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Physico-chemical analysis of ground water collected from three lakes of Khammam Rural, Telangana, India

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Abstract
This paper deals with the study of physico-chemical parameters of three lakes presented in khammam rural, Telangana, India. Monthly changes in physical and chemical parameters such as Water temp, pH, CO_3^{-2}, HCO_3^-, Cl, DO, BOD, COD, O.M, T.H, Ca^{++}, Mg^{++}, SO_4^{-2}, PO_4^{-3}, NO_3^-, NO_2^-, T.S, D.S, S.S, Na^+, K^+ were analyzed for a period of one year from April 2012 to March 2013. According to APHA Standard methods the result of analysis point out the fact that all the parameters are under permissible limits. The result indicates that all the lakes are good and can be used for domestic and irrigation purpose.

Keywords: Physico- chemical analysis, Ground water, Khammam rural lakes, Monthly changes, APHA

1. Introduction
Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70% water. But due to increased industrialization, human populations, use of fertilizers in the agriculture and man- made activity it is highly polluted with different harmful contaminants (Patil *et al*., 2012) [9]. The quality of water is vital concern for mankind because it directly linked with human health. Now a day, the menace of water borne diseases and epidemics still looms large on the horizons of developed and developing countries. The polluted water is the culprit in all such cases. (Ajit M. Kalwale *et al.,* 2012) [2]. The largely hidden nature of groundwater can result in development that is uncontrolled and not incorporated into river-basin management, which can result in overexploitation and contamination of groundwater. Even without considering climate change, groundwater sustainability is a major challenge because groundwater is a widely distributed resource that is affected by local users and contamination (Brekke *et al.,* 2009; Alley *et al.,* 2002) [6] Several sources contribute to the dissolved contents of groundwater the major elements released via various sources are used as proxies for weathering rates for which the identification of their different origins is required (Drever, 2005) [7]. Therefore it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water revels much about the metabolism of the ecosystem and explain the general hydro - biological relationship (Basavaraja Simpi *et al.* 2011) [5]. The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different types of impurities are introduced in to aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including mining, processing and the use of metal based materials. The increased use of metal-based fertilizer in agricultural revolution of the government could result in continued rise in concentration of metal pollutions in fresh water reservoir due to the water run-off. Also faucal pollution of drinking water causes water born disease which has led to the death of millions of people. (Adefemi and Awokunmi, 2010) [1].

2. Study area
Khammam District is a district in Telangana, India. It had a population of 2,565,412 of which 19.81% were urban as of 2001 census. Khammam town is the district headquarters.
In our investigation we have taken lakes which are as follows.

2.1. Lake-1: Muthagudam Cheruvu
Name of Source: Muthagudam Cheruvu, Khammam
Location: Lat: 16^0-24'-5" long: 76^0 – 32'-25"
Major Basin: Krishna
Sub-Basin: Muneeru

2.2. Lake-2: Yedulapuram Cheruvu
Name of Source: Yedulapuram Cheruvu, Khammam
Location: Lat: 16^0-24'-5" long: 76^0 – 32'-25"
Major Basin: Krishna
Sub-Basin: Muneeru

2.3. Lake-3: Pollepalli Cheruvu
Name of Source: Pollepalli cheruvu, Khammam
Location: Lat: 16^0-24'-5" long: 76^0 – 32'-25"
Major Basin: Krishna
Sub-Basin: Muneeru

3. Materials and Methods
One year samples were analyzed from April 2012 to March 2013. The pH was measured by using Elico-pH meter. Total hardness, calcium, magnesium were measured by EDTA

titration methods. Total alkalinity was determined by volumetrically by silver nitrate titrimetric methods using potassium chromate as indicator. Fluoride content in water was measured by Shimadzu-Spectrophotometer. The remaining Physico-Chemical analysis was carried out according to APHA (1995) [4] standard methods.

3.1. Water sampling

In present investigation the water samples were collected in polythene bottles which were cleaned with acid water, followed by rinsing twice with distilled water. The water samples are chemically analyzed (Karunakaran *et al.*). The analysis of water was done using procedure of standard methods.

