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Groundwater Quality Assessment – A Case Study on Few Rural Villages of Santhabommali

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KEYWORDS
Groundwater, pH, Sulphates, Chloride, Nitrates, TDS and TH.

ABSTRACT:
Groundwater is essential for an array of residential, commercial, and industrial purposes due to the shortage and contamination of surface water supplies as well as the increasing demand for agricultural techniques. (K.M. Das 2021) Human health and agricultural productivity are significantly impacted by the concentration and quality of groundwater. Canter (2020) A growing amount of study shows that the use of pesticides and fertilizer by farmers is an important factor of contamination of groundwater. Twenty groundwater samples were used during pre-monsoon in this investigation, which took place in five different villages of antlavaram, brundavanam, chinnathungam, govindapuram, ijjuvaram of santhabommali mandal of Srikakulam. The chemical characteristics of water quality parameters were determined by taking samples from a range of bore wells/wells using a random sampling approached. In the five rural villages of Antlavaram, Brundavanam, Chinnathungam, Govindapuram, and Ijjuvaram in the Santabombali mandal, the research looked at the maximum quantity of groundwater as well as the suitable treatment methods for trying to turn the water into a drinkable state.

1. Introduction

Everything that comes from the atmosphere to the earth's crust, be it rain, snow, fog, or other kinds of precipitation, is either highly pure or free of pollutants. These types of precipitations are rare in naturalistic ecosystems because of the enormous amount of chemicals present. Pure waters experienced chemical deterioration in the environment, which affected their ability to sustain life. Water absorbs from the atmosphere, but not before collecting the gases already present in the surrounding environment. The kind and amount of components in water define its quality. Based on the negative impact that different water quality elements have on human/animal health and irrigation ecosystems, many boards or agencies of the Bureau of Ind. St. (BIS) have created standards and guidelines for water quality. Groundwater quality is greatly impacted by waste streams, runoff from agriculture, and industrial effluents. Poor solid waste decommissioning, over aquifer drawing, improper solid waste disposal, and excessive use of fertilizer and pesticides in agricultural activities are the main factors affecting groundwater resources.

2. Study Area

Santhabommali is a Mandal located in the Srikakulam District of Andhra Pradesh. The Mandal is 8 metres (height) above sea level and has 120 villages and 34 panchayats. The neighbouring city is Srikakulam City. The Figure 1 is study mandals of Santhabommali.

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Fig.1: Study Villages of Mandal Area Map

3. Objective of Study

Finding the appropriate treatment techniques to render water useful, comparing allowable limits to Indian norms, and examining the properties of groundwater samples from five distinct villages in Santabombali mandal, which comprises the largest research area.

4. Methodology

Samples of groundwater from the villages of Antlavaram, Brundavanam, Chinnathungam, Govindapuram, and Ijjuvaram have been collected using hand pumps in preparation for chemical analysis in the Chemistry Laboratory.Analyses of chemical properties such pH, electrical conductivity, nitrates, chlorides, and magnesium were conducted using standard test methods. Assessing groundwater movement in the study region in the pre-monsoon season is the aim of the research. Water samples were collected in compliance with the guidelines provided in the UNESCO paper. The specimens that were collected stated precise records of every one of the samples that were obtained at the study area. Safety precautions are taken while submitting samples to the lab in bottles (APHA 1998). Table 2 shows the techniques used for water analysis

5. Results and Discussions

The relevant values for the chemical parameters pertaining to the water quality of the groundwater samples collected prior to the monsoon are displayed in Table 1. Graphs of pH, EC, TDS, TH, chlorides, sulphates and nitrates are displayed in Figures 2 to 8 for the various villages in the research region.

