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Seasonal variation of ground water parameters in the Godavari basin at Paithan town

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ABSTRACT

Ground water quality from four different places of Paithan city of Aurangabad district from Maharashtra, India, was assessed during 2008-2009 seasonally. The parameters determined were conductivity, TDS, Chloride, DO, pH, Hardness, Phosphate, Temperature etc. Most of the parameters were observed to be within permissible limits as described by various agencies.

INTRODUCTION

In a broad perspective “Water Pollution” means contamination of water leading to the alteration of physical, chemical or biological properties of water which render such water harmful or injurious to public health and safety.

The water pollution is the presence of undesirable foreign substances in water from external environment adversely influencing the quality of water and making it unfit for drinking, bathing, washing, irrigation, fisheries, etc. The drinking water standards of the U.S. Public Health Service, states that pollution means the presence of any foreign substance (organic, inorganic, radiological or biological) in water which tends to degrade its quality so as to constitute a hazard or impair the usefulness of the water. The quality of water is described by its physical, chemical and microbiological characteristics.

Pollution of an aquatic system may in general be classified into two types, one type is pollution by the poisonous substances like heavy metals or pesticides, and the other type is pollution by the nutrients or organic materials. While the former is responsible for toxic effects, the latter cause's eutrophication leading to anoxic conditions, the final result in both the cases is deterioration of water quality. The purity and quality of water is of basic concern to mankind, since it is directly related with welfare of the human beings. When the normal function and properties are altered then we say that water is polluted. In general water pollution is a state of

deviation from the quality and purity of the water sample. Water pollution disturbs the normal uses of water for agriculture, public water supply, aquatic life, wild life, industry.

Paithan is one of the most historical and holy towns in the south central part of the country. It is situated at the bank of Godavari River. This is located at latitude 19.51 N ° and 75.38 E° longitude. Previously known as *Pratishthan*. In order to monitor the impact of pollution on the groundwater of Paithan, we decided to under take present study.

MATERIALS AND METHODS

Water samples from four stations of Paithan city hand pump were collected in a precleaned and sterilized white high-density polyethylene container. The TDS, pH, electrical conductivity and temperature were measured at the spot. pH of the samples was determined with the help of pH meter and electrical conductivity with the help of Conductivity Bridge. Concentration of phosphate determined by stannous chloride colorimetric method. Sample was treated with ammonium molybdate solution. The phosphate present in the sample forms molybdophosphoric acid and further it is reduced by stannous chloride into the intense blue coloured complex. The total hardness of the samples were determined by titrating it with standard EDTA solution using EBT (dye) as an indicator, maintaining pH 11.2 by using ammonia-ammonium chloride buffer solution. The end point was wine red to blue. Result expressed as mg/L in terms of CaCO₃. The amount of Sulphate in the samples was estimated by colorimeter at 420 nm. Sulphate present in samples is precipitated in presence of few drops of HCl with help of BaCl₂ into BaSO₄ (white ppt). Calibration curve was plotted by using standard solution of Sulphate.

Chloride was determined by Mohr's Argentometry method. Winkler's Iodide azide method is used to determine the DO of samples. Nitrite of all samples measured by colorimeter. Colour was developed by the addition of alpha naphthyl amine solution and sulphaanilic acid solution. Optical density of reddish coloured treated samples were observed at 520 nm..For all estimations standard methods were used¹