4. Results

The results are represented in tabular format

Table 1: Physico-Chemical parameters at Lake-1: Muthagudam Cheruvu

	12-Apr	12-May	12-Jun	12-Jul	12-Aug	12-Sep	12-Oct	12-Nov	12-Dec	13-Jan	13-Feb	13-Mar
Temp	29	28	26	25.5	24	25	24	23	22	22	21	24
pH	8.3	8.1	8.2	8.2	8.3	8.2	8.3	8.4	8.4	8.2	8.4	8.4
CO3-2	18	16	18	20	22	18	16	26	34	46	32	26
HCO3-	279	286	258	156	189	132	135	156	125	154	154	186
Cl	28.25	30.12	27.45	25.21	19.12	18.45	15.56	24.52	21.26	22.14	23.54	21.35
DO	8.2	7.2	7.6	8.2	8.1	8.3	8.5	8.6	9.5	9.8	9.2	9.5
BOD	3.8	3.9	3.5	4.8	5.2	5.8	8.2	4.8	6.2	3.8	3.6	4.1
COD	120	125	142	36	21	65	55	15	16	16	210	251
OM	4.1	3.9	2.2	1.5	1.6	2.1	2.5	3.2	3.5	3.4	3.6	4.1
T.H	100	102	95	98	92	97	100	95	126	125	110	97
Ca++	35	41	29	18	21	24	19	23	32	28	26	31
Mg++	22.21	21.22	8.87	9.56	19.63	18.26	27.25	29.65	30.52	31.52	31.62	30.25
SO4-2	0.03	0.05	0.06	0.03	0.04	0.05	0.03	0.04	0.04	0.03	0.05	0.04
PO4-3	0.14	0.15	0.16	0.05	0.02	0.06	0.05	0.05	0.08	0.03	0.11	0.11
NO3-	0.05	0.09	0.01	0.02	0.09	0.01	0.07	0.07	0.05	0.04	0.05	0.06
NO2-	0.05	0.09	0.01	0.02	0.09	0.01	0.07	0.04	0.05	0.06	0.04	0.06
T.S	598	542	503	601	520	585	500	465	318	345	348	352
D.S	342	291	110	290	378	412	425	354	214	254	268	345
S.S	175	350	228	154	160	231	184	165	162	85	124	115
Na+	14.6	15.1	18.1	14.7	10.5	10.5	12.2	13	15.6	13.5	13.2	12.5
K+	3.1	2.9	3.6	2.5	3.1	3.2	2.5	1.9	2.1	2.3	2.6	2.5

CO3-: Carbonates, HCO3-: Bicarbonates, Cl: Clorides, DO: Disolve Oxygen, BOD: Biological Oxygen demand, COD: Chemical Oxygen demand, O.M.: Organic matter, T.H.: Total Hardness, CA+2:Calcium, MG+2;Magnesium, SO4-2:Sulphates, PO4-3: phosphates, NO3-2:Nitrates, NO2-:Nitrite, TS: Total Solids, D.S: Dissolve Solids, S.S.: Suspended Solids, Na+:Sodium, K+:Potassium

Table 2: Physico-Chemical parameters at Lake-2: Yedulapuram Cheruvu

	12-Apr	12-May	12-Jun	12-Jul	12-Aug	12-Sep	12-Oct	12-Nov	12-Dec	13-Jan	13-Feb	13-Mar
Temp	29	30	27	26	25	25	26	24	22	21	22	24
pH	8.3	7.9	8.1	8.4	8.3	8.4	8.3	8.1	8.3	8.4	8.3	8.2
CO3-2	24	32	18	16	14	20	22	36	38	42	36	28
HCO3-	296	275	230	215	206	215	236	254	156	254	224	254
Cl	31.2	30.1	22.2	20.1	18.4	18.1	18.0	19.4	23.2	22.4	24.5	23.1
DO	8.2	7.9	8.1	8.2	8.3	8.1	7.9	8.5	9.4	10.2	10.9	9.7
BOD	3.7	3.8	3.6	4.7	5.4	5.6	6.5	4.9	4.2	4	3.5	3.6
COD	135	125	142	55	26	31	25	19	16	14	55	52
OM	4.2	4.1	4.6	3.8	1.2	1.5	1.6	1.8	2.1	2.8	2.5	2.6
T.H	86	85	91	75	68	75	82	121	138	120	126	98
Ca++	48	42	39	18	21	19	21	22	28	29	31	32
Mg++	31.5	30.5	25.1	15.2	15.2	25.3	25.6	28.6	29.4	30.1	32.2	28.1
SO4-2	0.5	0.5	0.4	0.3	0.2	0.1	0.5	0.5	0.2	0.4	0.4	0.2
PO4-3	0.1	0.1	0.1	0.7	0.4	0.4	0.5	0.6	0.9	0.6	0.5	0.8
NO3-	0.5	0.6	0.4	0.4	0.6	0.5	0.3	0.3	0.1	0.6	0.2	0.4
NO2-	0.3	0.8	0.1	0.2	0.8	0.1	0.8	0.8	0.6	0.5	0.4	0.5
T.S	426	426	210	320	524	598	512	456	321	351	426	425
D.S	302	265	184	365	289	185	254	210	221	312	217	215
S.S	265	165	206	256	198	235	98	165	142	145	262	141
Na+	15.1	17.2	14.3	12.7	10.2	10.9	14.5	13.2	16.3	15.4	11.8	13.6
K+	2.5	3.4	3.1	3.9	4.2	4.0	3.2	2.3	1.2	1.5	1.9	2.6

