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Role of Major and Minor Constituents In Ground Water Quality of Industrial Area, Dist. Beed. (M.S.) India

KEYWORDS: Major Constituents, Minor Constituents, Ground water quality & Effluent.

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ABSTRACT *The groundwater composition in this particular case is likely to vary from place to place and time to time. Therefore, representative dug wells were selected for water samples collection. Some selected dug wells were close the effluent stream and some were progressively away from it. Thus dug wells in the study area were selected for their inventory and collection of water sample. The collected groundwater samples were brought to laboratory to carry out the chemical analysis of the constituents such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, TA, SO_4^{2-}, PO_4^{2-} NO^{3-} etc. The methods used for this analysis were standardized according to the procedure given in standard method or examination of water and wastewater by APHA-AWWA and WPCF (1975; Trividy and Goel, 1986;*

INTRODUCTION:

Water is one of the most important natural resources for all the living things, whether unicellular or multi cellular, since it is required for their various domestic purposes like irrigation, fishing, shipping, power generation and industries etc. Natural water resources are rivers, reservoirs, estuaries, lakes, ponds and flood wetlands.

The hydrological cycle describes the constant movement of water above, on, and below the earth's surface (Hassan et.al 2013, Patil, et.al 2014). As a part of this cycle, water is transformed between liquid, solid and gases states. Condensation, evaporation and freezing of water occur in the cycle in response to the earth's climatic conditions (Berner and Berner, 1987). Water resources has been the most exploited natural system since man strode the earth water is an essential requirement for all biological systems (S.S. Patil &I.B.Ghorade 2013). "Water Quality" in term of ground water is generally used to express the physical, chemical or biological state of water (Hassan et. al 2013) . The contamination of ground water from the manmade and natural sources is causing a great threat to the ground water system (Hassan et. al 2014). The increase in urbanization and industrialization are generating huge quality of waste and wastewater. Groundwater becomes the only alternate source of good quality water. But there are problems of ground water contamination in certain parts of the city, particularly in the industrial belts. Once the groundwater contaminated it may remain in unusable or oven hazardous condition for decades or even centuries (Patil, et al 2014).

MATERIAL AND METHODS:

The water samples were collected for physico-chemical analysis from industrial area of Beed District to evaluate the quality of the ground water. The aim of the study is to assess the impact of urbanization and industrialization and rapid growing developmental activities in the study area on the quality of ground water and to locate various sources and types of pollutants which are responsible for changes in ground water quality. To assess the ground water quality in Beed region Twelve sampling stations (dug wells), which are scattered in the main areas of sugar factories. The selected sites are of approximately 500 to 1200 m far from each other. The parameters used for the analysis of water are located in industrial areas, creating certain interference in the surface water and ground water. In addition to water quality. Analysis of the samples was carried out during the year 2007-2008. Each parameter was analyzed seasonally. Some selected dug wells were close the effluent stream and some were progressively away from it. In order to undertake accurate estimation of water quality, The collected groundwater samples were brought to laboratory to carry out the chemical analysis of the constituents such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, TA, SO_4^{2-}, PO_4^{2-} NO_3^- etc. The methods used for this analysis were standardized according to the procedure given in standard method or examination of water and wastewater by APHA-AWWA and WPCF (1975; Trividy and Goel, 1986.) The results are expressed as mg/l.

RESULT AND DISCUSSION:

Major Constituents (Cationic):-

Sodium: It is observed that the variations of sodium in the study area. The average value of Sodium during the study period was ranged from 73 (W1) to 358.5 mg/l (W9) The excess sodium and chloride in drinking water may induce congestive heart failure (Brooker and Johnson, 1984); Sivagurunathan and Dhinakaran, 2005). Lower concentration is physiologically harmless (Goyal, *et, al.,* 2006)

Potassium: The potassium in the ground water in the present study shows the average value of the potassium during the study period was ranged from 2.6 (W1) to 11.25 mg/l (W12).The concentration of potassium as per European directives are 12 mg/l, however, moderate quantities of it do not adversely affect the water quality (European Committee, 1976; Kiran *et.al.*, 2006).

Calcium: It is observed from the study period the average value of the calcium during the study period was ranged from 26.71 (W1) to 91.14 mg/l (W9). the excess Calcium may increase the total hardness of water preventing lather with soap and increases the boiling point of water (Rahul Mohan *et.al.*, 2000) which induces acidosis as the cation is not readily absorbed and excess calcium ion enters the blood and displaces the plasma bicarbonate resulting non-

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clotting of blood (Lohani, 2005).

Magnesium: The Magnesium in the ground water in the present study shows the average value of the magnesium during the study period was ranged from 6.42 (W6) to 23.28 mg/l (W10). After calcium magnesium is the most important alkaline earth metals present in the ground water. It is one of the most important contributors to the hardness of water.

