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Research Article

Comparative Limnological Studies of Barali Lake Hurda And Anasagar Lake Ajmer with Reference to Planktonic Population Dynamics

*Arpita Vijayvergiya, Reena Vyas, Mriganka Upadhyay

Govt. College Ajmer, Rajasthan, INDIA

ABSTRACT

Physiochemical study are summarized in Table- 1 and 2. Air temperature varied between 28°C in winter to 35°C in summer 2015-16 and between 26°C in winter to 38°C in summer 2016-17. Water temperature was observed to be highest during summer 2016-17 (27° C) and lowest during winter 2015-16 (17°C). The overall average value of air and water temperature was 36°C and 27.3°C respectively. A good synchronization between temperature and dissolved oxygen was seen. Temperature showed a significant inverse relationship with dissolved oxygen. Such an inverse relationship has also been observed in monsoon 2015-16 and 2016-17. pH fluctuated between 6.9 to 8.5. The minimum pH was recorded in monsoon 2015-16 and 2016-17 which was mainly attributed to rain water after a long dry period, and maximum pH was recorded during summer 2015-16 and 2016-17. According to the study, Anasagar lake was characterized by low levels of dissolved oxygen with average value of 7.1mg/l. The highest oxygen value of 8.5mg/l was observed in winter season of 2015-16 and 2016-17. The peak value during winter was also observed. Dissolved oxygen shows a significant negative relation with temperature, alkalinity, total hardness, electrical conductance, nitrate, phosphate, chloride, silicate and respiration. The observed high value of dissolved oxygen in winter due to the high solubility at low temperature and less degradation of organic matter. During the study, the highest value of total alkalinity was in summer 2015-16 and 2016-17 (590mg/l) and lowest value was observed in winter 2005-06 (410mg/l). Total alkalinity shows a positive relationship with temperature, pH, total hardness, TDS, conductivity, chloride and nitrate. The average value of total hardness during the study was lowest value of 315 mg/l in 2015-16 and 2016-17 and highest value of 375mg/l in 2006-07.

Keywords: TDS, Alkalinity, Hardness.

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*Address for Correspondence:

Arpita Vijayvergiya, Govt. College Ajmer, Rajasthan, INDIA. E mail: arpitavv@gmail.com

INTRODUCTION

Ajmer City is located in the center of Rajasthan (INDIA) between 25 0 38 " and 26 0 58 " north Latitude and 73 0 54 " and 75 0 22" east longitude covering a geographical area of about 8481sq km hemmed in all sides by Aravalli hills . Ajmer has hot dry summer and cold bracing winter. The temperature varies from 2 o c in winter and 49 0 c in summer. The normal annual rainfall is 527.3mm. The total population of the district is 2180526 persons. Around 5.56 % of total area available for land utilization is covered under forest. Ajmer is abode of certain flora and fauna that are particularly endemic to semi-arid and are specially adapted to survive in the dry waterless region of the state. In the present investigation an attempt has been made Comparative Limnological Studies of Barali Lake Hurda and Anasagar Lake Ajmer with Reference to Planktonic Population Dynamics

MATERIALS AND METHODS

Ajmer City is located in the center of Rajasthan (INDIA) between 25 0 38 " and 26 0 58 " north Latitude and 73 0 54 " and 75 0 22" east longitude covering a geographical area of about 8481sq km hemmed in all sides by Aravalli hills . Ajmer has hot dry summer and cold bracing winter. The temperature varies from 2 o c in winter and 49 0 c in summer

Total Dissolved Solids (TDS)

Total dissolved solids (TDS) indicate the presence of inorganic salts and small amounts of organic matter present in a solution and also an indicator of water quality. The principal constituents of TDS are usually calcium, magnesium, sodium, potassium, carbonate, hydrogencarbonate, chloride, sulfate and nitrate anions. Sources of these minerals are both natural and

anthropogenic. Mineral springs contain water with high levels of dissolved solids, because the water has flowed through the rocks of high salt content. The TDS of Barali lake water samples of both stations was within the range of 950 to 1350 mg/l in 2015-16 while in 2016-17 it was in the range of 950 to 1370 mg/l. The TDS of Anasagar lake water samples of both stations was within the range of 1050 to

