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Study of Total Dissolved Solids (TDS) of Water in Indapur Taluka

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Abstract

The present study was undertaken to know the variation in Total Dissolved Solids (TDS) of various sources of water i. e. Ujjani reservoir, open well and bore well located in Indapur taluka. The study was carried out over a period of one month. In India there are enormous number of natural and manmade water bodies used for various purposes, mainly for drinking and agriculture. One of the most severe problems in arid and semi- arid regions is high concentration of salts in soils and water resources. Thus, water quality and its management have received much attention in developing countries. The present study is aimed at assessing the Total Dissolved Solids (TDS) for water quality of sources of water and find out the causes of increased TDS. The analysis reveals that the surface water of the area needs some treatment before consumption; and it also needs to be protected.

Keywords: Total Dissolved Solids, Water quality

Introduction

Ground water is a good source of fresh water available on the earth. It is the important renewable resource having several inherent advantages over surface water (Sinha, 1945). Hence it is very important to assess the ground water quality not only for its present use but also from the view point of a potential source of water for future consumption (Kotadiya, et al, 2013). Water sources available for drinking and other domestic purpose must possess high degree of purity, free form chemical contamination and micro organism (Borul and Banmeru, 2012). Water is also one of the most important factors for every living organism on this planet. The quality of water is getting vastly deteriorated due to unscientific waste disposal, improper water management and carelessness towards environment, which has also led to scarcity of potable water affecting the human health (Agarkar, 2003).

In India there are enormous number of natural and manmade water bodies used for various purposes, mainly for drinking and agriculture. However, in recent years due to rapid urbanization industrialization and modern agricultural activities, the quality of water bodies deteriorated causing environmental hazards. Due to the growth of population, and man-made activities, the quality of water is deteriorating everywhere (Datye, 1984). Thus, water quality and its management have received much attention in developing countries.

For this research, Indapur taluka is selected as study area because it is one of the talukas of Maharashtra which is fall under drought prone area. Water quality of eastern area of Indapur taluka is very poor. In this research paper water quality of Indapur taluka is assessed.

Study Area

Indapur taluka is situated in Pune district. The northern and eastern border is demarcated by Bhima in Pune and Solapur districts while southern boundary is confined by Neera in Pune and Satara and Solapur districts. The region extends between 17° 53´ to 18°

15´ north latitudes and 74° 35´ to 75°08´east longitudes. The total geographical area of this is 1552.93 sq. km. having 3,83,100 populations (Census 2011).

Physiography of Indapur is characterized by broad valleys divided by flat topped interfluves. The slope decreases towards eastwards. The northern and the central parts cover by low hills and flat topped surface. The southern part is flat with deep black soil. The average elevation of study area is 544 meters from mean sea level. The direction of slope is eastward. The Bhima flows from west to east and then towards south near the eastern boundary of this.

The drainage in the study region is mainly dominated by Bhima River and Neera River and many other small streams. Neera originates near to Shirgaon village in Bhor in Pune district. The confluence of Bhima and Neera appears near Narsingpur village in south-east part in Indapur. Both rivers bring water during rainy season and shrink during summer. The climate of the study region is dry and hot. The rainfall is mainly sets in the month of June and lasts up to October. The annual average rainfall receives 450 to 550 mms. The amount of rainfall plays an important role in the evolution of the landscape (Bhadja and Vaghela, 2013). The soil of study region are derived from trap and it can be divided in three groups, namely, light brown shallow soil, medium deep black soils, and deep black soils. Due to untimely rainfall, irrigation is important aspect for better crop growth in Indapur Tahsil. The irrigation was less in 1991 but in 2011 the situation has changed. Presently in central part of Indapur has more area under irrigation.

Objectives

1. To find sources of water in Indapur Taluka.
2. To assess the water quality of water sources in Indapur taluka.

Methodology

SOI toposheets are used to map location of study area from SOI maps. The present study deals with total dissolved solids (TDS) of water which one of the physical parameters of water quality to check the present status of water quality of sampling site. The field study was conducted in the month of January 2015. Selected wells samples are mapped with the help of GPS Survey. Samples were collected from open wells and bore well. Total Dissolved Solids (TDS) is tested through TDS meter. The obtained values were compared with standards prescribed by BIS (BIS, 2012) and WHO (WHO, 2005). Different quantitative techniques are used for data analysis.

Result and discussion

Indapur taluka is selected as study area which is situated in Pune district. The northern and eastern border is demarcated by Bhima in Pune and Solapur districts while southern boundary is confined by Neera in Pune and Satara and Solapur districts. The region extends between 17° 53´ to 18° 15´ north latitudes and 74° 35´ to 75° 08´east longitudes.

