration of iron and bauxite in major proportion. Therefore, possibility of Cl^- and SO_4^{2-} in water sample is low. Most of the locations have chloride concentration within the desirable limit as prescribed by BIS, i.e. 250 mg/L. Similarly, most of the locations have sulphate concentration within the desirable limit as prescribed by BIS, i.e. 200 mg/L [8, 12].

Fluoride (F^-): The concentration of fluoride in Shriwardhan taluka is found within the acceptable limit. All the samples in Shriwardhan taluka have concentration of fluoride is in the range of 0.03-1.2 mg/L [14].

6. Conclusions

This research paper mainly based on different water samples on different locations in Shriwardhan taluka, having average annual rainfall 2164.5 mm. In spite of rainfall, ground water supply remains limited due to high slope gradient causes water flow rapidly downhill increasing surface runoff. The evaluation of different water samples has been observed that temperature of water samples WS-3, WS-4 and WS-6 was not within the range indicated by WHO i.e. 20to 32^0C. Evaluating the various parameters, awareness about use of water resources, harvesting, different problem arises because of water pollution and prevention of water pollution. So that we played crucial part for sustainable development.

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