# A GPS Based Environmental Study: Hydro-Chemical Parameters of Water in Rural Area, W.G District, A.P.

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***Abstract:*** Water is an essential resource for life on the earth. Ground water is the major source of water for drinking, agricultural, and industrial desires. India is the largest user of groundwater in the world. In the most part of our country ground water is a major source of drinking water. Ground water is one of the major source of the drinking water in Pedavegi Mandal. In the present study groundwater quality of 29 Villages in Pedavegi Mandal were taken for under investigations by groundwater samples collected from entire villages and assessed for their suitability for human consumption. Physico-chemical parameters such as pH , EC, Total Dissolved Solids, Total Hardness, alkalinity, Na, K, Ca, Mg, Fe, Cl, F, NO3, SO4, $PO_4$, DO,COD and BOD are determined using standard procedures which are carried out during in the year 2013.The paper presents groundwater quality assessment of Pedavegi Mandal, West Godavari district, Andhra Pradesh, and analyzed for their physico-chemical characteristics. The statistical analysis of the collected samples yielded the range of the variation, mean, standard deviation and co-efficient of variation

***Keywords: Pedavegi, Physico-Chemical, Hardness, Analysis.***

## I. INTRODUCTION

There are some natural elements which create water pollution. These are gases, soil, minerals, humus materials, water created by animals and other living organisms present in water. The present study is an attempt to analyse the rural groundwater quality assessment, the chemical composition and suitability for human consumption and agricultural uses. Water pollution simply means contamination of water due to any external material or in other words, introduction of something to natural water which makes unsuitable for human consumption. There is no doubt that water pollution is the result of the human activity. The rapid growth of population, urbanization, industrialization and increasing use of chemicals have resulted in water pollution and this problem is increasing day by day in spite of several measures taken in this direction. This is not only a problem of developed countries and urban areas but has also become an uncontrollable problem of developing countries as well as several areas .The Chemical composition of groundwater is measured to determine its suitability as a source for human use and animal consumption, irrigation, industrial purposes and the others. Water quality refers to the physical, chemical, and biological characteristics that are required for water uses.

**Study Area**: The West Godavari district in Andhra Pradesh occupies an area of approximately 7700 square kilometers. It has 46 Mandals out of which 24 are in Upland Region.Study area comprises of 29 panchayats in Pedavegi Mandal. Pedavegi Mandal lies between 16.88031 to 16.98490 Latitude and 81.02160 to 81.0090 Longitude. Geomorphologically the district can be divided into two major regions viz., alluvial deltaic region and upland areas. The deltaic region mostly constitutes black cotton soils and the upland areas are dominated by the red soils.

**Water sampling**: In present investigation 29 water samples from Pedavegi Mandal are collected. The water samples were collected in polythene bottles which were cleaned with acid water and hot water followed by rinsing twice with distilled water. The water samples were analyzed by using procedures of standard methods.

**Objectives**: To assess the ground water quality and its suitability for drinking purpose in the study area.

**Methodology:** The pH was measured by using Eutech ion-2700 PH meter and EC was measured in electrical conductivity meter 304. Total hardness, calcium, magnesium were measured by EDTA titration methods. Total alkalinity was determined by volumetrically. Sulphate was determined Turbidymetric method using digital Nephelo turbidity meter 132. Fluoride and chloride content in water was determined by using ion selectivity meter Eutech ion -2700. The Physico-chemical analysis was carried out according to standards methods. Iron, nitrite and phosphate were determined by spectrophotometer. DO, BOD, COD were determined using standard methods.

**Results:** Location of GPS details of pedavegi Mandal as shown in Table -1 and The Statistical Data of pedavegi Mandal as shown in Table -2 Statistical Data gives the min, max ,S.D values of the Hydro-Chemical Parameters , Correlation Studies gives Relation ship between one chemical parameters Related to on other chemical parameters is Shown in Table -3.