1350 mg/l in 2015-16 while in 2016-17 it was in the range of 980 to 1370 mg/l. Fresh water has less than 1,000 mg/l total dissolved solids. In many cases, TDS originates from weathering of rocks, soils, lime, agricultural activity etc. The results showed that TDS of Anasagar lake is higher than Barali lake water, which may be due to the fact that some minerals are picked up from soil and rocks.

Barali LAKE 1S 2016-17

| Period / Parameters | Rainy | | | Winter | | | Spring | | | Summer | | |
|---------------------|---------|--------|--------|--------|--------|--------|--------|--------|----------|----------|--------|---------|
| | July 16 | Aug 16 | Sep 16 | Oct 15 | Nov 16 | Dec 16 | Jan 17 | Feb 17 | March 17 | April 17 | May 17 | June 17 |
| Air temp. | 32.0 | 31.0 | 33.5 | 27.5 | 28.5 | 23.5 | 21.5 | 28.5 | 30.25 | 32.0 | 36.5 | 35.0 |
| Water Temp. | 17.0 | 18.5 | 17.5 | 21.2 | 19.5 | 17.0 | 17.5 | 18.2 | 24.2 | 26.3 | 27.3 | 27.5 |
| Ph. | 6.9 | 6.8 | 6.9 | 7.25 | 7.3 | 7.6 | 7.3 | 7.5 | 7.3 | 8.2 | 8.3 | 8.5 |
| Turbidity | 80 | 88 | 82 | 78 | 74 | 79 | 74 | 76 | 73 | 85 | 86 | 85 |
| Alkalinity | 457.62 | 420.16 | 452.23 | 414.25 | 425.6 | 465.25 | 479.25 | 459.5 | 495.36 | 540.65 | 565.23 | 569.23 |
| TDS | 959 | 988 | 966 | 1023 | 1070 | 1042 | 1012 | 1121 | 1235 | 1348 | 1370 | 1350 |
| DO | 7.2 | 7.6 | 7.0 | 8.2 | 7.8 | 8.3 | 8.6 | 8.5 | 7.9 | 7.6 | 7.0 | 7.1 |
| Total hardness | 315.5 | 320.6 | 322.56 | 355.55 | 358.21 | 368.25 | 376.55 | 383.54 | 366.12 | 357.25 | 368.15 | 351.21 |
| Chloride | 142 | 149 | 156 | 169 | 154 | 136 | 154 | 163 | 170 | 181 | 183 | 188 |
| Nitrates | 3.26 | 3.36 | 3.56 | 3.98 | 3.66 | 4.25 | 4.32 | 4.63 | 3.12 | 3.03 | 3.26 | 3.96 |
| Fluoride | 2.02 | 2.12 | 2.14 | 2.77 | 2.93 | 2.78 | 2.34 | 2.41 | 2.45 | 2.99 | 2.89 | 2.98 |
| BOD | 15.5 | 15.8 | 14.8 | 17.62 | 16.5 | 17.5 | 15.6 | 16.5 | 17.5 | 15.83 | 17.5 | 14.5 |
| COD | 128 | 135 | 126 | 138 | 130 | 125 | 122 | 128 | 134 | 129 | 139 | 130 |

