

Physico-chemical analysis of water – a Review

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Abstract - Water is the most important natural resource known on earth. It is important for all living organism. The existence of human race is dependent on health, food production, and economic development would not be possible without water. The safety of water is affected by various physico chemical factors such as hardness of water, pH, alkalinity etc. If not taken into consideration it may cause serious health problems. Sometimes poor quality of water causes many diseases in humans so the quality of the water must be tested for both the drinking purpose as well as for other daily use. During the study, it had been found that physical and chemical parameter needed should be within the desirable limit, as suggested by WHO (1971) and BIS (1991). The objective of this research is to study and provide information on the physicochemical characteristics & it's suitability for human consumption.

I. INTRODUCTION

Water plays an important role in human life. It is necessary for various purposes like industries, agriculture, fishery and many more. We know that water is present in 60% in the adult human body. There are 1400 million billion liters of water, out of which most of the water is not used for drinking purposes, because 97% is seawater and just 3% is fresh water, out of which 2% is found in the polar ice caps and glaciers. Good quality of water resources depends on amount of physicochemical parameters and biological characteristics. To assess that monitoring of those parameters it is important to spot magnitude and source of any pollution load. [1]

Biological assessment could be a helpful different for assessing the ecological quality of aquatic ecosystems, since biological communities integrate the environmental effects of water chemistry, additionally to the physical and morphologic characteristics of rivers and lakes. [2]

The WHO gave strictly Guidelines for Drinking Water Quality (GDWQ) which describes the need to protect public health through the adverse of a water safety plan (WSP). It forms basic guidelines for drinking water quality provided from a common point of reference worldwide to determine water safety. [3]

Following are the main factors which affect the quality of water

(1) Alkalinity- Alkalinity is the major factor which decides the quality of water. Total pH ranges from one hundred ten

mg/l (110 mg/l) to one hundred sixty five mg/l (165 mg/l) was recorded within the month of (summer). Alkalinity will be low down in the month of winter. Similar cases has been recorded in Gregorian calendar month due to the rise in bicarbonates within the water. (Hujare, M. S. 2008) minimum in winter thanks to the high chemical process rate [4]

(2) Turbidity- The turbidness of water fluctuates from three.90 to 14.25 NTU. the utmost worth of fourteen.25 NTU was recorded within the month of March, it's going to result to human activities, decrease within the water level and presence of suspended material and minimum worth of three.90 NTU within the month of Gregorian calendar month .

(3) The hardness of water- Hard water is defined as the water which does not form lather with soap and produces white scum. The hardness of water is an important factor to check the quality of water. The hardness of water depends on the presence of salts of heavy metals such as Ca, Mg, etc. The value of hardness fluctuates from seventy mg/l to 142 mg/l. the most prices (142 mg/l) was recorded within the month of April (summer) and minimum price (70 mg/l) The reportable total hardness was high throughout summer than monsoon and winter. High price of hardness throughout summer is attributed to decrease in water volume and increase of rate of evaporation of water. [5]

(4) The pH of water:- The pH of water is measure of the acid-base equilibrium and, in most natural waters, is controlled by the carbon dioxide-bicarbonate-carbonate equilibrium mechanism. An increased carbon dioxide concentration will therefore lower pH, whereas a decrease will cause it to rise.

Temperature will also affect the equilibria and the pH. In pure water, a decrease in pH of about 0.45 occurs as the temperature increase by 25 °C. In water with a buffering capacity Imparted by bicarbonate, carbonate, and hydroxyl ions, this temperature effect is modified. [6]

The pH of an aqueous sample is usually measured electrometrically with a glass electrode.

Temperature has a significant effect on pH measurement.

1. By evaporation, estimate the total solid
2. By estimation, estimate the volatile matter
3. The SO₃ is determine as fresh sample.

Extreme pH values result in irritation to the eyes, skin, and membranes.

