Physico- Chemical Analysis Of Drinking Water–Anantapur District, Andhra Pradesh

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ABSTRACT: *Due to lack of awareness about water pollution and remedies of pollution in human and their activities now a days in major areas ground and surface water is contaminated, and also it leads to damage human health by water born diseases like Cholera, Diarrhea, Malaria Typhoid, Filariasis[1] Thus the analysis of water quality parameters in selected area for present research is very important to protect and preserve the quality and warn to human by creating awareness in them .So that in Anantapur district water was contaminated due to lack of water sources and more industrial activities .For this we were collected some water samples in selected areas to analyze the samples of Ground water and surface water for physico – Chemical characteristics like $pH,EC,Turb.,F^-, NO_3^-, SO_4^{2-}, Temp, Dissolved oxygen, Total suspended solids ,Total Hardness, Chloride, and Trace metal ions are Cu, Zn, Mn, Fe, Al using the procedures outlined prescribed by Indian standards. The obtained results are after analysis compared with Indian Standard Drinking water specification IS: 10500-2012 [16].finally we suggest after this investigation, Analysis and preserve the water should be carried out as per standards to prevent diseases periodically.*

KEYWORDS: *Drinking Water, water Quality parameters , Indian Standards ,*

I.   Introduction

Water is the most Important substance in daily life of living organisms .and also shaping the land and regulating the climate too .Ground water and surface water sources are used for Human activities and also Industrial activities. but in the last few decades there has been increase the demand of fresh water due to rapid growth of populisation and industrialization and also climate change .In this context the remain some sources of water was contaminated by unwanted activities in present research area especially in this area due to presence of more hill area and lacking rainfall there is a raise of global warming. So that we selected this area to study. The greater part of the soluble constituents in ground water comes from soluble minerals in soils and sedimentary rocks. The more common soluble constituents include calcium, sodium, bicarbonate and sulphate ions. Another common constituent is chloride ion derived from intruded sea water, connate water, and evapo transpiration concentrating salts, and sewage wastes for example. So here we selected some areas of Anantapur district to analyze the samples for various parameters as taken in two different ground water sample and surface water sample in each area and each one two samples. For this study we selected four areas named as Kadiri,Tadipatri,Guntakal,Nallacheruvu, and total collected 16 samples i.e. 4 samples separated as 2 samples from ground water sources and 2 samples from surface water sources .samples collected as per Indian standards sample collecting procedures.

II.   Materials and methods :

1.Study Area:

It is the largest district of Andhra Pradesh spanning an area of 19,130 square kilometres (7,390 sq mi), comparatively equivalent to Japan's Shikoku Island. It is bounded on the north by Kurnool District, on the east by Kadapa District, on the southeast by Chittoor District, and on the southwest and west by Karnataka state It is part of Rayalaseema region on the state. Its northern and central portions are a high plateau, generally undulating, with large granite rocks or low hill ranges rising occasionally above its surface. In the southern portion of the district the surface is more hilly, the plateau there rising to 2,000 ft (610 m).above the sea. Six rivers flow within the district: Penna, Chithravathi, Vedavathi, Papagni, Swarnamukhi, and Thadakaleru. The district receives an average annual rainfall of 381 millimetres[2]
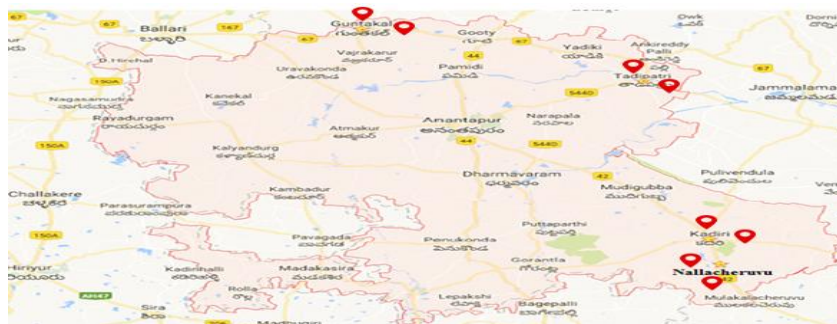
Fig.1 : Map of Annatapur district

2.Sampling and analytical methods:

The all samples were collected from specified as above 4 areas as per sampling methods specified in IS:3025 part 1 in Poly Ethylene bottles and immediatly brought to laboratory to analyze the samples for physico –Chemical characteristics like pH,EC,Turb.,F^- NO_3^- SO_4^{2-}Temp,Dissolved oxygen,Total suspended solids ,Total Hardness, Chloride, and Trace metal ions are Cu, Zn, Mn, Fe, Al as per Al using the procedures outlined prescribed by Indian standards[3]. The obtained results are after analysis compared with Indian Standard Drinking water specification IS: 10500-2012. . such as pH by using pH meter,EC by using Conductivity meter, Turbidity by nephelometric method, Fluoride will find by Colorimetric SPADNS Method ,Nitrate and sulphate by using Spectrophotometer ,Total dissolved Solids by TDS meter ,Hardness in water by using EDTA complexometric Titration method ,Chloride by An argentometric method, finally trace metals are like Copper ,Zinc,Iron,Managnese,Aluminium are by using Atomic absorption Spectrophotometric method[16] .

III.   Results and discussion:

The results of all physico chemical parameters for the water samples collected from each and every area specified in above are presented clearly in the below tables .

1.Temperature:

Temperature is a Important parameter of water quality to all bio chemical reactions in aquatic living organisms .If a rise in temperature in water it leads to speeding up of reactions loss in life span of organisms. The average temperature of the present study ranged from 22^0c - 29^0c.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	28	27	26	26
G2	27	29	27	26
S1	22	25	25	24
S2	24	24	25	25

Table 1: Temperature of various areas

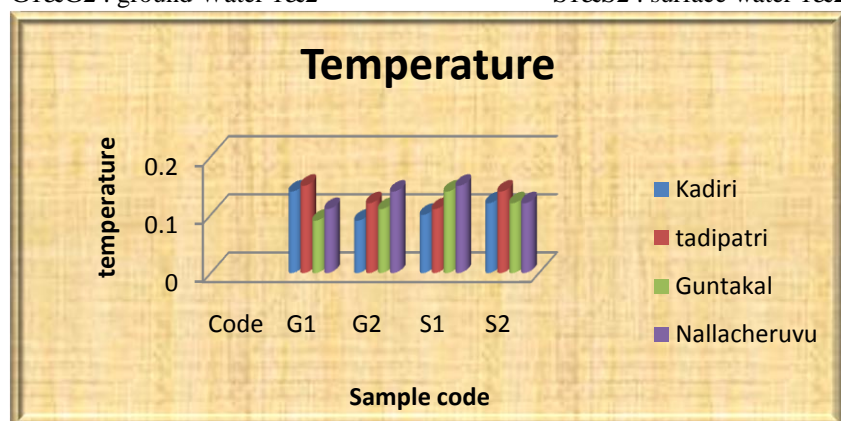G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

**Fig.2: Graphical representation of Temperature**

2. pH :

lower pH value of water sample is sore taste and higher value of water it gives a alkaline taste .Actually the pH standard is 6.5-8.5 .The pH values of the present study ranged from 6.02 – 8.24

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	6.78	6.48	6.58	7.11
G2	6.62	6.54	7.23	7.01
S1	6.98	6.81	7.96	6.99
S2	6.02	6.14	8.24	7.26

Table 2: pH of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
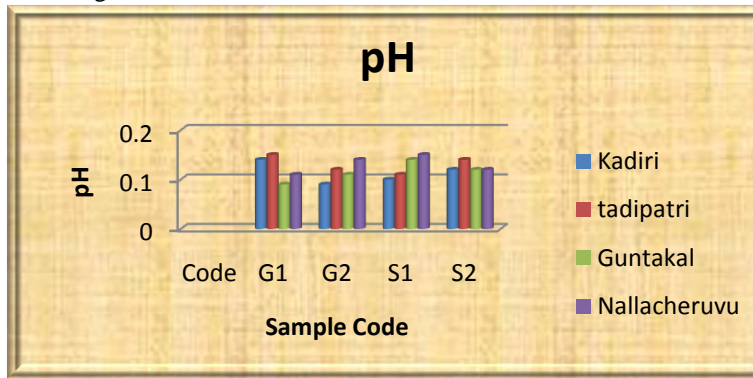
Fig.3: Graphical representation of pH
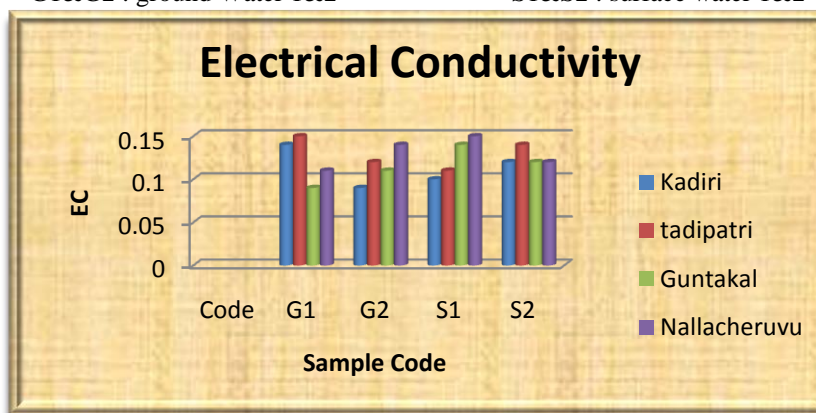
3.Electrical Conductivity:

. Freshwater is usually between 0 and 1,500 uS/cm.If Ec value 0-800 it is Good drinking water for humans (provided there is no organic pollution and not too much suspended clay material).In th e present study the values are ranged from 98 - 560 uS/cm.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	168	170	180	211
G2	201	199	159	184
S1	122	130	142	560
S2	185	190	156	98

Table 3: EC of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.4: Graphical representation of Electrical Conductivity

4.Total Dissolved solids:

TDS level as follows: excellent, less than 300 mg/litre; good, between 300 and600 mg/litre; fair, between 600 and 900 mg/litre; poor, between 900 and 1200 mg/litre; and unacceptable, greater than 1200 mg/litre in present study TDS values of this parameter is ranged from 239 – 271 mg/l

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	254	242	258	242
G2	239	259	264	256
S1	257	262	243	271
S2	246	267	249	258

Table 4: TDS of various areas

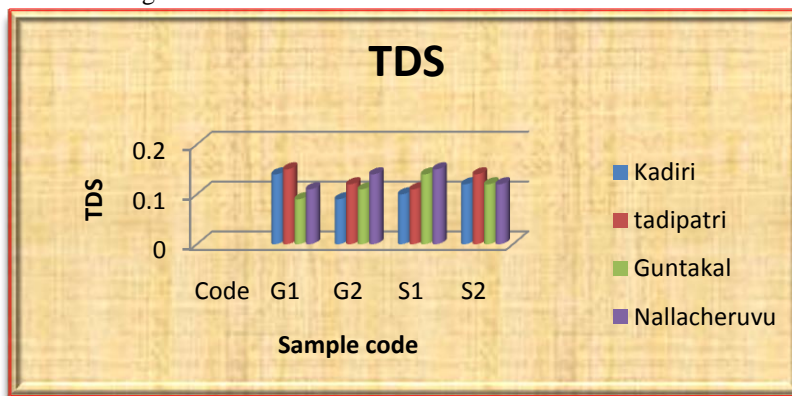G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.5: Graphical representation of TDS

5.Total hardness:

Hardness of water is a very important to used in domestical and industrial purpose.It may cause scale deposition and sludge formation in industries .actually as per standards hardness of water is desirable limit is 300 and permissible limit is 600 mg/l..In present study the hardness of water samples ranged from 196 – 246 mg/l.all are samples below desirable limit as per standards.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	231	223	196	207
G2	236	246	206	228
S1	214	216	214	234
S2	198	221	213	201

Table 5: Total hardness of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
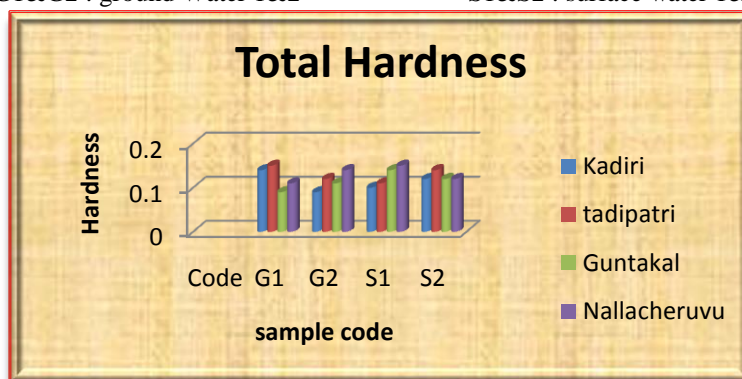

