Assessment of Ground Water Quality Analysis in The Vicinity of A Dumping Site at Beed, District Beed (M.S.), India

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Abstract

Water quality is essential parameter to be studied when the overall focus is sustainable development keeping mankind at focal point. Groundwater is the major source of drinking water in rural as well as in urban areas and over 94% of the drinking water demand is met by groundwater. The present study deals with assessment of the water quality of ground water analysis in the vicinity of a dumping site at Beed. The physico-chemical characteristics were studied and analyzed during January 2011 - December 2011. Seasonal variations at eight different vicinity of a dumping site at Beed [M.S] India were observed. The results revealed that the condition of different vicinity of a dumping site at Beed in different seasons showed fluctuations in physico-chemical parameters.

Keywords: physico-chemical parameters, seasonal variations, ground water and vicinity of a dumping site.

INTRODUCTION

Water is an essential natural resource for sustaining life and environment but over the last few decades the water quality has been deteriorated due to its over exploitation. Life began in water and life is nurtured with water. There are organisms, such as anaerobes, which can survive without oxygen. But no organism can survive for any length of time without water. The crucial role of water as the trigger and sustainer of civilizations has been witnessed throughout the human history, no life without water is a common saying (Abbasi et al., 1996). Water is the most abundant and essential compound in all the living systems. Water has played a crucial role in the process of chemical evolution by facilitating the formation of living molecules from simple molecular arrangements. It is a universal solvent, and as a solvent it provides the ionic balance and nutrients, which support all forms of life.

Groundwater is an important source of water supply throughout the world. Groundwater quality estimation is a part of environment assessment and is closely related with human wellbeing. Usually the groundwater is considered as less polluted as compared to the surface water, due to the reduced exposure to the external environment. But lack of sanitation, improper waste management, have a potential to spoil the purity of the ground water leading to increased pollution levels. Hence, it has been reported that about 40% or even more disease outbreaks are attributed to be water borne in nature (Cocchi and Scalgliarini, 2005). According to UNESCO report, a majority of Indian population has no access to safe drinking water and that about 66 million people rely on un-safe ground water for consumption (Swahney, 2006). The importance of water for the life processes, its' easy availability and the nature of water, has caused uncontrolled human interventions in the natural water cycle, which has resulted in the degradation of water both qualitatively in the form of decrease in water level index and quantitatively in the form of heavy loads of pollution. These unbalanced exploitations, during the last few decades have created serious problems of water quality and quantity. It appears that if such exploitation is continued, the conditions may still worsen (Sia Su, 2008).

Quality of ground water is the resultant of all processes and reactions that act on the water from the moment it is condensed in the atmosphere to the time it is discharged by a well or a spring and varies from place to place and with the depth of the water table. Groundwater crisis is not the result of natural factors. It has been caused by human actions. The industrial effluents if not treated and properly controlled, can pollute and cause serious damage to the groundwater resources (Phiri et al., 2005). Once the contamination enters the water source it is difficult and expensive to remove them (Avnish & Saksena, 2010). In developing countries like India, around 80 % of all diseases are directly related to poor drinking water quality and unhygienic conditions (Olajire & Imeokparia, 2001). Extensive studies on groundwater quality have been carried out by various workers Joshi and Seth (2011); Majolagbe et al., (2011); Memon et al., (2011); Jameel et al., (2011); Raju et al., (2009); Gupta et al.,(2009); Reddy et al., (2011).

Review on the literature showed that no studies have been undertaken in the study area in regard to physico-chemical characteristics of water yet. The present investigation has been undertaken to assess the water quality of ground water analysis in the vicinity of a dumping site at Beed, [M.S] India.

