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Study of Extent of drinking water analysis in South Ahmednagar district

KEYWORDS

BOD, COD, Suspended Solids and Toxic Metals.

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ABSTRACT The surface runoff water usually contain high BOD, COD, suspended solids & toxic heavy metals, while are furnished in to the nearest water body. Thus the present study has essentially include the estimation of water quality of some surface water bodies such as canal's, Bore well, lake, river etc. located in and around the district. Considering above aspects we have proposed to undertake a strategic planning for water quality assessment at parts of Ahmednagar district. Chemical parameters like pH, Total Dissolved Solids, Suspended Solids, Total Hardness, Dissolved Oxygen, BOD, COD and Total Phosphates were studied for the water samples.

INTODUCTION

Man's interest in water is as old as the history of man himself on the earth. Life is supposed to have originated in water and water is the most essential requirement of all. The human cultures evolved along the river courses and man his crops and man had used his crops and more recently for industrial development, which puts these resources under increasingly greater stress from numerous human activities & therefore makes a subject of detailed scientific investigation in different fields. (Ref.-1)

As water is main component of living world, organisms required water for their various life related activities. The most impressive feature of earth would surely be abundance of water at its surface out of this immense quantity of water covering 71 % of the earth surface to a mean depth of 3.8 Km relatively only a small fraction of 0.009 % occurs as freshwater of lakes, wet lands, rivers & other inland aquatic bodies.(Ref.-1 & 3).

Kolkwitz and marsson (1908) heralded a new era in the field of aquatic ecology when they first used biological data for monitoring the water quality in their "Suprobian system." Subsequently, fierdingstad (1964) proposed a system for assessing the extent of pollution.

Patrick (1949) & then palmer (1969) used algae as indicator of water pollution. (Ref.-1 & 2).

"Water means different things to different peoples."

Quantity & quality of water are interrelated & thus one cannot be considered while overlooking the other in any effective water management program.

Acceptable or ideal water quality depends on the end use of that particular body of water for example water suitable for drinking may not be suitable for certain sophisticated industrial uses such as in chemical & pharmaceutical industries. Hence it is necessary to conserve the quality of water. According to best designed use of water (Ref.-4)

The medicinal value of water is described in Ayur-veda , considered a supplement of the Atharva-vada ,this work enumerates all the benefits bestowed Veda.

The highest water consumption do not occurs in the most densely populated areas in general rates of water consumption reflect the needs of agriculture much more than those of the home of commerce, or of industry one conclusion from this difference is that effort to conserve water a significant contribution to the demand of agriculture therefore the fresh water available were the water on the earth surface in lakes & rivers, it would hardly be, enough. (Ref.-6 & 8)

Major water pollutants:

Important water pollution are organic pollutants, inorganic pollutants Sediments radioactive materials, & thermal pollutants.

The foreign substances in the water are also classified on the basis of their particle size such as suspended solids, colloidal particles & Dissolved matter etc. Acts for protection of water pollution India: (Ref.-7 & 9).

The Indian fisheries act, 1897.

The Damoder valley corporation of water pollution Act,1953, Orissa River pollution & Prevention Act,1953.Structural and functional attributes of water, which are physical chemical & biological, have to be monitored both qualitatively & quantitatively in order to have a comprehensive evaluation of the water.(Ref.-10)

EXPERIMENTAL

The basis of study in present project have been started from map of Ahmednagar district indicating proper part highlighted in the present project for various surface water bodies & ground water sources survey of city have been done & on the basis of those four sources i.e. stagnant water bodies, flowing water bodies, open dug well & tube well the sample have been collected, for collecting the sample representative locations from south area of the district have been selected, water sample have been collected from this location in the month of January i.e. winter season. In the proposed study sample of water have collected from above mentioned sources & have been analyzed for study of Physico-chemical parameters to facilitate the preparation of water quality data at these locations. The analyzed values have been In turn compared with permissible standard & are discussed in next chapter of project.

The methods applied for analysis of water sample for relevant parameters are according for analysis of water sample for relevant parameters are according to IS : 10500 & IS : 2490 & are discussed below. The survey and map of South side of district are enclosed here with.