Table 1. Results of Groundwater samples at study area during pre-monsoon

S. No.	Sampling Stations	pH	EC (mmhos/ cm)	TDS (mg/l)	CI (mg/l)	TH (mg/l)	Sulphate (mg/l)	Nitrate (mg/l)
1	Antlavaram: S1	7.79	1629	977	149	184	34	5
2	Antlavaram: S2	7.78	1624	971	147	180	30	6
3	Antlavaram: S3	7.77	1632	976	142	182	36	4
4	Antlavaram: S4	7.82	1631	980	146	190	36	5
5	Brundavanam: S1	7.42	900	735	173	92	23	20
6	Brundavanam: S2	7.44	902	728	170	96	21	18
7	Brundavanam: S3	7.43	902	732	172	95	24	21
8	Brundavanam: S4	7.43	904	733	173	97	28	25

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9	Chinnathungam:S1	7.45	1394	718	174	312	26	20
10	Chinnathungam:S2	7.49	1398	720	168	310	24	21
11	Chinnathungam:S3	7.40	1396	715	179	309	25	21
12	Chinnathungam:S4	7.48	1392	719	175	315	29	18
13	Govindapuram:S1	7.04	1866	942	208	352	30	19
14	Govindapuram:S2	7.05	1862	946	198	345	29	20
15	Govindapuram:S3	7.02	1872	938	210	357	32	18
16	Govindapuram:S4	7.06	1868	942	216	354	30	19
17	Ijjuvaram:S1	7.59	1983	1390	107	384	29	22
18	Ijjuvaram:S2	7.62	1986	1382	109	386	27	21
19	Ijjuvaram:S3	7.58	1981	1396	103	380	32	24
20	Ijjuvaram:S4	7.57	1979	1392	109	386	28	22

Table 2. Methods for Groundwater analysis

Test Conducted	Units	Principle of the method
P^H	levels	pH meter
Electrical conductivity	Millimhos	Digital conductivity meter
TDS	mgl^{-1}	Titration Method
TH	mgl^{-1}	Titration Method
Ca and Mg	mgl^{-1}	Titration Method
Chlorides	mgl-1	Titration Method
Nitrates	mgl^{-1}	Spectrophotometry

Source: American Public Health Association (APHA) 1998

Fig 2. Graphical representation of pH

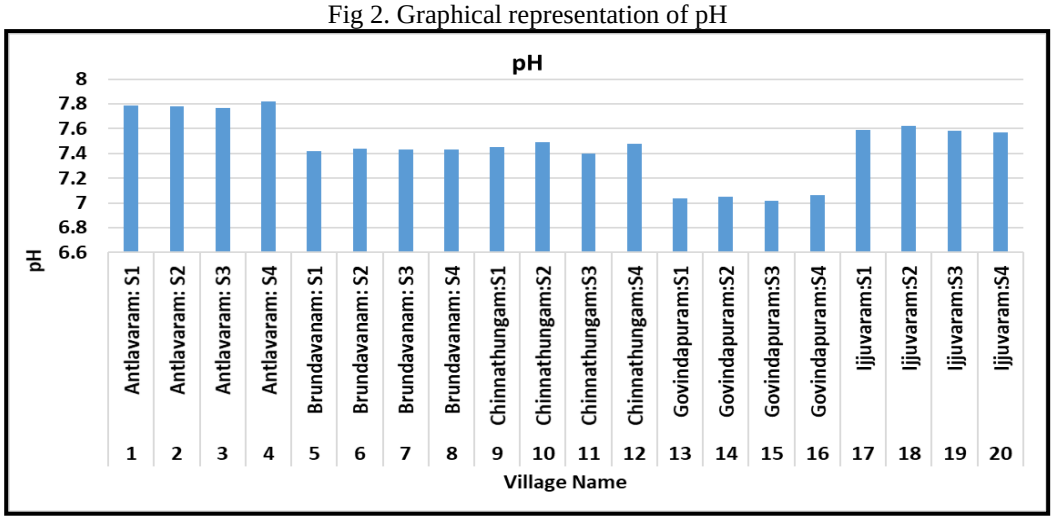

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Fig 3. Graphical representation of EC