MATERIAL AND METHODS

Water samples were collected from the dug wells and bore wells, around the dumping site. The sampling stations were at a minimum of 500 meters distance from each other. The area selected was of about 1 Km radius from the dumping ground at Jirewadi. The sampling stations were divided in core zone (approximately 1km.) and buffer zone (area after the core zone). The sampling was carried out in the mid of every season i.e. Summer (in the month of May), Monsoon (in the month of August) and Winter (in

the month of December) for One years. The water samples were collected in the sterile polythene bottles of 1 liter capacity between 8.00 am to 11.00 am from January 2011 to December 2011. During sampling all the precautions were taken as per the standard guidelines to avoid any possible contamination. In case of dug wells, the water samples were collected by lowering the bottle at depth of about 1 foot below the surface and then opening the cap to collect the water. For bore wells, the tap was fully opened and allowed to run to waste for about 5 minutes and then the water sample was collected in the sterile sampling bottles.

The different analysis was carried out within five hours after collecting the water samples. Water was stored at 5°C in the refrigerator for any delayed analysis. Characteristics like pH was recorded on the sampling site with the help of digital thermometer and pocket pH meter, respectively. Other characteristics, like Total Alkalinity, Chlorides, Salinity, Nitrates, Sulphates were analyzed in the laboratory. The samples were transported to laboratory in the ice boxes and kept in refrigerator until all the analysis was performed according to standard methods APHA, (1998); Trivedi and Goel, (1987).

RESULT AND DISCUSSION

The season wise physico-chemical parameters data of ground water analysis in the vicinity of a dumping site at Beed [M.S] India have been presented in table. No. 1 to 3.

pH:

The pH of the groundwater samples ranged between 7.5 to 8.3, which is well within the permissible limits of WHO standards. Seasonal studies do not reveal any significant effect of the climate on pH of groundwater. During Winter-2011 pH values of groundwater ranged between 7.5 to 8.0, the highest value was recorded for sampling station N1 (8.0) and lowest was at W2 (7.5). During Summer-2011 it ranged between 7.4 to 8.1, the highest value was recorded at N1 and lowest was at W2. During Monsoon 2011 it ranged between 7.5 to 8.0, the highest value was recorded at N1 whereas lowest was found at W1 and W2 (Table No. 1, 2 and 3).

These observations indicate that more than the seasonal effects the pH values are being influenced by the vicinity to the dump site, as it is observed that the pH values for the sampling stations located near the dump site in all directions are higher and increasing distance causes decline in the pH. Moreover the pH was also found to increase with respect to time, since for all the stations it was commonly observed that the pH values increased significantly from start of the study to the end.

Alkalinity:

The alkalinity was reported to occur between 289 mg/l to 354 mg/l. The highest alkalinity values were reported at sampling station N1 and lowest was at W2. Almost all the samples were found have values exceeding the WHO permissible limits of 200mg/l. During Winter-2011 Alkalinity of groundwater ranged between 289 to 344 mg/l, the highest value was recorded for sampling station N1 (344 mg/l) and lowest was at W2 (289 mg/l). During Summer-2011 it ranged between 292 to 346 mg/l, the highest value was recorded at N1 and lowest was at W2. During Monsoon 2011 it ranged between 289 to 347 mg/l, the highest value was recorded at N1 whereas lowest was found at W2 (Table No. 1, 2 and 3).

The study revealed that there were no significant seasonal fluctuations in the parameter; however it was found that the vicinity to the dumpsite is significantly contributing to the increasing alkalinity in groundwater reservoirs.

Chlorides:

The chlorides were estimated in the samples understudy, the maximum value was 302 mg/l at N1 and minimum recorded value was 239 mg/l at W1. Except for W1 all the groundwater samples were found to have chlorides in access of the permissible limit of 250 mg/l. During Winter-2011 Chlorides in groundwater ranged between 239 to 290 mg/l, the highest value was recorded for sampling station N1 and lowest was at W1. During Summer-2011 it ranged between 264 to 291 mg/l, the highest value was recorded at N1 and lowest was at W1. During Monsoon 2011 it ranged between 245 to 293 mg/l, the highest value was recorded at N1 whereas lowest was found at W1 (Table No. 1, 2 and 3).