Fig.6: Graphical representation of Total Hardness

6.Chloride:

Chloride occurs in water samples is leads to sewage pollution as per low and higher values. Chloride desirable limit is 250 and permissible limit is 1000 mg/l.Chloride values are ranged from. 89.1 – 212.4 mg/l.all are below desirable limit and safe to drinking.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	89.1	99.4	212.4	154.3
G2	108.2	128.5	183.4	129.2
S1	210.3	140.7	119.4	211.1
S2	158.3	159.8	126.2	176.3

Table 6: Chloride of various areas

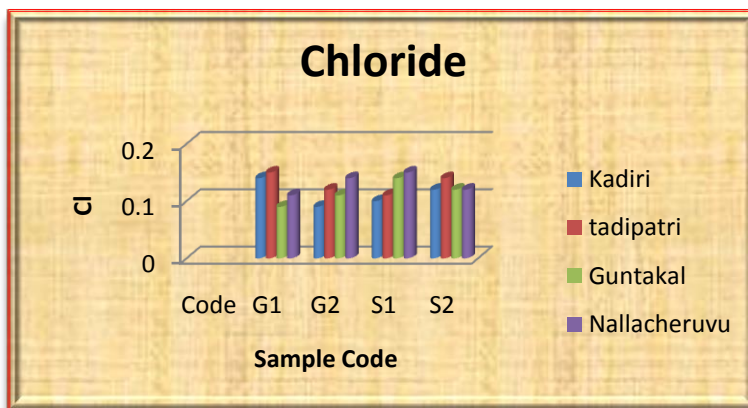G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.7: Graphical representation of Chloride

7.Fluoride:

The major sources of fluoride in ground water are fluoride bearing rocks such as fluorspar, cryolite, fluorspatite and hydroxylapatite etc. In India.in this present study area there is rock hill areas . as per standards fluoride desirable limit is 1.0 and permisble limit is 1.5 mg/l.The high concentration of fluoride is leads to Dental and skeleton fluorosis . The concentration of fluoride is vary in various areas as from 0.59 – 1.33 mg/l.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	0.72	0.70	0.60	1.33
G2	0.77	0.63	0.75	1.05
S1	1.12	1.15	1.05	0.92
S2	0.59	0.61	0.86	0.65

Table 7: Fluoride of various areas

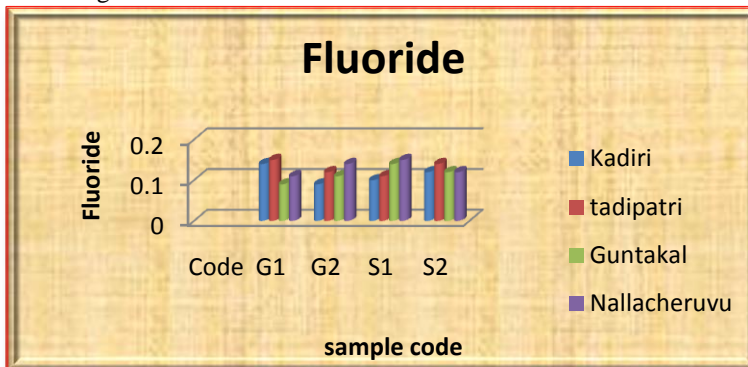G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.8: Graphical representation of Fluoride

8.Nitrate:

Nitrate is the most important of nutrient in Ecosystem.generally water bodies polluted by organic matter exhibit higher values of nitrate As per standards Nitrate desirable limit is 45 and permissible limit is 100 mg/l..the nitrate are shown vary in selected area from 14.15 – 36.58 mg/l

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	15.32	15.21	14.41	19.86
G2	35.22	34.62	36.58	33.41
S1	28.32	26.32	28.74	30.12
S2	14.15	19.85	29.75	28.16

Table 8: Nitrate of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
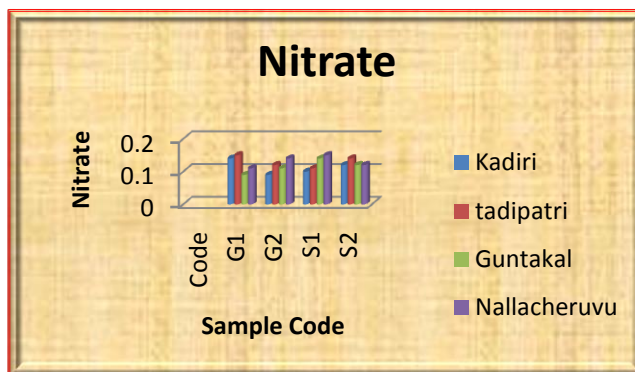
Fig.9: Graphical representation of Nitrate