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Sample Collection:

Sr.No.	Name of the Place	Sample collected
1	Shrigonda	Bore Well
2	Jamkhed	Bore Well
3	Shevgaon	Bore Well (Amrapur)
4	Pathardi	Bore Well (Koradgaon)
5	Parner	Bore Well
6	Karjat	Bore Well
7	Karanji	Bore Well
8	A.nagar (City)	Bore Well (Bolhegaon)
9	A.nagar (Gramin)	Bore Well (Ghospuri)
10	Bodhegaon	Bore Well

Map of Ahmednagar District :

CHAMICAL PARAMERETS

1] pH:

For most practical purpose the P^H of aqueous solution can be taken as negative logarithm of hydrogen ion activity. P^H value 0 to 7 are diminishingly acidic, 7 to 14 increasingly alkaline and 7 is neutral.

Now days for the measurement of pH the digital pH – meters are available in market. These instruments are standardized using solution of suitable P^H and then the direct reading is noted. Standardized the digital P^H meter using KHP solution (pH = 4). Solution and record the P^H values for samples directly on the scale for appropriate sample volume in the cell.

2] Total Dissolved Solids:

Salts like carbonate, bicarbonate, chlorides, sulphates, phosphates and nitrates of Ca, Mg, Na, K, Fe, and Mn etc. are dissolved in natural waters. The high amounts of such dissolved solids are carcinogenic. Take known amount of sample in a previously weighed (W1) & cleaned silica crucible. The dish is heated. The sample in dish is evaporated to dryness. The dish is then cooled in desiccators and then again the weight of dish after cooling is taken (W_2).

The amount of total dissolved solids is determined using formula.
T.D.S.(mg/L) = (W_2-W_1) 100 / volume of sample.

3] Suspended Solids:

Non-Filterable residue left on the filter papers and further dried at 103^0C-105^0C are suspended solids and the loss in weight of the filter paper ignited at 550^0C are suspended volatile solids. Filter suitable aliquot of sample through tarred a goouch crucible ignited to constant weight (W_1)

1] Wash residue three times with about 5-10 ml of water allowing it to drain free.
2] Carefully remove the crucible filter paper & dry in an oven at 105^0c for one hour.
3] Cool in desiccators and weight (W_2).
Total suspended solids mg/lit. = $(W_2. W_1)$ *1000/ ml of sample

3] Hardness:

In alkaline condition EDTA reacts with Ca & Mg to from a soluble chelated Ca& Mg ions develop wine red colour with Eriochrome black T under alkaline condition when EDTA is added as a titrant, Ca& Mg divalent ions get blue which indicates end-point of the titration. Mg^{++} ions precipitates & only Ca^{++} ions remain in solution at this P^H Murexide indicator forms a pink colour with Ca^{++} when EDTA is added Ca^{++} get complexed resulting in a change from pink to purple which indicates end point of the reaction.

4] Total Hardness:

1] Take 25 ml well mixed sample in porcelain dish or conical flask.
2] Add 1-2 ml buffer solution followed by 4 ml inhibitor.
3] Add pinch of Eriochrome black T and titrate with standard EDTA Required (A).
4] Run a reagent blank in similar way note volume of EDTA (B).
5] Calculate volume of EDTA required by sample as C = (A-B) ml.

5] Calcium Hardness:

1] Take 25 ml sample in porcelain dish.
2] Add 1 ml NaOH to raise P^H to 12 and a pinch of Murexide indicator.
3] Titrate immediately with EDTA till pink colour changes to purple. Note volume of EDTA required (A).
4] Simillerly take one more reading for reagent blank as ml of EDTA.

6] Magnesium Hardness:

Magnesium Hardness = Total Hardness - Ca hardness as $CaCO_3$ ppm

7] Dissolved Oxygen:

Oxygen present in sample rapidly oxidizes the dispersed divalent manganous hydroxide to its higher valency which precipitates as a brown hydrates iodine from KI equivalent to the original DO content. The liberated iodine is titrated against 0.025 N $Na_2S_2O_3$ using starch as an indicator.

1] Collect sample in BOD bottle.
2] Add 2 ml $MnSO_4$ + 2 ml alkali iodide – azide reagent and stopper bottle quickly.
3] Mix well by inverting the bottle 2-3 times & allow precipitate to settle.
4] Now add 2 ml conc.H_2SO_4& mix well till precipitate goes in to solution.
5] Take 200 ml in conical flask & titrate against 0.025 N $Na_2S_2O_3$ using starch as an indicator.