It was observed that in case of Chlorides also vicinity to the dumpsite and exposure time played pivotal role in increasing Chloride concentrations, than the climatic changes.

Salinity:

The salinity was calculated based on the chloride concentration and it has shown a similar pattern, with maximum value at N1 and minimum at W1 and W2 (Table No. 1, 2 and 3). The salinity values followed the pattern similar to the chloride values.

Sulphates:

The sulphates in the assessed groundwater samples ranged between 252.9 mg/l to 299.7 mg/l. The highest sulphate concentration was found at W1 and lowest was at E2. At all the sampling stations sulphate concentration was found to be exceeding the permissible limits of WHO.

During Winter-2011 sulphates in groundwater ranged between 252.9 mg/l to 280.8 mg/l, the highest value was recorded for sampling station W1 and lowest was at E2. During Summer-2011 it ranged between 255.8 to 289.3 mg/l, the highest value was recorded at W1 and lowest was at E2. During Monsoon 2011 it ranged between 256.9 to 290.9 mg/l, the highest value was recorded at W1 whereas lowest was found at E2 (Table No. 1, 2 and 3).

Nitrates:

The groundwater samples assessed have been found to contain nitrates in a range of 38.7 mg/l to 51.4 mg/l. The highest nitrate concentration was recorded at E1 and lowest was found at W2. However all the groundwater samples

assessed have shown nitrate concentrations exceeding the WHO prescribed limits of 10 mg/l. During Winter-2011 nitrate in groundwater ranged between 39.2 mg/l to 46.9 mg/l, the highest value was recorded for sampling station E1 and lowest was at W2. During Summer-2011 it ranged between 38.7 to 47.3 mg/l, the highest value was recorded at E1 and lowest was at W1. During Monsoon-2011 it ranged between 38.9 to 48.5 mg/l, the highest value was recorded at E1 whereas lowest was found at W2 (Table No. 1, 2 and 3).

CONCLUSIONS

The present study show detailed physico-chemical characteristics and quality of ground water analysis in the vicinity of a eight dumping site at Beed (M.S) India.

1) The summer, monsoon and winter seasons shows different seasonal fluctuations in various physico-chemical parameters.
2) The vicinity to the dump site, as it is observed that the pH values for the sampling stations located near the dump site in all directions are higher and increasing distance causes decline in the pH.
3) There were no significant seasonal fluctuations in the parameter; however it was found that the vicinity to the dumpsite is significantly contributing to the increasing alkalinity in groundwater reservoirs.
4) Chlorides and salinity also vicinity to the dumpsite and exposure time played pivotal role in increasing Chloride concentrations, than the climatic changes.
5) All the sampling stations sulphate and nitrates concentration was found to be exceeding the permissible limits of WHO.
6) N1 station is more polluted than other seven stations.
7) To improve quality of water there should be continuous monitoring of pollution level and maintain the favorable conditions essential for increase ground water quality in the vicinity of a dumping site at Beed (M.S) India.

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Table 1: Physico-chemical analysis of groundwater during Summer 2011.

Sample / Station	pH	Alk.	Cl.	Sal	SO4	NO3
N1	8.1	346	291	525.285	271.5	43.2
N2	7.8	298	288	519.87	262.4	42.9
S1	7.7	301	275	496.405	261.3	41.3
S2	7.5	305	283	510.845	275.3	44.9
E1	7.8	317	286	516.26	261.4	47.3
E2	7.8	295	288	519.87	255.8	46.8
W1	7.8	297	243	438.645	289.3	42.1
W2	7.4	292	264	476.55	259.9	38.7
Avg.	7.74	306.38	277.25	500.47	267.11	43.40
SD	±0.21	±17.76	±16.40	±29.61	±11.00	±2.87

Table 2: Physico-chemical analysis of groundwater during Monsoon 2011.