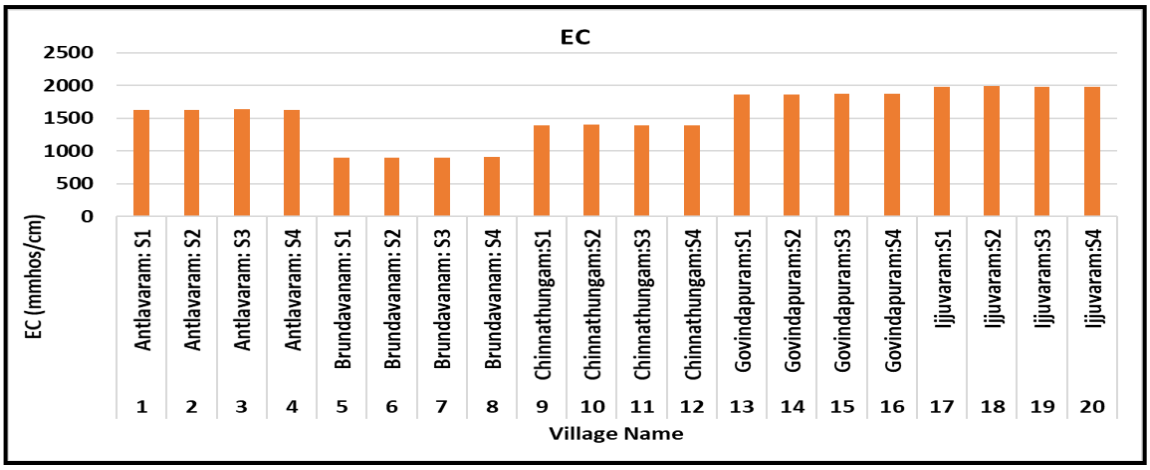

Fig 4. Graphical representation of TDS

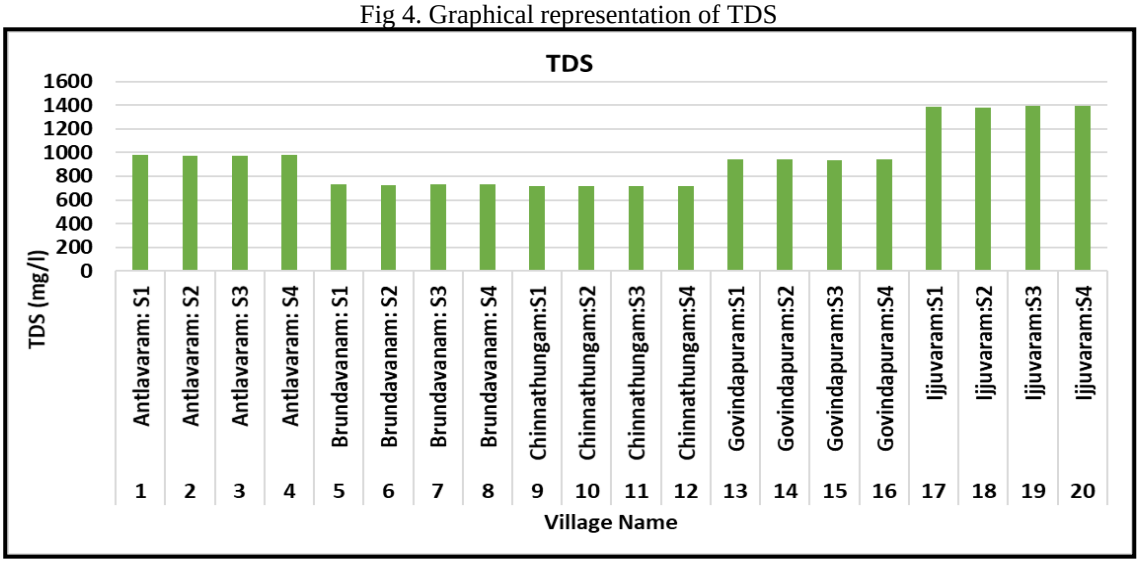

Fig 5. Graphical representation of Cl

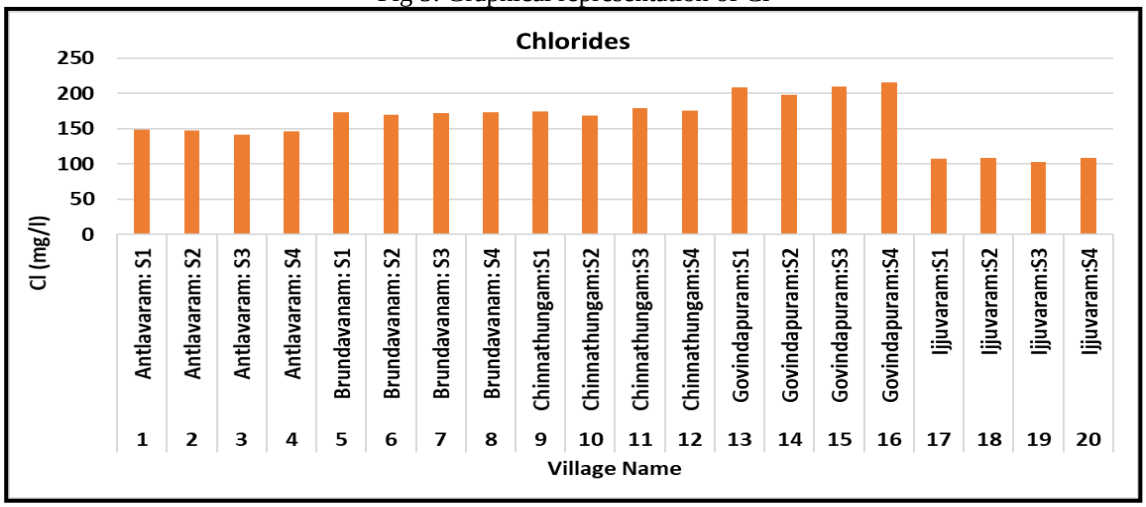

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Fig 6. Graphical representation of TH