Major Constituents (Anionic):-

Chloride: The chloride concentration in the water varied from the average value of the chloride during the study period was ranged from 89.42 (W1) to 437.14 mg/l (W8). Chloride is a major anion in waste water. The chloride concentration is higher in organic wastes and its higher level in natural water is a definite indication of water pollution from organic wastes. However, there is no any apparent source of chloride in natural waters (Karanth, 1989). A number of workers (Kodarkar *et,al.*, 1995; Chandrashekhar, S.V.A. and M.S. Kodarkar 1994;) have reported chloride in water was to domestic wastes. The significance of chloride lies in its potential to regulate salinity of water and exerts consequent osmotic stress on aquatic community.

Alkalinity (AT): The total alkalinity in the study area the average value of the alkalinity during the study period was ranged from 165.14 (W1) to 355.86 mg/l (W9). Alkalinity of water measures its capacity to neutralize acid salts of weak acids usually impart the natural alkalinity in waters (Goel, 1997). The constituents of alkalinity in natural system mainly include carbonate, bicarbonate and hydroxide. The WHO acceptable limit for total alkalinity is 200 mg/l, beyond this limit taste may become unpleasant.

Sulphate: The average value of the sulphate during the study period was ranged from 30.54 (W 5) to 73.86 mg/l (W12). Sulphate is found in appreciable quantity in all natural waters, particularly in arid and semiarid regions where natural water in general have high salt content (Saxena, 1989). Sulphate itself has never been a limiting factor for water bodies as it dissolves in water easily while flowing with running water. In normal level, sulphate is more than enough to meet plants need. If the concentration exceeds, above 500 mg/l it has laxative effect and cause gastro intestinal irritation.

Minor Constituents:-

Phosphate: The average value of the phosphate during the study period was ranged from 0.19 (W12) to 0.62 mg/l (W2). Low values of phosphate observed in the study area may be due to the fact that as tropical water always possess low concentration of phosphate (Dasgupta and Purohit, 2001). High concentration of phosphate leads to increase in the growth of algae and eutrophication. The permissible limit of USPHS is 0.1 mg/l. The excess, causes risk to human beings as algae produces toxins, which damage neurological system (Kalaivani, *et,al.*, 2006).

Nitrates: The average value of the nitrate during the study period was ranged from 0.01(W4&5) to 0.57 mg/l (W11). Besides the above, the regeneration of nitrates from sediment to surface water also plays an important role for higher values. The nitrate depletion is induced by denitrification process initiated by the denitrifying bacteria in the absence of D O (Banakar, *et,al.*, 2005).

Table 1:- Average cationic, anionic, and minor constituents of ground water from study area (2007-2008).

Well No	Major Constituents							Minor Constituents	
	Cationic				Anionic				
	Na^+	K^+	Ca^{2+}	Mg^{2+}	Cl^-	TA	SO_4^{2-}	PO_4^{2-}	NO_3^-
1	73	2.6	26.71	8.14	89.42	165.14	59.86	0.61	0.50
2	81	5.2	47.28	12	92.42	240	36.00	0.62	0.05
3	115	3.5	44.85	6.85	104	263.86	37.00	0.38	0.05
4	134	4.2	31.57	7.28	136.71	272.14	40.71	0.26	0.01
5	156.5	7.8	43.57	11.28	181.7	250.19	30.54	0.40	0.01
6	171.5	4	39.85	6.42	183.42	232	30.86	0.45	0.00
7	141.5	2.9	39.71	7.57	230	228.29	38.7	0.29	0.13
8	316.5	6.1	83.42	12.71	437.14	353.29	57.43	0.31	0.01
9	358.5	5.68	91.14	9.85	413.4	355.86	69.43	0.53	0.12
10	271	4.54	76.71	23.28	374.7	351.71	66.14	0.30	0.00
11	98.5	3.25	67.57	9.42	76.86	268	62.29	0.33	0.57
12	177.5	11.25	70.71	7.85	125.7	354	73.86	0.19	0.04

Note:1) TA is the total alkalinity 2) All values are in mg/l. 3) W= well number

CONCLUSION:

The value it is found that sudden increase in the Na^+, Ca^{2+}, K^+, Cl^-, and SO_4^{2-} at some well give an idea that their water was affected due to addition of some constituents of anthropogenic origin. This may be due to the location of these wells in the down radiant direction of the effluent disposal stream as well as in the close vicinity of the press mud dumping station. The concentration of Mg up to 10 mg/l or above that along with higher calcium values was considered to reflect the contamination of groundwater due to the effluent. Further, it was observed that the concentration of sodium was ranged from 73.0 to 358.5 mg/l. It was interesting to note that the average value of sodium for the groundwater was higher than that of concentration of sodium in the effluent. This had indicated that apart from contamination of groundwater from the effluent, the natural process, which increase the sodium concentration in water, are more important.

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