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Water Quality Status of Bore Well Water in Nagaram (Vi), Ranga Reddy Dt, T.S, India

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Abstract-The ground water samples from Nagaram village were analyzed for the physical-chemical and heavy metal parameters in the year of 2013. The source of pollution is Cherlapally Lake is located 2km away from Nagaram village, R.R. (Dt), Telangana state. There are many heavy metals polluting industries surrounding the Cherlapally lake, due to the effluents released from the industries the ground water was polluted. The Lake was already proved as a polluted lake in earlier investigations by the same author. The bore well water samples were collected for three seasons in the year 2013. The present study was taken up to find out the pollution status. The physic-chemical parameters and heavy metals were also investigated i.e. pH, hardness, alkalinity, TDS, TSS, chlorides, nitrates, phosphates, sulphates, DO, BOD, COD, EC and heavy metals like Ni, K, Cd, Pb, Mg, Co, Zn, Mn, Na, As, Cu, Ca, Fe. The results of the ground water samples were compared with BIS limits.

Key words- water quality, bore well water, nagaram village, heavy metals, pollution status

I. INTRODUCTION

A study was conducted to know the pollution status of the bore well water of Nagaram village and analyses the physic- chemical and heavy metal parameters. The ground water samples were collected from a bore-well located 2 km away from the Cherlapally Lake. The Cherlapally Lake is situated in Cherlapally village, Ranga Reddy District. The drainage water comes from kapra and Kushaiguda areas enters into the Cherlapally Lake. The heavy metal industries like electrical and electronics, metal fabrications, forgings and casting, printing and packing and bore wells rigs and earth drilling equipment industries have come up in the surroundings of this lake. The Lake was investigated and reported to be polluted by the Amrutha kalyani et al., (2014). The purpose of this study is to know if there is a possibility of contamination of the ground water in the Nagaram Village which is receiving polluted water from Cherlapally Lake 2km away.

II. MATERIALS AND METHODS

The present study was carried out in ground water quality of Nagaram village near to pollution site - Cherlapally Lake of Cherlapally village, Ranga Reddy District, Hyderabad, T.S. India. The study was carried out during the year 2013.

III. FREQUENCY OF THE COLLECTION OF WATER SAMPLES

The water samples were collected in three seasons. i.e. Summer, winter and Rainy

IV. COLLECTION OF WATER SAMPLES

The ground water samples were collected and analysed for various Physico-Chemical parameters in three seasons. The outcome results were compared with BIS standards (Bureau of Indian Standards) to find out the actual pollution status of the ground water in Nagaram village.

V. PHYSICAL-CHEMICAL PARAMETER ANALYSIS METHODS

The chemical parameters like pH were measured using pH meter and noted. TDS (Total dissolved solids), TSS (Total Suspended Solids), alkalinity, acidity, phosphates, chlorides, total hardness (CaCO₃), nitrates, sulphates and electrical conductivity were estimated using standard methods followed by APHA(1992). Total hardness was determined by EDTA titrimetric method using Eriochrome black-T as indicator. Acidity was determined by titration method. Dissolve oxygen was determined by Winkler's method. Chloride was determined by Argentometric method. Chemical oxygen demand was determined by open reflux method. Nitrate was determined by U.V-Spectrophotometric method. Phosphorus was determined by vanadomolybdo phosphoric acid

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colorimetric method. Total alkalinity was estimated by titrometric method using methyl orange and phenolphthalein indicators.