Fig.1: View of Mandals in West Godavari map

**Table 1 : Location of GPS values and soil type of Pedavegi Mandal**

| S.No | Sample Code | Village Name | GPS Details | | Source Details | | Geology | Health | Landmark |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Latitude & Longitude ( Degrees)** | **Elevation (Ft)** | **Bore Depth (Ft)** | **Water Table (Ft)** | | | |
| 01. | 8:1:1S | Duggirala | 16.69954,81.05081 | 66 | 400 | 110 | Red soil | Good | Anganavadi school |
| 02. | 8:2:1S | Vanguru | 16.75490,81.07948 | 104 | 180 | 112 | Red soil | Good | Near Siva subhramanya swami temple |
| 03. | 8:3:1S | Lakshmipuram | 16.77408,81.07998 | 139 | 400 | 114 | Red soil | Good | Opposite c s I church |
| 04. | 8:4:1S | Kavvakunta | 16.78895,81.08448 | 164 | 350 | 115 | | Good | Near Ramalayam Temple |
| 05. | 8:4:2S | Kavvakunta | 16.79095,81.08575 | 151 | 300 | 119 | Red soil | Cold | Near Anganavadi |
| 06. | 8:5:1S | Jaganadhapuram | 16.78561,81.06641 | 108 | 250 | 111 | Red soil | Good | Harijanavada |
| 07. | 8:6:1S | Janampeta | 16.77660,81.05316 | 138 | 350 | 116 | Red soil | Good | House of simbhu verayya |
| 08. | 8:7:1S | Vijayarai | 16.80891,81.03603 | 157 | 280 | 115 | Red soil | Good | Z P High School |
| 09. | 8:8:1S | Vadipalli | 16.83060,81.00906 | 204 | 250 | 114 | Red soil | Good | Water tank |
| 10. | 8:9:1S | Rayannapalem | 16.85321,81.05500 | 194 | 200 | 112 | Red soil | Good | Water tank |
| 11. | 8:9:2S | Rayannapalem | 16.8555,81.05660 | 266 | 250 | 112 | | | Z P High School |
| 12. | 8:10:1S | Kondalaravupalem | 16.83570,81.05580 | 368 | 450 | 109 | Red soil | Good | Near sriramavaram colony, Chintalapudi rd |
| 13. | 8:11:1S | | 16.84236,81.07170 | 423 | 350 | 110 | Red soil | Good | Undavalli suryanarayana gari ho |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14. | 8:12:1S | Kuchimpudi | 16.86806,81.11238 | 241 | 310 | 116 | Black cotton soil | | Transformer |
| 15. | 8:13:1S | Ramasingavaram | 16.88780,81.10931 | 252 | 210 | 115 | Red soil | | Z P High School |
| 16. | 8:14:1S | Nayampalli | 16.84738,81.09481 | 286 | 400 | 110 | Red soil | Good | Water tank |
| 17. | 8:15:1S | Pedavegi | 16.81103,81.10778 | 173 | 280 | 109 | Red soil | Good | Beside bus stand |
| 18 | 8:16:1S | Koppalavarigudem | 16.81103,81.10778 | 182 | 200 | 112 | Red soil | Good | Water tank |
| 19. | 8:17:1S | Monduru | 16.82930,81.16018 | 142 | 180 | 115 | Red soil | Good | Back side bus stop |
| 20. | 8:18:1S | Chakrayagudem | 16.86078,81.15916 | 193 | 220 | 116 | Red soil | Bodypains | Ramalayam Temple |
| 21. | 8:19:1D | K Kannapuram | 16.8700,81.19055 | 209 | 210 | 119 | Red soil | Good | Z P High School |
| 22. | 8:20:1D | Tallagokavaram | 16.88291,81.14975 | 215 | 250 | 115 | Red soil | Good | S C Colony |
| 23. | 8:20:2D | Ramalayam | 16.88460,81.14886 | 220 | 220 | 113 | Red soil | Good | Water tank |
| 24. | 8:21:1S | Bhogapuram | 16.71506,81.02456 | 217 | 350 | 114 | Red soil | Good | Water tank |
| 25. | 8:22:1S | Ammapalem | 16.72401,81.02736 | 124 | 300 | 115 | Red soil | Good | Water tank |
| 26. | 8:23:1S | Pedakadimi | 16.73580,81.02138 | 137 | 320 | 116 | Red soil | | Water tank |
| 27. | 8:24:1S | Koppaka | 16.90233,81.02908 | 138 | 300 | 109 | Red soil | Good | NearPond |
| 28. | 8:25:1S | Ankannagudem | 16.76463,81.01751 | 116 | 180 | 110 | Red soil | Good | Panchyat office |
| 29. | 8:26:1S | Pinakadimi | 16.74546,81.05986 | 90 | 220 | 118 | Red soil | Good | Uttaravapu Road |

**Table 2 : Statistical Data of Pedavegi Mandal**

| NAME OF THE PERAMETER | MIN | MAX | MEAN | S.D | C.V |
|---|---|---|---|---|---|
| PH | 6.24 | 8.03 | 7.572069 | 0.339057 | 4.477737 |
| EC | 500 | 2900 | 1372.414 | 631.2666 | 45.99681 |
| TDS | 320 | 1856 | 878.3448 | 404.0106 | 45.99681 |
| TURBIDITY | 0 | 2 | 0.275862 | 0.527565 | 191.2424 |
| ALKILINITY | 204 | 578 | 362.069 | 98.73845 | 27.27062 |
| TH | 100 | 335 | 224.6552 | 61.88888 | 27.54839 |
| SODIUM | 4 | 196 | 86.27586 | 56.64293 | 65.65327 |
| POTASSIUM | 0.9 | 14.8 | 5.817931 | 3.756143 | 64.56149 |
| CALCIUM | 10.02 | 62.08 | 33.57966 | 11.39116 | 33.92281 |
| MAGNESIUM | 1.21 | 69.42 | 29.81862 | 18.88065 | 63.31832 |
| CHLORIDE | 31.7 | 756 | 258.5517 | 217.0737 | 83.95755 |
| FLOURIDE | 0.218 | 1.36 | 0.706759 | 0.317797 | 44.96543 |
| SULPHATE | 8.4 | 102.8 | 50.82069 | 26.06753 | 51.29314 |
| DO | 2 | 4.8 | 3.834483 | 0.897726 | 23.41191 |
| COD | 0 | 36.8 | 14.56552 | 11.38546 | 78.16724 |
| BOD | 1.2 | 24 | 2.910345 | 4.091659 | 140.5902 |

