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Quantitative Assessment of Drinking Water of Akkalkot Area

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Abstract - *Water is nature's most wonderful, abundant, useful compound and is essential without it one cannot survive. Water as a universal solvent has the ability to dissolve many organic or inorganic compounds. According to the World Health Organization, people around the world suffer from poor access to water, sanitation, and hygiene.*

Water is highly contaminated due to industrialization, agriculture practices, population, and man-made activities. The quality of water is deteriorating, due to water contamination. Assessment is required to check the Quality of water includes temperature, alkalinity, total hardness, chloride content, turbidity, pH, and total dissolved solids, Electric conductivity, and dissolved oxygen.

Key Words: Solvent, water contamination, alkalinity, turbidity, dissolved oxygen.

1. INTRODUCTION

The main source of water includes rain, surface, and groundwater. About 71% of the earth's surface is water-covered, out of which 97% of water found in oceans and 2% in the form of ice and glacier, and only 1% available as freshwater. Groundwater is the major source of water supply for rural and urban areas. Due to the increase in the human population, industrialization, agriculture activity, and various human activities have increased the pollution of surface water and groundwater. According to the World Health Organization 3.4 million deaths, every year turning out to be some of the world's most dangerous waterborne diseases. India is the second-largest population in the world and facing serious problems of natural water scarcity. The good quality of water is absolutely necessary for preventing diseases and sustainable life.

Natural water is contaminated with various impurities such as suspended, dissolved, colloidal, biological, metallic, and non –metallic ions, etc. So the analysis of water is required for estimating various impurities present in water and also for choosing the proper water treatment process.

2. Methodology

2.1 Collection of Water Samples

Akkalkot city is located southeast of Sholapur, covers an area of 1,407 km2 and the total population is approximately 314,570 (2011 census). The water samples for analysis were collected in plastic containers, which were washed and rinsed with water and distilled water, from a different area of Akkalkot city. The temperature was recorded at the site of collection by using a mercury thermometer. In this study, analyzing the water samples are coded as B.S.1 for near Pramila Park, B.S.2 for Utkrash Nagar, B.S.3 for Samata Nagar, B.S.4 for near Vidhya Nagar, B.S.5 for near Mangurle chowk.

2.2 Physicochemical Analysis of water samples

Assessment of water samples carried out by various physicochemical methods. The alkalinity, hardness, chloride content, and dissolved oxygen were estimated by the titrimetric method. TDS was measured by filtration, and weighing methods. Turbidity was measured by Turbidity meter (model NT-2000), PH was measured by PH meter (model EQ-610), and E.C. was measured by a conductivity meter (model EQ-660A). The measured value is recorded in table no.1 which is compared to Indian standard.

2.3 Result and Discussion

1. Temperature: It is a physical parameter that refers to how cold or hot the water is. The temperature of the samples founded at a range of 25-28°C.

2. Total Alkalinity: Alkalinity is a measure of the ability of water to neutralize the acids. The alkalinity of water is due to the presence of hydroxide ion (OH-), bicarbonate ion (HCO3-), and carbonate ion. (CO32-). These ions are estimated separately by titration against standard acid using methyl orange as an indicator and are expressed as commonly as milligrams per liter. The alkalinity of the water sample founded to be 90-200mg/l. The highest alkalinity was recorded of B.S.4

3. Total hardness: Salts of calcium and magnesium in the form of their chlorides, sulfates, and carbonates causes the total hardness and estimated by titration with a standard solution of ethylene diamine tetraacetic acid (EDTA) using the Eriochrome Black-T indicator. Desirable limit of hardness range is 200 to 600 mg/l, the degree of hardness of water has been expressed in terms of the equivalent CaCO3. Total hardness of the water sample founded to be 280-416mg/l.The highest hardness of water was recorded for B.S.1

4. Chloride: Water contains dissolved chloride salts of calcium, magnesium, and sodium ionize to give chloride ions in water. Chloride content determines by titrated with silver nitrate solution, using potassium chromate indicator. All types of natural and raw water contain chlorides and are one

of the most abundant inorganic ions in natural water. The desirable limit for chloride is 250 -1000 mg/l in the Permissible limit.

5. Turbidity: Suspension of particles in water interfering with the passage of light is called turbidity. Turbidity is caused by a wide variety of suspended particles like' clay, salts, and organisms. Turbidity measured by its effect on the scattering of light which is termed as Nephelometry.

6. Total dissolved solids (TDS): Total Dissolved Solids (TDS) in the water are some organic and inorganic materials, which include minerals and ions that are dissolved in a particular quantity in water. Minerals, chemicals, and fertilizers are the main sources of TDS, and its value calculated by a known amount of water filtered through Whatman's filter paper; take filtrate in porcelain dish and place in an oven to evaporate to dryness at 103°C to 105°C.