VI. RESULTS AND DISCUSSIONS

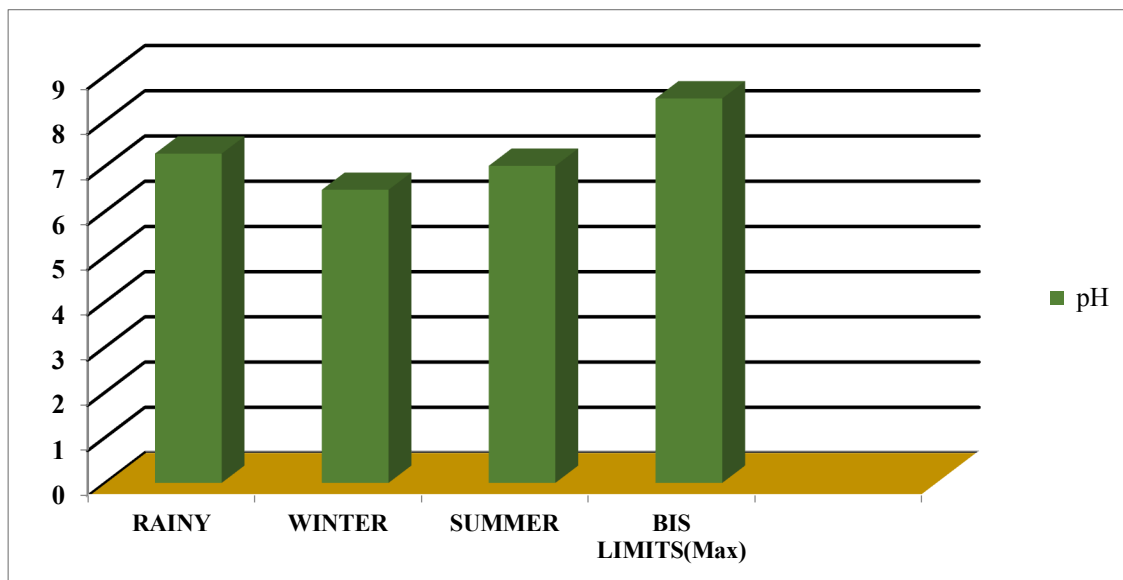


Figure. 1 showing the pH in three seasons of the bore well water in Nagaram village-2013.

The recorded pH ranged from 6.48 to 7.28. The maximum value observed in rainy season and minimum in winter season. Compared to BIS standards pH range of 6.5 to 8.5 is normally accepted. This shows that the pH of water samples was neutral, does not cause severe health hazard. Similar findings were recorded Janakiraman.A et al., [2].

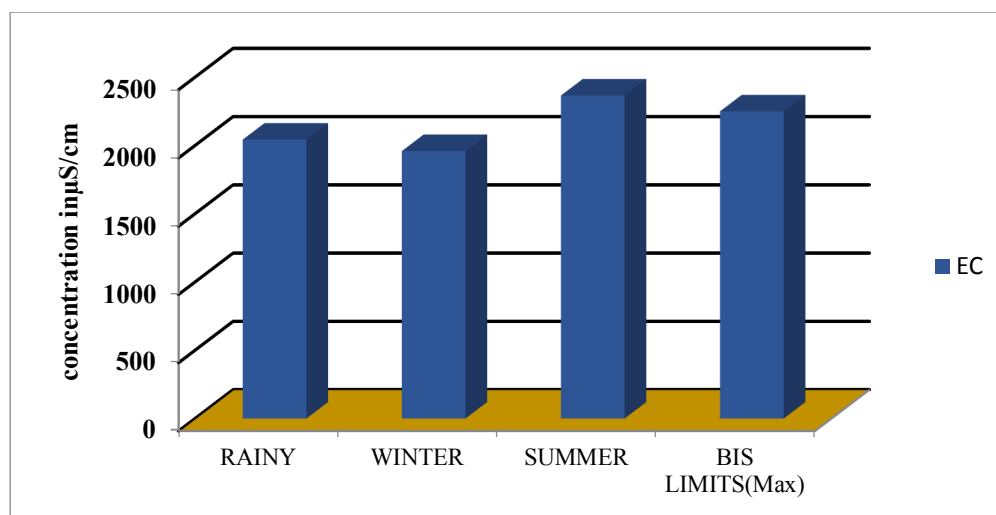


Figure. 2 showing the electrical conductivity concentration ($\mu\text{S}/\text{cm}$) in three seasons of the bore well water in Nagaram village-2013.

In present study the EC (Electrical Conductivity) concentration was observed from 1959 to 2045 $\mu\text{S}/\text{cm}$. The maximum EC concentration was observed in rainy season and minimum concentration was observed in winter. Electrical Conductivity concentration is lower when compared to BIS guidelines. Similar observation was founded by Dorairaju S.V et al., [8].