Total Dissolved Solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water, expressed in units of mg per unit volume of water (mg/L), also referred to as parts per million (ppm). "Dissolved solids" refer to any minerals, salts, metals, cations or anions dissolved in water. This includes anything present in water other than the pure water (H_2O) molecule and suspended solids. (Suspended solids are

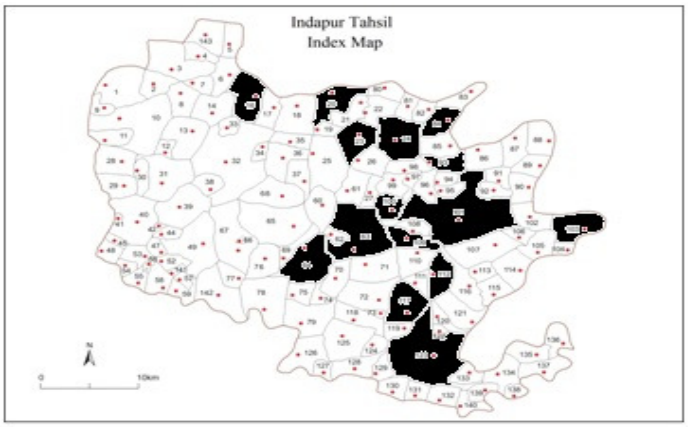
any particles/substances that are neither dissolved nor settled in the water, such as wood pulp.) Dissolved solids also come from inorganic materials such as rocks and air that may contain calcium bicarbonate, nitrogen, iron phosphorous, sulfur, and other minerals. Many of these materials form salts, which are compounds that contain both a metal and a nonmetal. Salts usually dissolve in water forming ions. Ions are particles that have a positive or negative charge (http://www.tdsmeter.com/what-is).

The concentration of salts in surface and groundwater can increase in several ways. Increased dissolution can increase salinity levels. Evaporative enrichment is the process of increasing salinity levels in surface or groundwater by removing water via evaporation. For example, irrigation water is often applied to crops during the summer when evaporation rates are highest. As water molecules evaporate into the atmosphere, salts remain behind in the irrigation water. This irrigation water can percolate into the underlying groundwater. If the groundwater is later pumped and used for additional irrigation, the evaporation cycle is repeated and salinity levels will continue to increase. Dry land salinity affects soils when groundwater is brought to the surface by capillary action; evaporation removes water and leaves salt at the soil surface.

The Ujjani Reservoir is built up on Bhima river and located at the eastern side of Indapur Taluka. The total storage capacity of Ujjani Reservoir is 110 TMC (Thousands Million Cubic Feet). Area under agriculture is more at the eastern part than western part of Indapur Taluka because water is most available over the year. So most of the samples are selected from eastern part of taluka. There are sixteen villages which are selected as samples for field survey (Fig 1). Field survey is carried out in selected villages to know sources of water and to measure TDS of water.

We have found that there are four major sources e. g. open well, hand pumps, bore wells and Ujjani Reservoir. Total Dissolved Solids (TDS) is measured through TDS meter and we have got the primary data. We have observed that TDS value is more in that villages which are located at Ujjani Reservoir. TDS value is observed maximum in Village Bawada (1680 mg/l) followed by Indapur (1587 mg/l), Kandalgaon (1350 mg/l) and minimum Shetpahal Haveli (310 mg/l). The average TDS is measured that is 917 mg/l. As per Bureau of Indian Standard (2012), the acceptable limit of TDS for drinking purpose is 500 mg/l (Table 1). Almost in thirteen villages the TDS value is more than acceptable limit. Most of the villages which are located at the bank of Ujjani Reservoir uses water which gets from reservoir, open well, bore well for drinking purpose. More TDS affects on human health, agriculture and soil.

Fig. 1 : Selected sample villages in Indapur taluka for field survey



More water is required for various crops. Irrigation water is applied to crops during the summer when evaporation rates are highest. As water molecules evaporate into the atmosphere, salts remain behind in the irrigation water. This irrigation water can percolate into the underlying groundwater. The groundwater is later pumped and used for additional irrigation in summer season, the evaporation cycle is repeated and salinity levels continue to increase.

Table 1 : Average TDS (mg/l) of selected villages in Indapur Taluka

Sr. No.	Villages	Average TDS (mg/l)	Source	Lat	Long	Elevation (m)
1	Dalaj No. 1	913	Hand Pump	18.234	74.820	505
2	Gotandi	932	Bore well	18.075	74.870	535
3	Palasdeo	404	Open Well	18.232	74.880	508
4	Nimgaon Ketki	790	Open Well	18.086	74.916	539
5	Loni Deokar	997	Bore well	18.206	74.918	536
6	Varkute (Khurd)	991	Open Well	18.064	74.928	528
7	Pondkulwadi	806	Open Well	18.126	74.953	533
8	Shetphal Haveli	310	Bore well	18.018	74.966	511
9	Tarangwadi	538	Bore well	18.102	74.973	524
10	Wadapuri	850	Open Well	18.063	74.990	513
11	Bawada	1680	Bore well	17.967	74.996	487
12	Kalashi	1103	Hand Pump, Openwell	18.222	75.001	523
13	Kalthan No. 2	986	Bore well	18.172	75.019	515
14	Indapur	1587	Bore well, Openwell	18.116	75.026	516
15	Kandalgaon	1350	Bore well	18.103	75.111	524
16	Bhimanagar	434	Open Well	18.066	75.116	503
	Average	**917**				**519**

Conclusion

The observation in this study indicates the major sources of water are reservoir, open and bore well. Also the higher values of TDS has found in reservoir, bore well and open well water. The overuse of water for agriculture is the main problem of increasing TDS in reservoir, open well and other sources of water. To minimize TDS value of water in reservoir, recycling and water treatment is necessary.

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