7. PH: The pH of a solution is the negative logarithm of the hydrogen ion activity: PH is the standard measure of how acidic or alkaline a solution is, It is measured on a scale from 0 -14. The positively charged ion (H+) and negatively charged ion (OH-) are equal; the PH value of water is 7 i.e. neutral. PH meter is calibrated by using buffer solutions of PH 4.0, 7.0, and 9.2. PH value of water sample is between 6.32-8.15.

8. Electric Conductivity: Conductivity is the capacity of water to carry an electrical current and this ability depends on the presence of ions, their total concentration, mobility, valence, and relative concentrations, and on the temperature of the liquid.

9. Dissolved oxygen: Dissolved oxygen refers to the level of free, non-compound oxygen present in water. The D.O value varies with temperature, pressure, and chloride concentration. Dissolved oxygen is absolutely essential for the survival of all aquatic organisms and measured by titrimetric method (Winkler Method).

Table -1: Physico-chemical parameter of different water samples

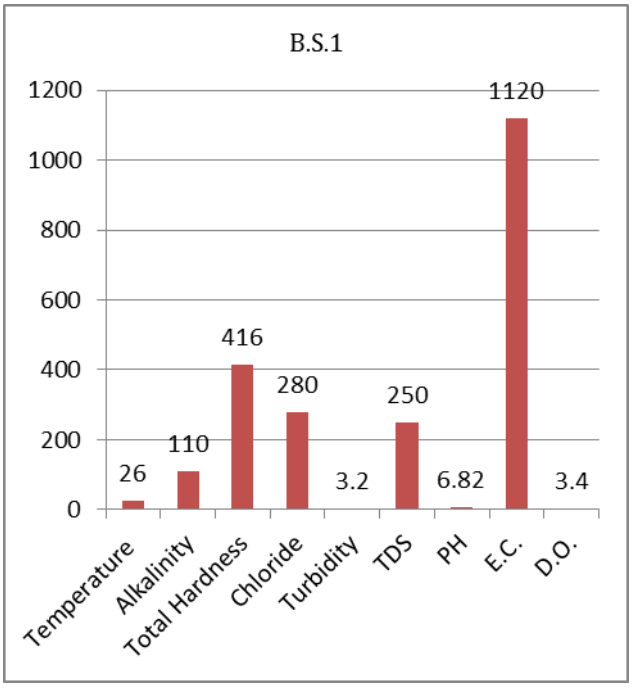
Sr. No.	Parameter	Unit	B.S.1	B.S.2	B.S.3	B.S.4	B.S.5
1.	Temperature	°C	26	27	25	28	26
2.	Alkalinity	mg/l	110	150	90	200	180
3.	Total Hardness	mg/l	416	320	280	380	300
4.	Chloride	mg/l	280	340	320	370	360
5.	Turbidity	NTU	3.2	2.5	2.8	4.2	3.8
6.	TDS	mg/l	250	300	320	400	380
7.	PH	-	6.82	6.43	6.32	7.25	8.15
8.	E.C.	µS/cm	1120	910	610	946	860
9.	D.O.	mg/l	3.4	3.2	3.6	4.2	4.1

Table -2: Indian Standard specification of Drinking water

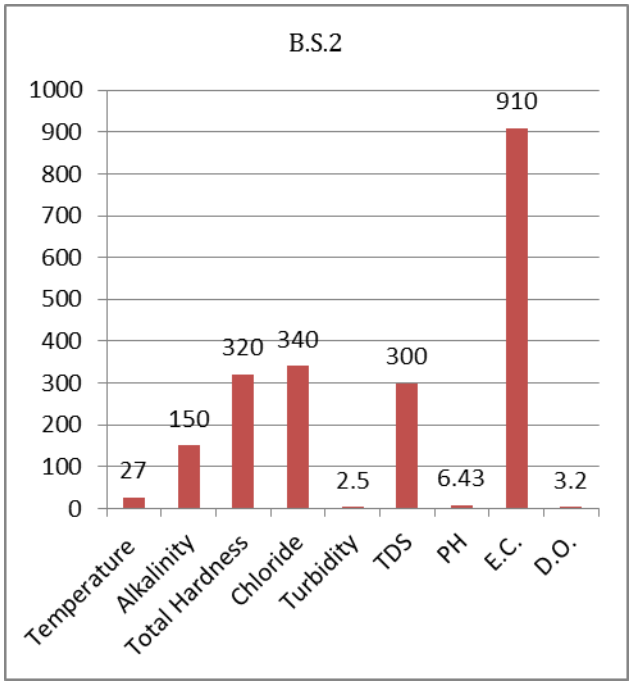
Sr.No.	Sample water	Indian Standard
1.	Temperature (°C)	-
2.	Alkalinity	200-600 mg/l
3.	Total Hardness	200-600 mg/l
4.	Chloride	250-1000 mg/l
5.	Turbidity	1-5 NTU
6.	TDS	500-2000 mg/l
7.	PH	6.5-8.5

Results obtained are represented in following graph number 1 to 5 for water samples having code B.S.1 to B.S.5.