9.Sulphate:

Sulphate ion if present in excess amount produce cathartic effect upon human beings. As per standards desirable limit is 200 and permisbile limit is 400 mg/l.The sulphate ion concentration is from   38.35 – 66.54 mg/l.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	53.12	57.56	55.97	43.33
G2	55.36	66.54	56.47	51.12
S1	49.20	42.14	44.20	56.83
S2	40.65	38.35	43.15	46.87

Table 9: Sulphate of various areas

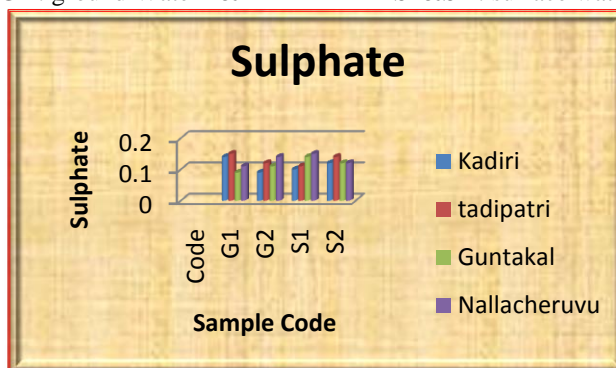G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.10: Graphical representation of Sulphate

10.Dissloved oxygen:

It is an important parameter which is essential to the metabolism of all aquatic organisms that posses aerobic respiration. The DO values obtained in the present study are as from 5.2 – 8.2 mg/l

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	5.2	6.2	5.4	6.7
G2	6.1	6.8	6.8	8.2
S1	6.5	5.9	7.2	7.9
S2	5.8	6.4	7.9	6.4

Table 10: DO of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
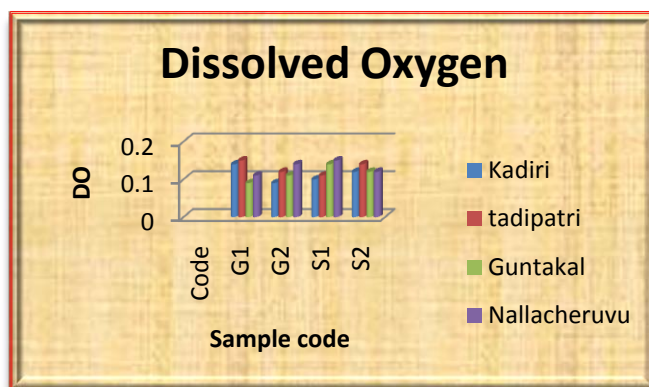
Fig.11: Graphical representation of Dissolved oxygen

11.Turbidity :

In drinking water, the higher the turbidity level, the higher the risk that people may develop gastrointestinal diseases. Turbidity values obtained in the present study as are 15.13 – 55.14 NTU.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	42.01	28.32	39.14	19.99
G2	50.17	48.26	51.17	22.19
S1	15.13	26.53	16.74	55.14
S2	44.27	53.78	43.84	17.12

Table 11: Turbidity of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
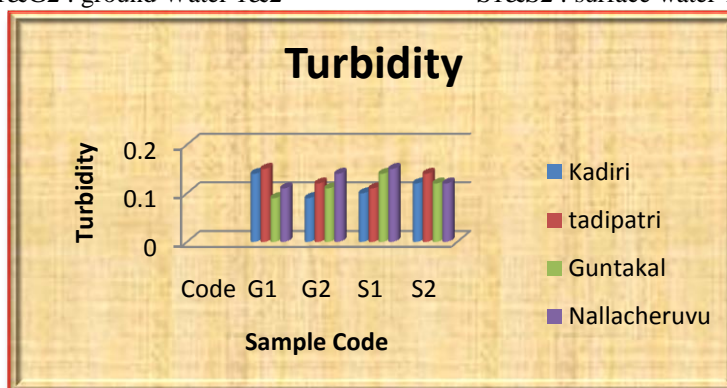