Eye irritation and skin disorders have been associated with pH values greater than 11. In addition, solutions of pH 10–12 have been reported to cause hair fibres to swell

. In sensitive individuals, gastrointestinal irritation may also occur. Exposure to low pH values can also result in similar effects. Below pH 4, redness and irritation of the eyes have been reported, the severity of which increases with decreasing pH. Below pH 2.5, damage to the epithelium is irreversible and extensive. In addition, because pH can affect the degree of corrosion of metals as well as disinfection efficiency, it may have an indirect effect on health.

(5) Temperature- Temperature is a physico chemical parameters which decides the suitability of microorganism. Temperature of water samples taken at the time of collection were in the range of 24 to 26°C. The maximum permitted standard of drinking water is 25°C. [7]

(6) Carbonate- Whenever the pH is at the 8.3, the presence of carbonates is indicated. It is measured by titration with standardized hydrochloric acid using phenolphthalein as an indicator. Below pH 8.3, the carbonates are converted into an equivalent amount of bicarbonates. The titration can also be done pH metrically or potentiometrically.

(7) Chemical Oxygen Demand (COD) - COD is another measure of organic material contamination in water. COD is that the amount of dissolved oxygen required to cause chemical oxidation of the organic material in water. Both BOD and COD are key indicators of the environmental health of a surface water system. They are commonly utilized in waste water treatment but rarely generally water treatment. [8]

(8) Magnesium- It is also measured by complexometric titration with a standard solution of EDTA using Eriochrome Black T as an indicator under the buffer conditions of pH 10.0. The buffer solution is made from Ammonium Chloride and Ammonium Hydroxide. The solution resists the pH variations during titration.

(9) Colour

Colour in water you see around you can be imparted in two ways: dissolved and suspended components. An example of dissolved substances is tannin, which is caused by organic matter coming from leaves, roots, and plant remains (left-side picture). In the picture below the colour is probably attributable to naturally dissolved organic acids formed when plant material is slowly broken down by into tiny particles that are essentially dissolved in the water. If you filtered that tannin-water in the picture the colour would probably remain.



Table I: Different analytical water quality parameters with their analytical technique and guideline values as per WHO and Indian standard

Sr. No.	Parameter	Technique used	WHO standard	Indian Standard	EPA guidelines
01	Temperature	Thermometer	-	-	-
02	Color	Visual / color kit	-	5 Hazen units	-
03	Odour	Physiological sense	Acceptable	Acceptable	-
04	Electrical conductivity	Conductivity meter / Water analysis kit	-	-	2500 us/cm
05	pH	pH meter	6.5–9.5	6.5–9.5	6.5–9.5
06	Dissolved oxygen	Redox titration	-	-	-
07	Total Hardness	Complexometric titration	200 ppm	300 ppm	< 200 ppm
08	Alkalinity	Acid–Base titration	-	200 ppm	-
09	Acidity	Acid–Base titration	-	-	-
10	Ammonia	UV Visible Spectrophotometer	0.3 ppm	0.5 ppm	0.5 ppm

All the parameters were analyzed by using standard methods (Kodarkar 1992), (APHA/WWA-WPCF 1999), APHA (2005)

10. Conclusion

The water generally seen that the healthiest rivers and lakes is not absolutely pure. All water (even if it is distilled) contains many naturally occurring substances mainly bicarbonates, sulphates, sodium, chlorides, calcium, magnesium, and potassium. Many factors affect water quality. Substances present in the air affect rainfall. Dust, volcanic gases, and natural gases in the air, such as carbon dioxide, oxygen, and nitrogen, are all dissolved or entrapped in rain. When other substances such as sulphur dioxide, toxic chemicals, or lead are in the air, they are also collected in the rain as it falls to the ground which leads to contaminates water.

In this paper the study of the various Physio-chemical properties of the water is done used which is important for human sustainability. This water is normally for drinking, agriculture and domestic purpose.

Physiological aspects of the water have been investigated to assess the quality of water. It has been concluded that variations of the physicochemical properties of water directly influence the biotic communities and the productivity of the water bodies at different points.

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