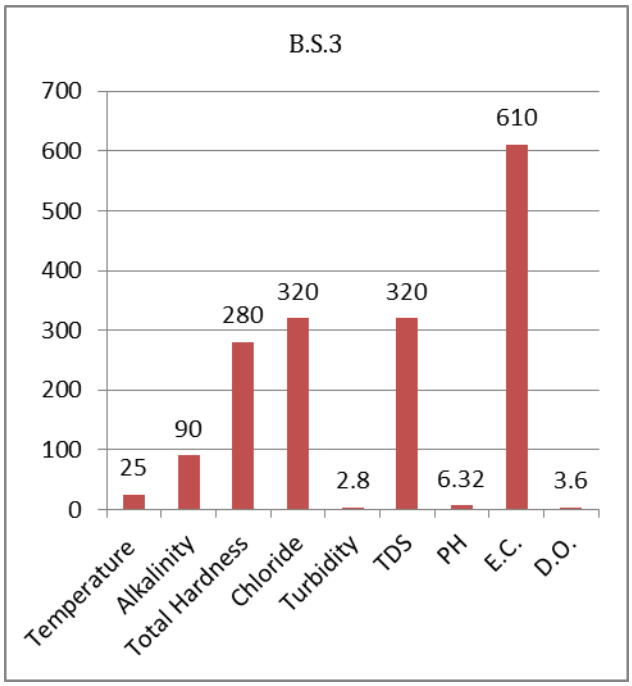
Graph No 1: Physico-chemical parameter of B.S.1



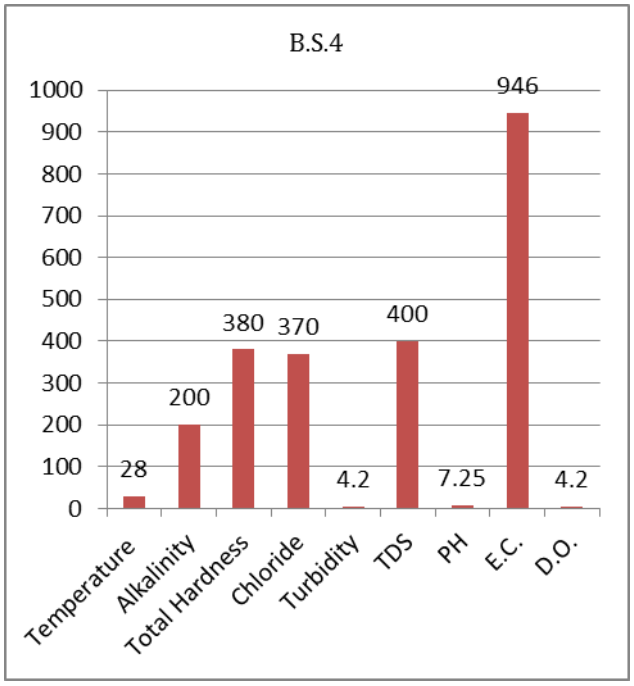
Graph No 2: Physico-chemical parameter of B.S.2



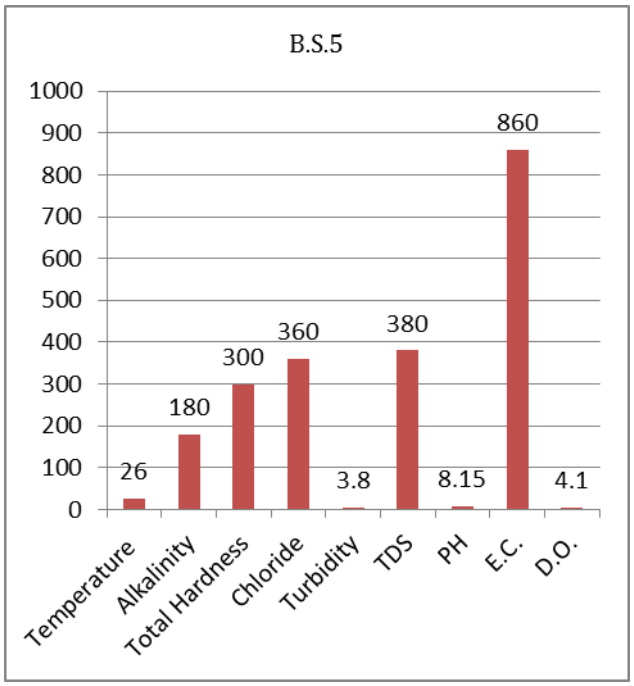
Graph No 3: Physico-chemical parameter of B.S.3



Graph No 4: Physico-chemical parameter of B.S.4



Graph No 5: Physico-chemical parameter of B.S.5



3. CONCLUSIONS

In this article I have assessed several water quality parameters and compare with Indian standard of Drinking water. The value of alkalinity, total hardness, chloride content and turbidity of water samples are within the permissible limit and PH value is less than permissible limit, because of the higher hydrogen ion concentration, Electric conductivity of B.S. 1sample found to be exceeding the limit. Treatment of water is necessary to keep better quality of

drinking water and it is needed to be further investigation of chemical oxygen demand, biological oxygen demand and biological parameter of water.

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