Fig.12: Graphical representation of Turbidity

IV.   Analysis of trace metal ions:

1. Copper:

If the water samples exceed the EPA copper actionlevel of 1.3 mg per liter, water systems must use treatment to reduce corrosion. Consumers should take steps to reduce exposure to copper if they learn their waterexceeds the action level.As per IS standards acceptable limit is 0.05 permissble limit is 1.5 mg/l.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	2.14	2.13	2.44	1.84
G2	1.49	2.05	1.84	1.99
S1	1.62	1.84	1.99	2.13
S2	2.15	1.99	1.65	2.05

Table 12: Copper of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
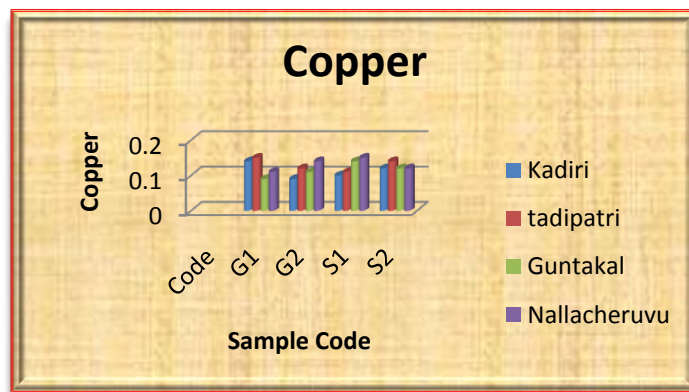
Fig.13: Graphical representation of copper

2.Zinc :

Zinc is an essential element for humans, and most health issues are focussed on a deficiency of zincrather than an excess. Adverse effects of an excess of zinc are centred around gastro-intestinal issues. As per IS standards acceptable limit is 5 permissble limit is 15 mg/l. In the present study maximum all areas samples below permissible limit and above acceptable limit except kadiri G2 .

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	9	16	14	15
G2	4	8	15	9
S1	6	15	9	16
S2	9	9	11	8

Table 13: Zinc of various areas

G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2
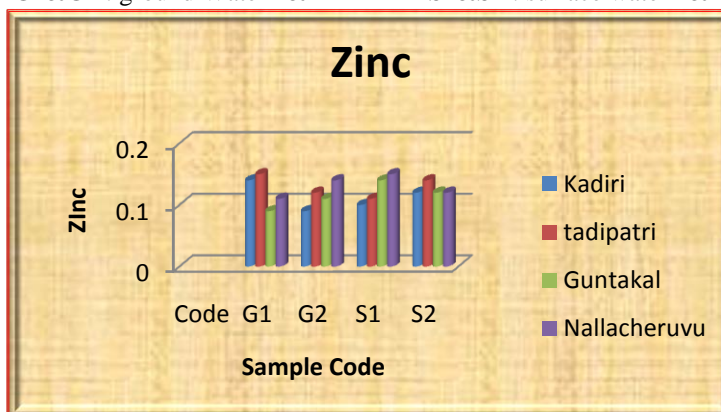

Fig.14: Graphical representation of Zinc

3.Manganese :

Drinking WaterRegulations recommend a limit of 0.05 mg/lmanganese because of the staining which may be caused. For many industrial purposes themanganese content should not exceed 0.01 to 0.02 mg/l.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	0.0757	0.124	0.0946	0.0842
G2	0.0941	0.0951	0.0842	0.189
S1	0.0757	0.0842	0.189	0.124
S2	0.154	0.189	0.0757	0.0951

Table 14: Manganese of various areas

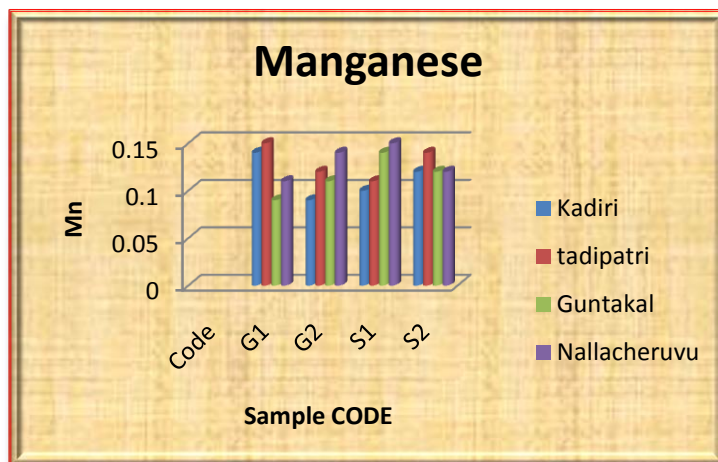G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.15: Graphical representation of Manganese