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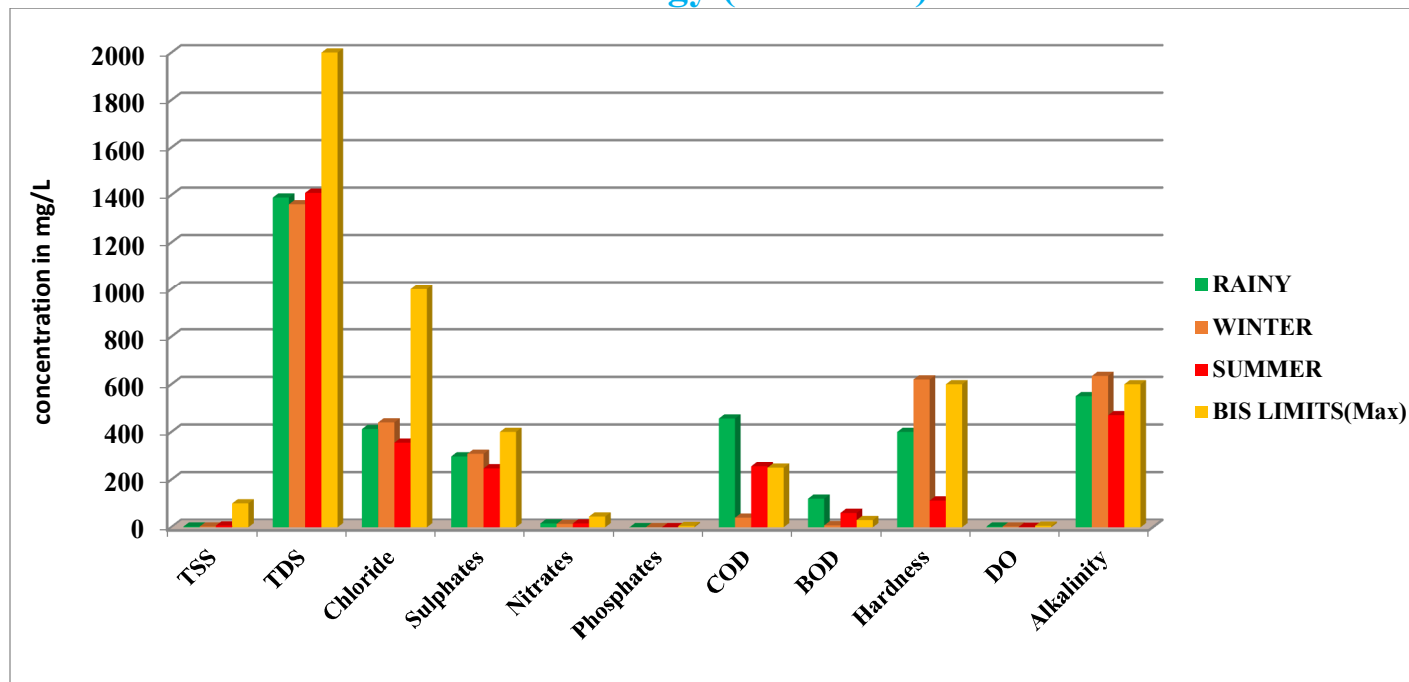


Figure. 3 showing the physical-chemical parameter concentrations (mg/L) in three seasons of the bore well water in Nagaram village-2013.

The Total Suspended Solids concentrations were observed from 3 to 7mg/L. The maximum value was observed in summer and lowest observed in rainy and winter seasons. When compared to BIS standards the T.S.S concentration was lower.

The TDS (Total Dissolved Solids) concentration was observed from 1361 to 1409 mg/L. The maximum concentration was observed in summer and minimum concentration was observed in winter of the bore well water sample, similar observations founded by Dorairaju S.V et al., [8].

The chloride concentration observed in 355 to 440 mg/L. The maximum value observed in winter and minimum one is summer. Similar trend was reported earlier Kalaiarasi M et al., [12] and Basavaraja Simpi et al., [13].

Sulphates concentration was observed in 247 to 309 mg/L. The maximum concentration observed in winter and minimum one is summer season of the sample. Similar observations founded by Dorairaju S.V et al., [8].

Nitrate concentration ranged from 14 to 16 mg/L. The maximum value observed in rainy and summer seasons, the minimum concentration observed in winter season. There is no much difference in nitrate concentration in all three seasons of the bore well water sample. Nitrate concentration was lower when compared to BIS guidelines. Similar observations were founded Mohan Raj V et al., [14].

Phosphorus concentration was observed ranged from 0.16 to 0.17mg/L. The maximum concentration observed in rainy and summer seasons and minimum concentration observed in winter. There is no much difference in three seasons of the bore well water sample. Phosphates concentration was lower when compared to BIS standards. Similar observations 0.719 to 1.920 mg/L were reported Basavaraja Simpi et al., [13] and Chakravarthi K.R et al., [17].