Calculations:

Dissolved Oxygen in mg /lit. =(0.2 * 1000) ml of $Na_2S_2O_3$/Volume of sample

8] Biochemical Oxygen Demand (BOD):

Biochemical oxygen demand (BOD) is defined as the amount of oxygen required by micro-organism while oxygen required by micro-organism while stabilizing biologically decomposable organic matter as a waste under aerobic condition BOD test is widely used to determine.

1] The pollution load of waste waters.
2] Degree of pollution in water bodies at any time & their self purification capacity.
3] Efficiency of waste water treatment methods.

To calculate BOD follow the procedure given under does and calculates DO. Then same bottles are kept in incubator for 5 days at $20^0C \pm 1^0C$. After 5 days wing he same procedure the DO is calculated.

9] Chemical Oxygen Demand:

The organic matter gets oxidized complexes by $K_2Cr_2O_7$ in the

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presence of H_2SO_4 to produce CO_2 + H_2O. The excess $K_2Cr_2O_7$ remaining after the reaction is titrated with Ferrous Ammonium Sulphate. The dichromate consumed gives the O_2 required for oxidation of the organic matter.

1] Place 0.4 gm HgSO4 in a reflux flask.
2] Add 20 ml sample & mix well then add porcelain piece. Followed by 10 ml 0.025 N $K_2Cr_2O_7$.
3] Add slowly an inch of silver sulphate and mercuric sulphate in the reflux flask.
4] Connect flask to condenser, reflux for minimum 2 hours cool & wash condenser with distilled water.
5] Dilute the refluxed content to 150 ml & titrate it against standard o.o25 N FAS using ferroin indicator. The end point is blue green to wine red.
6] Perform the similar procedure using distilled water instead of sample.

10] Total Phosphate:
In acidic condition, orthophosphate reacts with ammonium molybdate to form molybdo phosphoric acid. It is further reduced to molybdenum blue by adding reducing agents such as stannous chloride. The intensity of blue coloured complex is measured which is directly proportional to the concentration of phosphate present in the sample.

Preparation of calibration graph :
In to a series of 100 ml Nesseler tubes pipette appropriate amounts of phosphate working solution to cover the range of 5-30 mg /lit. Then add 2 ml ammonium molybdate, 2 ml stannous chloride & dilute to 100 ml prepare the blank using distilled water in the same way. Measure intensity of blue coloured complex at 690 nm in one cm cell after 10–12 minutes of development of colour. Prepare the calibration graph relating net absorbance mg of phosphate.

Sample Treatment:
Take 100 ml well mixed sample in 150 ml conical flask add one drop of phenolphthalein indicator. If red colour then add 1 ml H_2SO_4 excess. Boil gently for ninety minutes adding distilled water to keep the volume between 25 & 50 ml cool add 1 drop of phenolphthalein & neutralize to a faint pink colour with hydroxide solution. Restore volume to 100 ml with distilled water. Take Suitable volume of this sample and proceed as per in the calibration curve & read concentration of phosphate from graph.

RESULT AND DISCUSSION
The analysis of the different parameters is carried out according to the standard procedure and the amount of certain parameters is calculated in laboratory. It is essential to know the amount of calculated parameters in the sample that one is analyzing to relate its influence on the quality of water. By comparing the values for these parameters from the standards we can conclude the extent of water pollution in that particular area, from which the sample is collected. In this chapter the each calculated parameter, its content and its significance are given.

For the Ten samples collected from different locations, and their result are tabulated and are discussed in the present chapter.

Parameter	Shrigonda	Jamkhed	Shevgaon Amarapur	Pathardi Kordgaon	Parner	Karjat	Karanji	A.nagar City	A.nagar Ghospuri	Bodhegaon	IS: 10500 For Drinking Water	IS:2490 for Effluent discharge
Sus. Solids	10	11	12	15	12	14	17	32	13	11	-	100
Disso. Solids	455	470	480	540	470	510	600	520	520	430	-	2100
PH value	7.22	7.12	7.24	7.10	7.20	7.14	7.10	7.30	7.28	7.14	6.5-8.5	5.5-9.0
T. Hardness	120	100	140	180	140	120	180	375	120	130	300	-
Ca Hardness	60	60	80	80	60	50	80	150	70	80	170	-
Mg Hardness	60	40	60	100	80	70	100	175	50	50	130	-
Phosphate	0.40	0.20	0.40	0.35	0.45	0.40	0.45	0.40	0.50	0.35	-	-
DO value	6.0	5.0	6.2	5.7	6.30	6.1	6.9	11.7	6.3	5.9	-	-
COD value	67.6	57.9	69.7	52.4	69.00	66.8	69.4	310.20	62.9	60.10	-	250