4.Iron:

Rainfall seeping through soil causes iron to dissolve and leach into groundwater, including wells and aquifers used to supply drinking water. . The drinking water standard for iron is 0.3 milli- grams per liter (mg/l), Iron overload can lead to hemochromatosis, which can lead to liver, heart and pancreatic damage, as well as diabetes

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	0.64	0.75	0.75	0.34
G2	0.41	0.63	0.34	0.67
S1	0.37	0.34	0.67	0.75
S2	0.41	0.67	0.12	0.63

Table 15: Iron of various areas

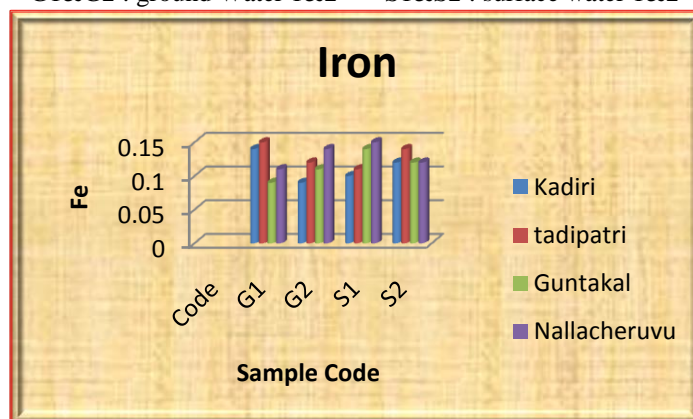G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.16: Graphical representation of Iron

5.Aluminium:

. The drinking water standard for iron is 0.03 – 0.2milli- grams per liter (mg/l).if It has been hypothesized that aluminium exposure is a risk factor for the development or acceleration of onset of Alzheimer disease (AD) in humans.

Sample Code	Kadiri	tadipatri	Guntakal	Nallacheruvu
G1	0.14	0.15	0.09	0.11
G2	0.09	0.12	0.11	0.14
S1	0.10	0.11	0.14	0.15
S2	0.12	0.14	0.12	0.12

Table 16: Alluminium of various areas

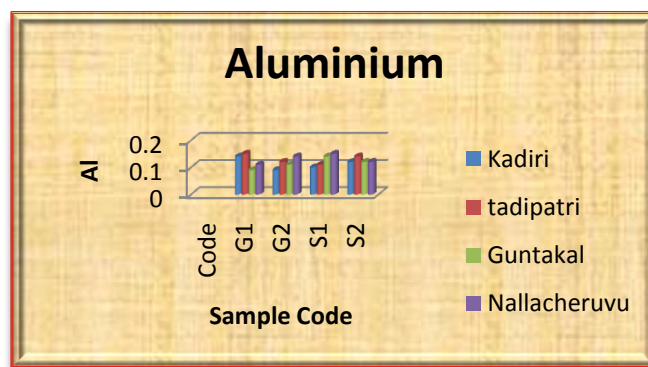G1&G2 : ground Water 1&2   S1&S2 : surface water 1&2

Fig.17: Graphical representation of Aluminium

V.   Conclusion:

Based on the above results of water quality in 4 areas viz.kadiri, tadpatri ,guntakal,Nalla cheruvu .Among these after observation of all analytical data pH,EC ,TDS ,total hardness ,Nitrate,Suplhate ,are all below desirable limit as per IS :10500 :1991 means according to these parameters water is safe to drinking no suggested any methods .but Incase of Fluoride some samples below desirable limit except S1(kadiri),S1(Guntakal),G1&G2 (Nallacheruvu) are above desirable limit and below permissible limit means some little bit water treatment is needed to drinking purpose.Incase of turbidity all sample are above limit .especially incase of trace metal ions Cu,Zn,Fe,Mn,Al are all above limit except one or two samples only due to industrial ores availability mean dolomite iron ore high volume availability.here We conclude water will treat must to drinking purpose aswell as agricultural purpose also.Due to this heavy concentration in tracemetal ions in this place crop percentage is also low.So must caring about industrial effluents treatment methods.

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