The COD (Chemical Oxygen Demand) concentration was observed ranged from 40 to 456 mg/L. The maximum range observed in rainy season and minimum range observed in winter season. There is much difference in three seasons. COD concentration was higher in rainy and summer seasons and lower in winter season when compared to BIS standards. Similar findings were observed Chakravarthi K.R et al., [17] and Sahoo C et al., [18].

The BOD (Biological Oxygen Demand) concentration was observed 8 to 120 mg/L. The maximum value was observed in rainy and minimum value was observed in winter. There is higher difference in three seasons; BOD concentration was higher when compared to BIS standards. Similar findings were reported Singh R.S et al., [10] and Piyush India et al., [11].

Total hardness concentration was observed from 112 to 620 mg/L. The hardness concentration was maximum in winter season and minimum concentration in summer. TDS, Alkalinity, Hardness concentration in three seasons of the bore well water sample

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analyzed were less than the BIS standards. Similar results reported Khandekar J.D et al., [9].

The DO (Dissolved Oxygen) concentration was observed ranged from 1.8 to 3.2 mg/L. The highest range observed in winter season and lowest range observed in summer season. Similar findings were observed Dorairaju S.V et al., [8].

The total alkalinity concentration observed from 470 to 635 mg/L. The maximum value observed in winter season and minimum value observed in summer, similar results reported Dorairaju S.V et al., [8].

VII. ANALYSIS OF METALS

Processing of the water samples as per the APHA (1992) [1] and the preliminary digestion was done with HNO₃, Hcl. Transferred a measured volume of well mixed acid. Preserved sample in a flask or beaker. Add 3ml of conc. HNO₃. Place flask or beaker on a hot plate and cautiously evaporate to less than 5ml, making sure that the sample should not boil and that go dry, cool and add 5ml conc.HNO₃. Cover container with a watch glass and return to hot plate. Increase temperature of hot plate, so that a gentle reflux action occurs. Continue heating, adding additional acid as necessary until digestion is complete.

VIII. ESTIMATION OF METALS

Such metal ions as cadmium, chromium, cobalt, lead, arsenic, zinc, the micro nutrients determined like calcium, copper, iron, magnesium, manganese, potassium, sodium were determined the using atomic absorption spectrophotometer.