**Table3: Correlation Matrix of Pedavegi Mandal**

| | pH | EC | TDS | Alkalinity | Total Hardness | Sodium | Potassium | Calcium | Magnesium | Chloride | Fluoride | Sulphate | DO | COD | BOD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | 1 | | | | | | | | | | | | | | |
| EC | -0.46827 | 1 | | | | | | | | | | | | | |
| TDS | -0.46827 | 1 | 1 | | | | | | | | | | | | |
| Alkalinity | 0.235587 | 0.337978 | 0.337978 | 1 | | | | | | | | | | | |
| TotalHardness | -0.07451 | 0.250224 | 0.250224 | 0.299532 | 1 | | | | | | | | | | |
| Sodium | -0.38263 | 0.686903 | 0.686903 | 0.152717 | 0.506416 | 1 | | | | | | | | | |
| Potassium | -0.10148 | 0.417287 | 0.417287 | 0.096482 | 0.230647 | 0.185629 | 1 | | | | | | | | |
| Calcium | -0.58427 | 0.040626 | 0.040626 | -0.58282 | -0.36812 | -0.12959 | -0.10638 | 1 | | | | | | | |
| Magnesium | 0.031501 | 0.42293 | 0.42293 | 0.333257 | 0.68107 | 0.592253 | 0.14584 | -0.33128 | 1 | | | | | | |
| Chloride | -0.41139 | 0.889348 | 0.889348 | 0.388375 | 0.443727 | 0.706288 | 0.407135 | -0.04457 | 0.487818 | 1 | | | | | |
| Fluoride | -0.05771 | 0.202842 | 0.202842 | 0.40308 | 0.290549 | 0.20466 | 0.151357 | -0.36366 | 0.24743 | 0.174275 | 1 | | | | |
| Sulphate | -0.31465 | 0.837269 | 0.837269 | 0.383944 | 0.244492 | 0.706144 | 0.325624 | -0.11178 | 0.436036 | 0.821661 | 0.270691 | 1 | | | |
| DO | 0.473319 | -0.67133 | -0.67133 | -0.07594 | -0.41504 | -0.78177 | -0.46893 | -0.03874 | -0.54948 | -0.72092 | -0.09629 | -0.64291 | 1 | | |
| COD | 0.303028 | -0.22355 | -0.22355 | 0.290766 | 0.179306 | -0.07568 | -0.18885 | -0.18751 | 0.011938 | -0.17792 | 0.194102 | -0.13105 | 0.226964 | 1 | |
| BOD | -0.75055 | 0.454748 | 0.454748 | -0.26218 | -0.02692 | 0.202657 | 0.124943 | 0.471028 | -0.06303 | 0.443561 | -0.03378 | 0.282559 | -0.38999 | -0.25628 | 1 |

The correlation coefficient r value gives us information about sources of dissolved parameters, not only that it also gives information how one parameter vary with another parameters and gives possible combination of dissolved salts.

In the above Correlation studies EC and TDS strongly Correlated with Chloride , EC and TDS are Also strongly Correlated with Sulphate ,Sodium Strongly correlated with Chloride and Sulphate This indicate that hardness is perminent in nature.

**Table 4 :% Desirable In Between Desirable and Permissible and Above Permissible Limits.**

| | | PEDAVEGI MANDAL | | |
|---|---|---|---|---|
| S.No | parameter | % of samples below the desirable limit | % of samples in between desirable & permissible limit | % of samples above the permissible limit |
| 1 | pH | 3 | 97 | - |
| 2 | TDS | 10 | 90 | - |
| 3 | ALKALINITY | 27 | 73 | |
| 4 | HARDNESS | 82 | 18 | - |
| 5 | CALCIUM | 100 | - | - |
| 6 | MAGNESIUM | 58 | 42 | - |
| 7 | CHLORIDE | 58 | 42 | - |
| 8 | FLUORIDE | 100 | - | - |

**Table 5- Classification of water sample in the study area is on the Basis of HARDNESS**

| S.No | Description | Hardness(mg/L) | No of samples |
|---|---|---|---|
| 1 | Soft | 0-75 | 00 |
| 2 | Moderately hard | 75-150 | 03 |
| 3 | Hard | 150-300 | 21 |
| 4 | Very hard | >300 | 05 |

## II. CONCLUSIONS

From the Above Table we can Conclude that the samples in pedavegi Mandal most of them are in desirable limits ,pH values of the samples are in the pedavegi mandal are in between the desirable and permissible limits .TDS values are most of the samples are within the Range . Hardness, Calcium, Magnesium, most of them Values are within the desirable limits. On the classification of water sample in the study area based on hardness are mostly hard in quality.

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