Sample / Station	pH	Alk.	Cl.	Sal	SO4	NO3
N1	8	347	293	528.895	273.4	44.3
N2	7.7	301	289	521.675	264.3	41.3
S1	7.6	298	276	498.21	263.8	43.2
S2	7.6	301	281	507.235	274.1	44.2
E1	7.9	313	284	512.65	265.5	48.5
E2	7.7	293	289	521.675	256.9	47.2
W1	7.5	291	245	442.255	290.9	39.2
W2	7.5	289	261	471.135	261.2	38.9
Avg.	7.69	304.13	277.25	500.47	268.76	43.35
SD	±0.18	±18.89	±16.43	±29.66	±10.64	±3.47

Table 3: Physico-chemical analysis of groundwater during Winter 2011.

Sample / Station	pH	Alk.	Cl.	Sal	SO4	NO3
N1	8	344	290	545.20	270.10	41.20
N2	7.9	296	281	528.28	259.4	42.4
S1	7.6	298	271	509.48	258.9	40.8
S2	7.5	300	278	522.64	271.2	44.3
E1	7.9	312	277	520.76	262.1	46.6
E2	7.9	293	281	528.28	252.9	46.9
W1	7.7	295	239	449.32	280.8	41.7
W2	7.5	289	259	486.92	261.6	39.2
Avg.	7.75	303.38	272	511.36	264.63	42.89
SD	±0.2	±17.74	±16.06	±30.20	±8.85	±2.79

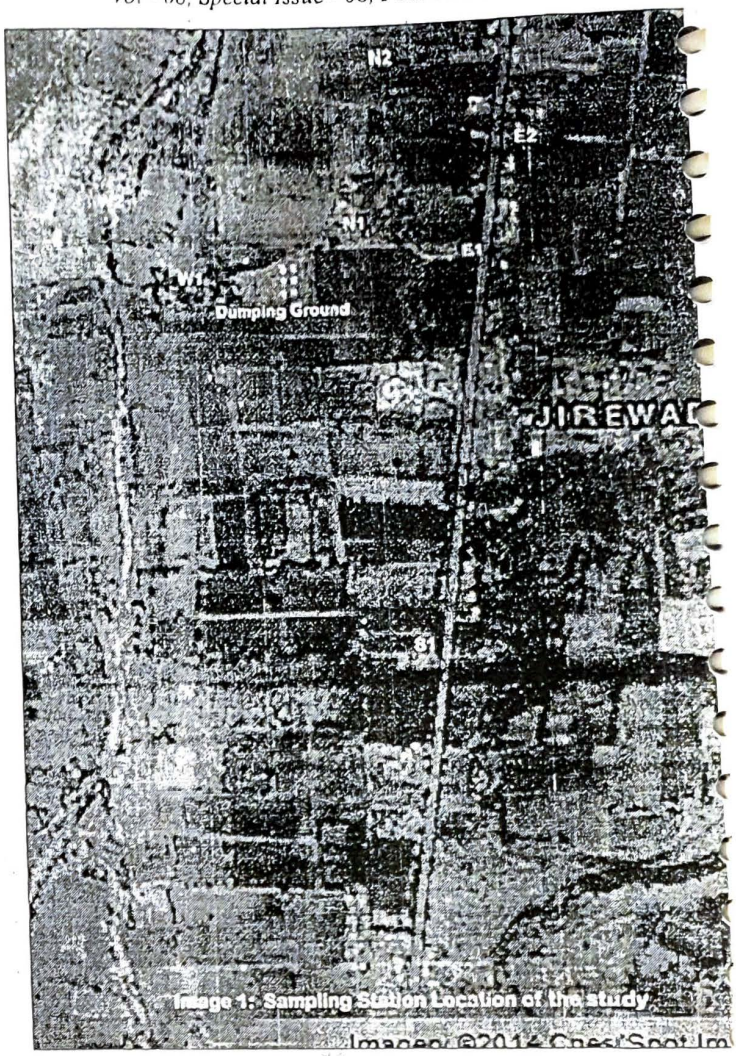

Image 1: Sampling Station Location of the study