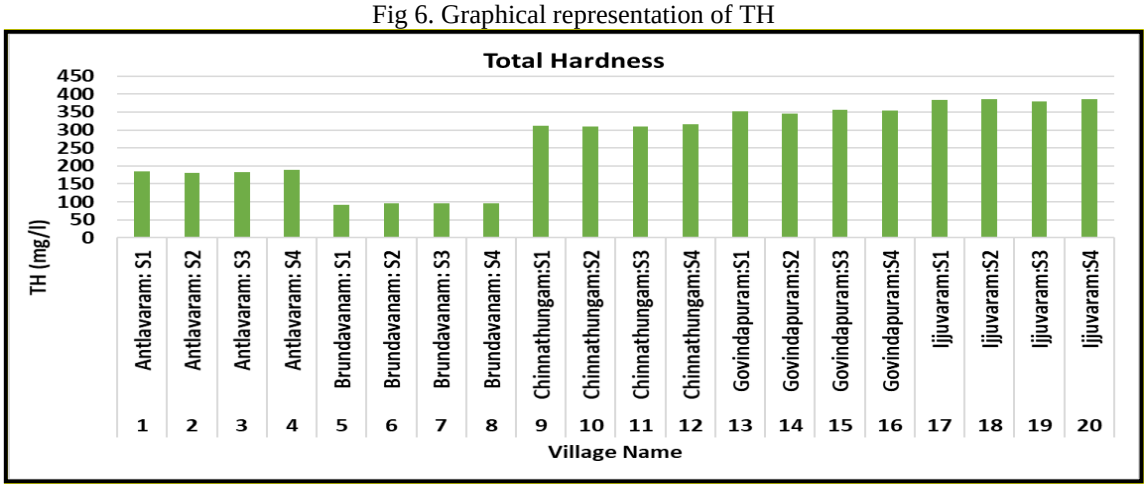


Fig 7. Graphical representation of Sulphates

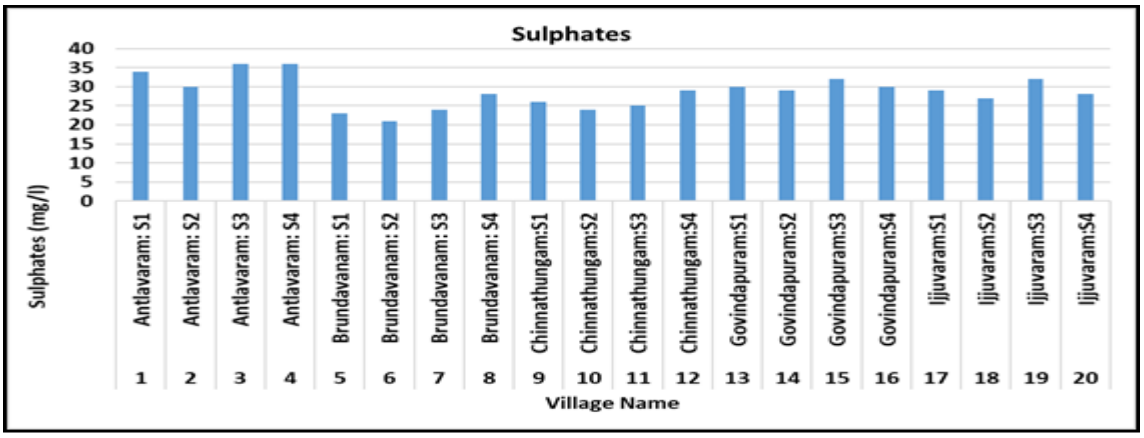
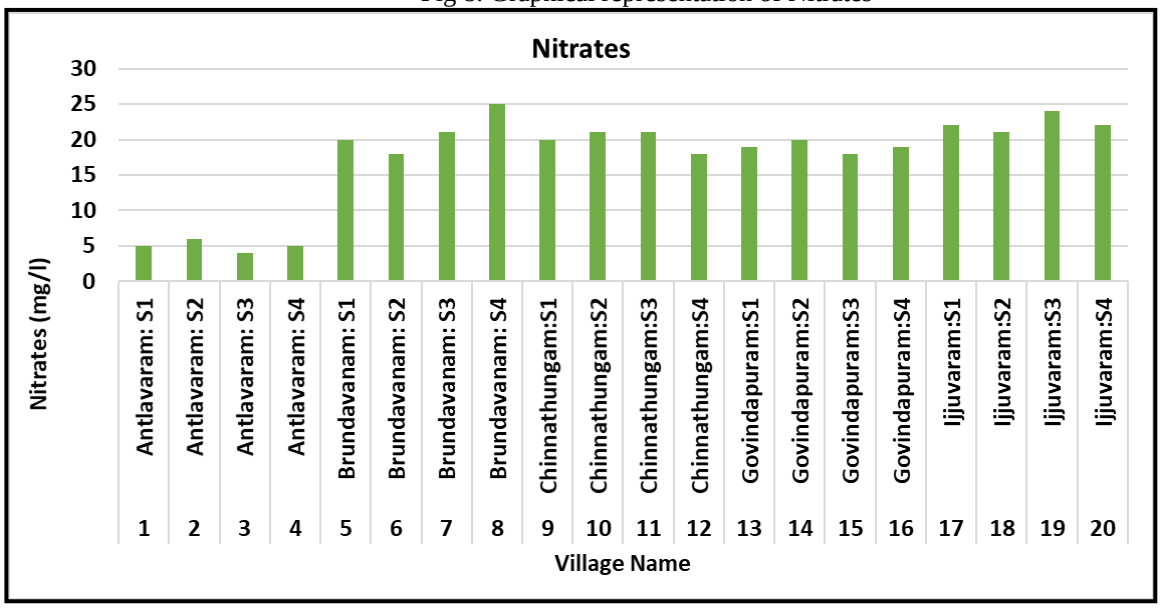


Fig 8. Graphical representation of Nitrates



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6. Conclusions

When compared to the WHO-permitted limitations, the groundwater in the study Mandal areas of Antlavaram, Brundavanam, Chinnathungam, Govindapuram, and Ijjuvaram is biassed in favour of smaller living forms. Numerous samples were found to be marginally and moderately saline in nature, to have total hardness concentrations that were moderately unsafe within permissible limits, to have nitrate concentrations that were moderately safe within permissible limits, and to have chloride concentrations that were moderately safe within permissible limits. Raising public awareness requires ensuring the use of pollution control technology, prudent water usage, and proper sanitation.

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