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Physico-chemical Studies on Ground Water Quality of Shastripuram Agra (U.P.) India

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Abstract The area of study Shastripuram situated in Agra, Utter Pradesh India. The present study deals with Physico-Chemical analysis of ground water of five different blocks of the shastripuram i.e block-A(S1), block-B(S2), block-C(S3), block-D(S4) and block-E(S5). The ground water parameters such as temperature, turbidity, pH, alkalinity, conductivity, dissolve oxygen, biochemical oxygen demand, total hardness, magnesium, calcium, iron, sulphate, phosphate and nitrate were examined in the samples to evaluate there qualities. The results reveal that concentration of dissolve oxygen, biochemical oxygen demand, iron and alkalinity are within permissible limits and magnesium, calcium, phosphate, nitrate and sulphate are negligible in comparison to permissible limits but the value of total dissolve solid is not very high to permissible limits. It is clear that the water quality is suitable for both drinking and irrigation purposes.

Keywords Pollution, dissolve oxygen, biochemical oxygen demand, ground water

Introduction

Water is most important natural resources on the World. It is not only used for drinking, irrigation, fisheries, recreation, navigation and water generation purpose etc. rather also required to manage waste water discharges from habitat center, industries, agricultural activities etc. In our country quite 65% of the irrigation requirement and 80% of beverage passionate about the ground water. The ground water quality of the world is deteriorating thanks to water logging, domestic and industrial contaminy etc. due rapid urbanization of this area.

Water from beneath the ground has been used for domestic, livestock, industrialization and irrigation uses since olden days generally with none treatment (Gyan Rani freeda, 2002). Disposal of sewage beneath the land leakage of sewage effluent from the sewer channel leakage from septic tanks and cesspools are filtered to the ground and meet into the ground water resulting contamination (Shriparna Saxena,2002).The impact of urbanisation on biodiversity of River yamuna in Delhi studied (Ravindra Kumar Meena ,2019).

Local pollution from industrial discharges and spills fairly often introduce nutrients, pesticides, heavy metals and organic pollutants that will seriously degrade local and regional water quality. Results show that prime contents of nitrate, iron, fluoride, chromium, manganese and high salinity render well water unsuitable for drinking purpose (S. Das, 2001).

Shrivastava and Vaishnav have investigated about physic chemical characteristics. The regression toward the mean and correlation analysis are performed on water quality parameters of Vapi industrial area (V.S shrivastava ,2002). Similar kind of works are carried on textile, dyeing and printing industrial waste water (J.R. Kulkarni ,2001) and

factory also (P. Malviya, 2001). Increasing growth of industrialization causes large volume discharge of effluents on to adjoining areas. This affects the surface water quality by moving horizontally and also affects the ground water quality when effluent moves vertically downwards. This demands for quality management of ground water through periodical monitoring by spring water sampling, chemical analysis and also statistic analysis of water quality data collected over a period of your time.

This paper mainly deals with spring water quality to suit drinking and domestic purpose. The various quality parameters like pH, turbidity hardness, electrical conductivity (EC), total dissolved solids (TDS), calcium, magnesium, iron, sodium, chloride, phosphate and sulphate are analyzed and compared with BIS potable quality standards.

Experimental

The samples are collected with the assistance of a clean plastic container, rinsed several times with the assistance of same samples which are to be analyzed. These water samples were extremely used for drinking and domestic purposes. The locations of the sampling area are block-A(S1), block-B(S2), block-C(S3), block-D(S4) and block-E(S5) of shastripuram Agra.The physico-chemical analysis of the ground water samples were determined by standard method (APHA,1989). The all samples were collected from August 2021 to January 2022. The pH was firm using electrical digital pH meter (model D1:707), turbidity was measured by using Turbidity meter and therefore the estimation of hardness, TDS, EC. Calcium, magnesium, Common salt and Sulphate were administered by standard methods.

Results and Discussion

The physico-chemical analysis of ground water are present within the table-1, which clearly indicated that the variation of pH and other parameters of various samples. The results were compared with (WHO1992) and IS: 10500 standards for beverage.

pH :

Determination of pH is one in all the important parameters in biological treatment of waste water and in chemical co-agulation, disinfection, water softening etc. It's also employed in the determination of carbonate, bicarbonate and acid base equilibria. The pH values of ground water ranged from 7.3 to 8.5 which is within the permissible limits indicated slightly alkaline nature. Alkaline nature of the water is thanks to presence of salts of weak acid of strong bases. It's not any direct effect on individual the range of desirable pH of water prescribed for drinking purpose by (ISI, 1991) is 6.3 to 8.4.

Temperature:

Water temperature is most vital for all metabolic and physiological activities and life process of aquatic organism.water quality is maintained by temperature.during present investigation the range of water temperature is 22.7 °c to 25.6 °c.