RESULTS

Table1: physico chemical parameters of paithan area

Parameters↓	Station No↓	'08W	'08S	'08R	'09W	'09S	'09R
Temperature (°C)	1	24.3	32.1	26.6	23.0	33.2	27.2
	2	24.1	32.0	26.7	23.1	32.6	27.2
	3	24.2	31.9	27.0	23.5	32.5	27.3
	4	24.2	31.5	26.9	23.8	33.5	27.3
Cond. mili mhos	1	2.360	2.460	2.130	1.584	2.280	1.933
	2	1.458	1.515	1.160	0.484	1.510	1.672
	3	0.638	0.774	0.463	0.358	0.836	1.000
	4	1.015	1.415	0.762	0.497	1.301	0.743
pH	1	8.02	7.05	7.14	7.80	8.00	7.14
	2	7.57	6.80	6.91	7.37	7.18	6.69
	3	8.19	7.36	7.54	7.38	7.31	6.80
	4	8.10	7.10	7.34	7.54	7.78	7.32
TDS gm/l	1	1.628	1.596	1.515	1.271	1.480	1.214
	2	0.958	0.998	1.071	0.238	0.994	1.115
	3	0.419	0.488	0.704	0.189	0.550	0.656
	4	0.667	0.930	1.160	0.248	0.854	0.418
Cl ⁻ mg/l	1	169.93	414.83	424.83	159.93	234.90	162.93
	2	164.93	299.98	224.90	180.93	244.90	224.91
	3	44.98	89.98	29.98	69.97	79.96	43.96

	4	99.96	119.95	79.96	131.07	249.90	54.01
DO mg/l	1	6.3	5.8	5.6	7.5	4.7	8.9
	2	7.5	4.8	6.6	7.6	5.1	6.4
	3	7.4	5.9	5.5	7.7	5.2	6.2
	4	7.3	4.4	4.5	7.6	5.0	7.0
Hardness mg/l as CaCO ₃	1	476	368	432	388	248	280
	2	520	412	568	752	360	672
	3	100	88	116	436	264	432
	4	684	368	724	592	356	452
PO ₄ mg/l	1	0.041	0.060	0.041	0.010	0.015	0.017
	2	0.032	0.060	0.027	0.027	0.041	0.015
	3	0.022	0.037	0.017	0.050	0.032	0.015
	4	0.010	0.060	0.015	0.041	0.500	0.022

DISCUSSION

The maximum and minimum temperatures of ambient air of Paithan city is given in the following table2.

Table 2: Ambient air temperature

Paithan	Maximum	Minimum
Summer	42.6°C	14.8°C
Winter	28.3°C	7.6°C

The average rainfall of Paithan city is 520 millimetres which is due to south-west monsoon wind from the month of June to mid of September. The main source of water is from Jaikwadi Dam, through Municipal Corporation but in some area still people use hand pump, bore-well for their daily requirement. The ground water pollution depends upon house discharges, temperature and evaporation, soil erosion, soil conservation practices, amount of run off and percolation etc.

We observed that the temperature of samples were high in summer season and moderate in rainy season. Temperature at these stations varies between 23.0 °C to 33.5 °C. It was in agreement with the result observed by other researchers reported for other place². As compared to atmospheric temperature ground water temperature remains higher in winter and rainy season. The maximum electrical conductivity is observed in summer season i.e. 2.460 mili mhos and minimum is recorded 0.358 mili mhos. The high value of conductivity in summer season indicates the inverse proportionality to the quantity of water³. Conductivity increases by evaporation of water in summer season. pH expresses the intensity of acidic and alkaline condition of a solution. It is an important factor in water analysis. It was observed that the pH value of ground in this areas water samples varies in between 6.69 to 8.19. This shows the slight basic nature, it may be due to presence of HCO₃⁻ and CO₃⁻. The high value of pH was recorded in winter season. The TDS lies in between 0.189 to 1.628 gm/L. At these stations TDS value for summer season was recorded high. This suggests increase in concentration of salts in the summer season due to evaporation of water⁴. Chloride was in the range of 29.98 to 424.83 mg/l. similarly phosphate concentration observed high in summer season and presence of phosphate indicates excess use of detergents, in rainy season it get percolated. In the present study the percentage of phosphate recorded was fluctuates in between 0.010 to 0.500 mg/L. The drinking water must be free from phosphate maximum permissible limit for phosphate is 0.1 mg/L as per the specification given by USPH.

We observed moderate hardness of water; it ranges from 88 to 752 mg/L as calcium carbonate. According to WHO the maximum permissible limit for drinking water is 500 mg/L as calcium carbonate. Due to evaporation in summer high values of hardness observed. In the present study

D.O. values varied in between 3.1 to 7.3 mg/L. It was observed higher in rainy season and winter season, which decreases in summer due to rise in temperature⁵

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