CONCLUSION
From the above parameters the final conclusion is as following:

Sr.No.	Name of place	Quality of water sample
1	Shrigonda	Water is drinkable.
2	Jamkhed	Water is drinkable.
3	Shegaon	Water is drinkable.
4	Pathardi	Water is drinkable.
5	Parner	Water is drinkable.
6	Karjat	Water is drinkable.
7	Karanji	Water is drinkable.
8	A.Nagar (City)	Water is not drinkable.
9	A.Nagar (Gramin)	Water is drinkable.
10	Bodhegaon	Water is drinkable.

Now a days the problem of pollution is finding vast magnitude because of increasing high population density, increase in urban population & rapid quality of water the prevention & control of pollution should be given the top priority.

In the recent part a studied increase in the pollution of environment & its impacts on the society has drawn tremendous attention of the developed and the developing nation due to a world-wide hue & cry of various scientific agencies from the international platform most of countries including India, have taken a serious view of this situation, thus culminating in to the collection of enormous data as a result of extensive monitoring of several affected or some of such potential areas.

Ahmednagar district is situated in dry area. In the district the causes of ground water pollution are mainly due to the drainage system which is open & the effluents from the industrial area situated the north side of city. This all adds in lowering down the quality of ground water in city. The most common and widespread danger associated with drinking water is largely due to lack of safe drinking water is defined at the water that is –

a] Free from pathogenic agents.
b] Free from harmful chemicals.
c] Pleasant to taste.
d] Usable for domestic purposes.

To save human health risks from diseases due to polluted water the following parameters in the water samples are conducted to assess its portability.

a] Physical examination.
b] Chemical examination.
c] Bacteriological examination.
d] Virological examination.
e] Radiological examination.(Ref.-2)

By taking into consideration the water of the district have been investigated for physical examination content.

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The Specified area for above mentioned study is South side of district. The experimental methods applied are according to the Indian standards viz. IS : 10500 & IS : 2490. The water sample after investigation has shown sometime the crossed value from these permissible limits.

Some of the water samples have high bacterial content is being utilized for drinking purposes by the citizens of this area. Presence of coli forms which may be fecal or non fecal type, in the water is not advisable to be utilized for drinking purposes as it causes number of gastro enteric diseases which is harmful for the life.

Water like energy, is an essential ingredients in almost every human endeavor. Availability of water is vital to feeding the growing population of the world, producing the materials that raise the living standard and preserving the nature upon which the life on this earth itself depends. Scarcity of fresh water may, in many cases , become a factor limiting the economic growth and food production over the coming decodes. Increased competition for a limited supply of available water and the rising economic and environmental costs of traditional water strategies demand a new approach to the management of fresh water.

REFERENCES

1. Water Pollution (Conservation and Management); A.K.Sinha, P.N. Vishwanathan and Ram Bosh.
2. Water quality(Sampling and Analysis) ; S.A.Abbasi (1998)
3. Environmental Analysis (Water, Soil and Air) ; M.M.Saxena (1987)
4. Water and Water Pollution ; S.A.Abbasi and Naseema Abbasi (1996)
5. Environmental Chemistry (4thedition) A.K.De ; 2000.
6. Assessment of Environmental Pollution ;Technical Aspects, R.C.Dalela and U.H.Mane (1984)
7. Environmental Pollution and Protection; Attar Chand; 1989.
8. Water, Life and Pollution. Dr. S.S.Purohit and Dr.M.M.Saxena ; 1990.
9. Environment Everyone; S.A.Abbasi 1998.
10. Environmental Impact Analysis; R.K.Jali, L.V. Vrban and G.S. Stacey; 1977.
11. Environmental Chemistry, Nigael J. Bunce, 1991.