Turbidity :

The turbidity of various samples varies from 4.3 to 6.0 NTU which is in permissible limits with reference of the (BIS,1998) standards. Turbidity is also removed either by setting or by centrifuging in the water, the bounds of turbidity prescribed is 6 NTU.

Electric conductivity:

The conductivity of water is because of presence of soluble salts which act as conducting substances.the values of conductance for the samples are within the permissible limits (245 to 621). The electrical conductance could be a good measure of dissolved solids and excessive presence of sodium in water is not only unsafe for irrigation but also makes the soil uncultivable (Verma ,1994). Higher range of electrical conductivity affect germination, growth and yield in many plants.

Alkalinity:

The ground water contain substantial amount of dissolved greenhouse gas, bicarbonate and hydroxides. These constituents are the results of dissolution of minerals within the soil and also the atmosphere.

Dissolved oxygen (DO):

DO is most significant parameter for the ground water. Low value of DO gives bad odor to water due to annerobic decomposition of organic waste (Sallae, 1974). The worth of DO varies with temperature of water and altitude. The DO of natural water depends upon chemical, physical and biological activities prevailing within the water bodies. The values of DO is varies from 6.2 to 6.9mg/L. It showed an inverse relationship with temperature which could be thanks to oxidation of oxygen as reported by (Dyaneshwari and Meena, 2006).

Biochemical oxygen demand (BOD):

The value of BOD for the ground water samples are varies from 0.4 to 0.9 mg/L. The utmost value of BOD for potable is 6 mg/L. The low value of BOD indicate low pollution.

Total Hardness :

The total hardness is because of the presence of calcium and magnesium cations. Carbonate hardness was called temporary Hardness because it are often precipitated by boiling. In present study total hardness of water samples range from 160 to 350 mg/L, which isn't very high to permissible limits. Hardness do not have any I'll impact on the soul directly.

Magnesium and Calcium :

Magnesium and Calcium play a very important role for all living being. It's most abundant metals of natural water. The high concentration of those metals may result in increase in water corrosive nature and adversely affect the water quality by acquiring harmful elements. The worth of magnesium and Calcium ions for the water samples are within the range 11.3 to 13.5 mg/L, 40.2 to 61.8 mg/L respectively.

Iron:

The concentration of iron found within the range from 0.65 to 0.89 mg/ L which is within the permissible limits.

Sulphate:

The sulphate play an important role in hardness of water. Higher concentration of sulphate ions may cause adverse affect on the health of human being. Gastrointestinal diseases develop in human being due to high concentration of sulphate ions. The values of sulphate ions varies from 5.2 to 71.3 mg/L for these water samples.

Nitrate:

The major contribution to nitrate concentration is from biological oxidation of nitrogenous substances which is comes from domestic waste which dissolve in rain water leaches in to under ground water. The present study deal with the concentration of nitrate varies 0.61 to 12.6 mg/L which is within the permissible limits of WHO health based guidelines values.

Phosphate:

Phosphate is not harmful to man but it associate with high value of calcium may cause kidney stone. The concentration of phosphate ion ranged from 0.023 to 0.089 mg/L.

Table - 1 Ground Water Quality of the Study Area

Parameters/ Samples	Block A, S1	Block B, S2	Block C, S3	Block D, S4	Block E, S5
pH	7.1	7.9	8.3	8.5	7.3
Temperature (°C)	25.6	24.7	22.7	22.6	23.9
Turbidity (NTU)	5.8	6.0	4.7	5.4	4.3
EC(mho cm^{-1})	245	359	458	621	542
Alkalinity (mg/L)	10	14	25	19	12
DO(mg/L)	6.2	6.4	6.5	6.9	6.0
BOD(mg/L)	0.4	0.6	0.7	0.9	0.6
Total Hardness (mg/L)	240	160	269	196	350
Magnesium (mg/L)	11.3	12.7	13.5	13.1	12.8
Calcium (mg/L)	46.3	40.2	51.8	61.8	58.9
Iron(mg/L)	0.65	0.83	0.77	0.69	0.89
Sulphate (mg/L)	34.6	5.2	56.3	71.3	68.2
Nitrate (mg/L)	0.61	7.13	11.9	10.8	12.6
Phosphate (mg/L)	0.089	0.046	0.023	0.083	0.057

Conclusion

With increasing discharge of spent wash on the land, ground water has been exposed to the risks of contamination and this needs remedial measures. This study of water samples which is collected from different block of shastripuram. It is concluded that the concentration of dissolve oxygen, biochemical oxygen demand, calcium are within the permissible limits but total hardness is kind of high to permissible limits. The concentration of phosphate and alkalinity are not high to permissible limits. The concentration of iron is far higher to upper permissible limits. Finally all perimeters of spring water quality is found within the permissible limits so water are often used for drinking purpose still as irrigation also.

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