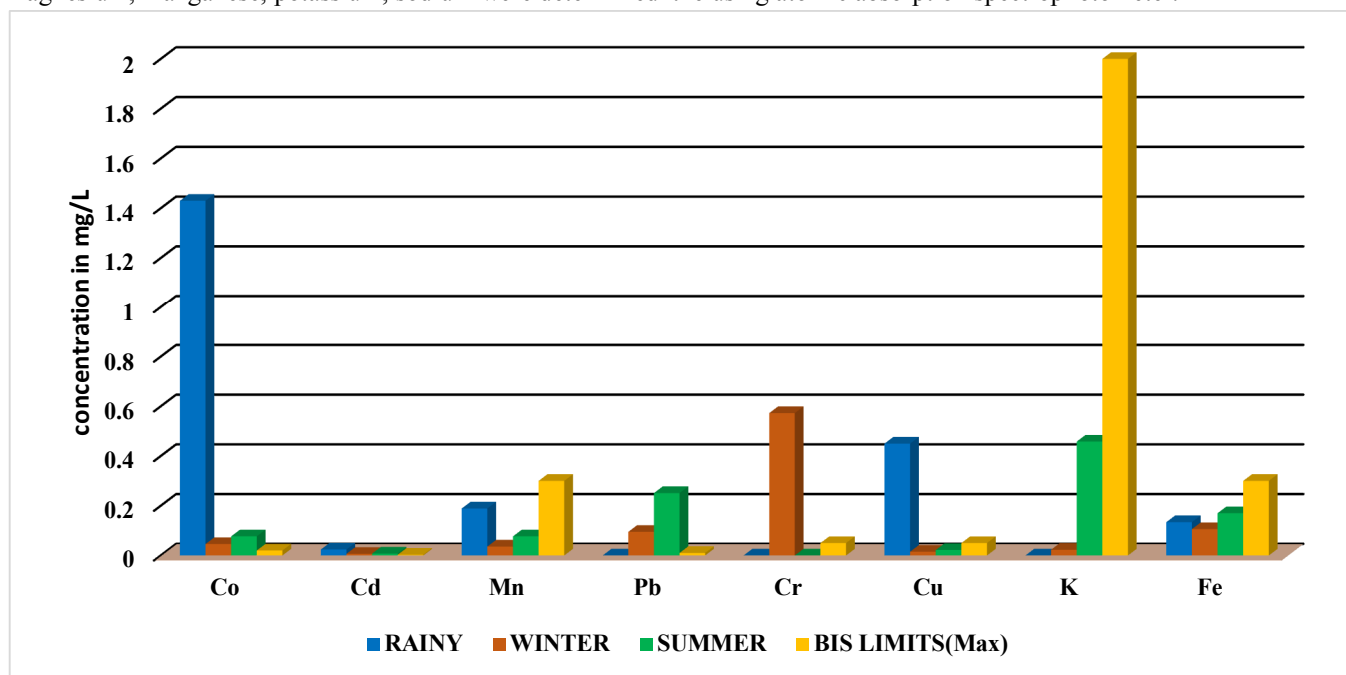


Figure. 4 showing the heavy metal concentrations (mg/L) in three seasons of the bore well water in Nagaram village-2013.

Cobalt concentration was observed from 0.04 to 1.43 mg/L. The highest concentration 1.43 mg/L was observed in rainy season and lowest concentration value 0.04mg/L was observed in winter season. The Co concentration was higher in all 3 seasons when compared to BIS values. Similar observations were founded by Joseph Clement Akan et al., [22].

Cadmium concentration was observed from 0.006 to 0.02 mg/L. The highest concentration 0.02 mg/L was observed in rainy season and lowest value 0.006 mg/L was observed in winter season of the bore well water sample. The Cadmium concentration was higher in all 3 seasons when compared to BIS values. Higher values founded A. S. Adekunle et al., [19] similar values founded by G. T. Chandrappa and H. Lokeshwari [20] and O.N. Maitera et al., [21].

Manganese concentration was recorded from 0.03 to 0.18 mg/L. Maximum concentration 0.18 mg/L was observed in rainy season and minimum concentration 0.03 mg/L was observed in winter. Mn is low concentration in all seasons of the sample when compared to BIS values. Similar observation was founded by Mohammed Taha Abbagambo et al., [22] and similar observations found by Davies Onome Augustina et al., [23].

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Copper concentration was recorded from 0.01 to 0.45mg/L. Maximum concentration 0.45 mg/L was observed in rainy season and lowest concentration 0.01 mg/L was observed in winter season. The concentration of the copper is high in rainy season, lower in winter and summer seasons when compared to BIS limits. Similar values were recorded by E. A. Oluyemi et al., [19] and VA Jackson et al., [24]. Lower values found by J.Akan et al., [22] Also find by J.R.Turnland et al., [25] and S.A. Abbasi et al., [26] and Also found similar observations by O.N. Maitera et al., [21].

Potassium concentration was observed from 0.02 to 0.45mg/L. Highest concentration 0.45 mg/L was observed in summer season and lowest concentration 0.02 mg/L was observed in winter season the bore well water sample. In rainy season the K content was not detectable. K concentration was lower in three sites when compared to BIS values.

Ferrous concentration was observed from 0.10 to 0.17mg/L. Highest concentration 0.17 mg/L was observed in summer season and lowest concentration 0.10 mg/L was observed in winter season. Fe concentration was lower in all three sites when compared to BIS values. Similar findings were observed by A. A. Adenuga et al., [19], Fanna Inna Abdulrahman et al., [22] and AN Paulse et al., [24].