CO3-: Carbonates, HCO3-: Bicarbonates, Cl: Clorides, DO: Disolve Oxygen, BOD: Biological Oxygen demand, COD: Chemical Oxygen demand, O.M.: Organic matter, T.H.: Total Hardness, CA+2:Calcium, MG+2;Magnesium, SO4-2:Sulphates, PO4-3: phosphates, NO3-2:Nitrates, NO2-:Nitrite, TS: Total Solids, D.S: Dissolve Solids, S.S.: Suspended Solids, Na+:Sodium, K+:Potassium

Table 3: Physico-Chemical parameters at Lake-3: Pollepalli Cheruvu

	12-Apr	12-May	12-Jun	12-Jul	12-Aug	12-Sep	12-Oct	12-Nov	12-Dec	13-Jan	13-Feb	13-Mar
Temp	29	28	27	25	25	26	24	23	22	23	22	23
pH	8.3	8.1	8.3	8.3	8.4	8.3	8.2	8.3	8.4	8.2	8.2	8.1
CO3-2	18	20	24	20	18	12	18	24	32	30	36	28
HCO3-	289	268	236	156	95	184	214	226	249	224	254	224
Cl	31.1	31.5	29.1	19.6	18.9	17.6	19.5	21.2	22.5	24.6	21.5	28.5
DO	7.9	8.1	8.2	7.9	8.6	8.1	8.2	8.4	9.8	11.2	10.5	9.8
BOD	4.1	4.2	3.5	4.6	5.1	5.6	6.2	4.8	3.8	4.1	4.6	5.3
COD	144	135	152	45	24	36	35	19	15	18	72	45
OM	4.2	4.6	3.5	2.5	1.5	1.6	1.7	1.2	3.2	3.4	3.2	3.4
T.H	100	98	98	85	82	95	124	125	127	122	100	110
Ca++	43	41	39	19	18	17	16	21	25	35	34	32
Mg++	35.2	39.8	41.5	9.6	10.2	11.2	12.6	26.2	31.2	31.6	29.5	29.4
SO4-2	0.3	0.4	0.3	0.3	0.4	0.5	0.4	0.3	0.5	0.4	0.5	0.4
PO4-3	0.1	0.1	0.1	0.8	0.6	0.1	0.5	0.4	0.1	0.1	0.8	0.9
NO3-	0.2	0.6	0.5	0.5	0.8	0.7	0.9	0.6	1.7	0.8	0.8	0.6
NO2-	0.6	0.8	0.1	0.2	0.8	0.1	0.6	0.6	0.4	0.5	0.6	0.8
T.S	426	430	419	351	520	594	521	462	390	342	435	452
D.S	168	254	308	311	301	265	241	234	165	354	198	203
S.S	263	145	151	152	201	158	215	135	112	135	165	132
Na+	18.6	13.2	10.5	16.2	11.6	11.5	16.3	15.6	15.1	12.9	15.9	19.6
K+	3.2	1.5	2.1	4.3	1.6	3.6	2.5	3.4	2.5	4.5	4.2	3.5

CO3-: Carbonates, HCO3-: Bicarbonates, Cl: Clorides, DO: Disolve Oxygen, BOD: Biological Oxygen demand, COD: Chemical Oxygen demand, O.M.: Organic matter, T.H.: Total Hardness, CA+2:Calcium, MG+2;Magnesium, SO4-2:Sulphates, PO4-3: phosphates, NO3-2:Nitrates, NO2-:Nitrite, TS: Total Solids, D.S: Dissolve Solids, S.S.: Suspended Solids, Na+:Sodium, K+:Potassium

5. Discussion and Conclusion

The result of analysis point out the fact that all the parameters are under permissible limits. The result indicates that all the lakes are good and can be used for domestic and irrigation purpose.

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