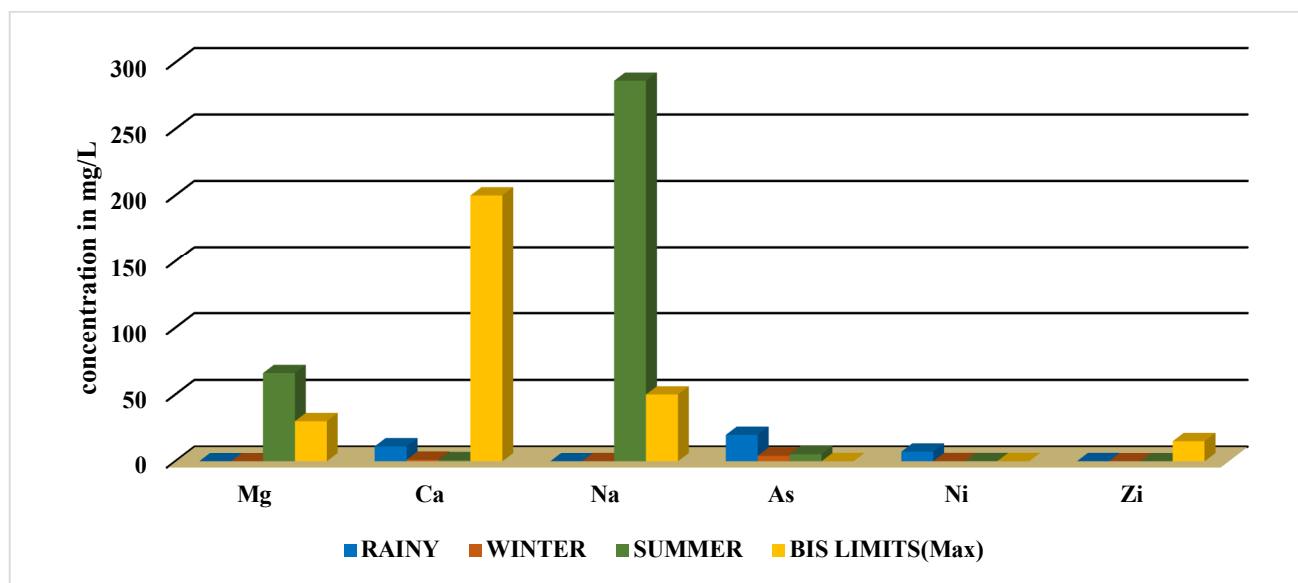


Figure. 5 showing the heavy metal concentration (mg/L) in three seasons of the bore well water in Nagaram village -2013.

Magnesium concentration was observed from 0.016 to 66.04 mg/L. Maximum concentration was observed 66.04 mg/L in summer season and lowest concentration 0.016 mg/L was observed in winter season. The Mg concentration was not detectable in rainy season. When compared to BIS guidelines the mg concentration was very high in summer season and very lower in winter season.

Calcium concentration was observed from 0.828 to 11.19 mg/L. The highest concentration 11.19mg/L was observed in rainy season and lowest value 0.828 mg/L was observed in summer season. Ca content was recorded minimum in all three seasons when compared to BIS values.

Sodium concentration was observed from 0.095 to 286.3 mg /L. the maximum concentration was recorded 286.3 mg/L in summer and minimum concentration was observed in winter season of the bore well water sample. The Na content was not detectable in rainy season. The Na concentration was very higher in summer and lower in winter season when compared to BIS values.

Arsenic concentration was observed from 4.167 to 19.78 mg/L. The highest concentration 19.78 mg/L was observed in rainy season of the bore well water sample and lowest concentration 4.167 mg/L was observed in winter season. Arsenic concentration was very high in all three seasons when compared the BIS values. Lower values were observed by Christophe Kaki et al., [27].

Nickel concentration was observed from 0.08 to 7.18 mg/L. Highest concentration 7.18 mg/L was observed rainy season and lowest concentration 0.08 mg/L was observed in winter season. When compared to BIS value the Nickel concentration was high in all three seasons. Lower results were observed by Davies Onome Augustina et al., [23].

Zn concentration ranged from 0.005 to 0.018 mg/L. Highest concentration 0.018 mg/L was observed in rainy season and lowest concentration 0.005 mg/L was observed in summer season. The concentration of the zinc was lower when compared to BIS values

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in three seasons. Similar findings were observed by E. A. Oluyemi et al., [19] and Zaynab Muhammad Chellube et al., [22].

IX. CONCLUSION

In rainy season the COD, BOD concentrations were higher when compared to BIS limits and lower in remaining parameters. In winter season except alkalinity, all physico-chemical parameters found to be lower when compared to BIS limits. In summer season EC, COD, BOD concentrations were higher, remaining parameters found to be lower when compared to BIS limits. In rainy season heavy metals like Co, Cd, Ni, Cu, As concentrations were found to be maximum when compared to BIS limits. Pb, Cr, K were not detectable in this season. Heavy metals like Co, Cd, Ni, Pb, As, Cr, Cu concentrations were found to be maximum in winter season above the BIS limits. In summer season Mg, Co, Cd, Ni, Pb, As, Na concentrations are higher when compared to BIS limit.

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