ANASAGAR LAKE 1S 2016-17

| Period / Parameters | Rainy | | | Winter | | | Spring | | | Summer | | |
|---------------------|---------|--------|--------|--------|--------|--------|--------|--------|----------|----------|--------|---------|
| | July 16 | Aug 16 | Sep 16 | Oct 15 | Nov 16 | Dec 16 | Jan 17 | Feb 17 | March 17 | April 17 | May 17 | June 17 |
| Air temp. | 30.0 | 30.5 | 33.5 | 26.5 | 28.5 | 22.25 | 21.5 | 27.5 | 31.25 | 32.0 | 37.5 | 34.0 |
| Water Temp. | 17.5 | 17.5 | 18.5 | 20.2 | 20.5 | 17.0 | 16.5 | 17.2 | 25.2 | 26.3 | 28.53 | 28.25 |
| Ph. | 7.9 | 7.5 | 7.8 | 7.5 | 7.8 | 7.6 | 7.4 | 7.5 | 7.9 | 8.5 | 8.5 | 8.6 |
| Turbidity | 78 | 88 | 82 | 75 | 76 | 89 | 84 | 87 | 72 | 85 | 76 | 84 |
| Alkalinity | 457.62 | 420.16 | 452.23 | 414.25 | 425.6 | 465.25 | 479.25 | 459.5 | 495.36 | 540.65 | 565.23 | 569.23 |
| TDS | 978 | 987 | 996 | 1015 | 1025 | 1092 | 1102 | 1220 | 1280 | 1245 | 1255 | 1370 |
| DO | 7.4 | 7.4 | 6.8 | 7.5 | 7.3 | 7.4 | 7.5 | 7.5 | 6.8 | 6.9 | 6.7 | 6.7 |
| Total hardness | 325.35 | 330.26 | 342.56 | 380.85 | 366.21 | 385.25 | 365.56 | 371.54 | 358.12 | 359.25 | 367.75 | 370.81 |
| Chloride | 152 | 159 | 146 | 170 | 165 | 163 | 165 | 163 | 160 | 171 | 183 | 189 |
| Nitrates | 4.26 | 4.26 | 4.76 | 3.88 | 3.86 | 4.75 | 4.92 | 4.68 | 3.89 | 4.03 | 4.26 | 4.96 |
| Fluoride | 2.32 | 2.12 | 2.24 | 2.78 | 2.95 | 2.75 | 2.44 | 2.42 | 2.46 | 2.97 | 2.89 | 2.98 |
| BOD | 14.5 | 14.8 | 15.8 | 16.6 | 17.25 | 18.8 | 16.26 | 16.65 | 16.35 | 15.83 | 17.24 | 15.23 |
| COD | 132 | 135 | 130 | 135 | 128 | 127 | 128 | 127 | 139 | 139 | 139 | 138 |

Barali LAKE 2S 2016-17

| Period / Parameters | Rainy | | | Winter | | | Spring | | | Summer | | |
|---------------------|---------|--------|--------|--------|--------|--------|--------|--------|----------|----------|--------|---------|
| | July 16 | Aug 16 | Sep 16 | Oct 15 | Nov 16 | Dec 16 | Jan 17 | Feb 17 | March 17 | April 17 | May 17 | June 17 |
| Air temp. | 32.0 | 31.0 | 33.5 | 27.5 | 28.5 | 23.5 | 21.5 | 28.5 | 30.25 | 32.0 | 36.5 | 35.0 |
| Water Temp. | 17.0 | 18.5 | 17.5 | 21.2 | 19.5 | 17.0 | 17.5 | 18.2 | 24.2 | 26.3 | 27.3 | 27.5 |
| Ph. | 6.9 | 6.8 | 6.9 | 7.6 | 7.4 | 7.6 | 7.3 | 7.5 | 7.4 | 8.3 | 8.3 | 8.5 |
| Turbidity | 80 | 88 | 83 | 80 | 78 | 79 | 78 | 76 | 75 | 84 | 86 | 85 |
| Alkalinity | 455.72 | 425.6 | 455.25 | 414.5 | 426.6 | 465.25 | 479.25 | 459.5 | 494.36 | 542.65 | 564.23 | 568.23 |
| TDS | 958 | 988 | 957 | 1033 | 1062 | 1042 | 1004 | 1121 | 1240 | 1345 | 1365 | 1350 |
| DO | 7.25 | 7.5 | 7.4 | 8.2 | 7.8 | 8.5 | 8.62 | 8.4 | 7.9 | 7.6 | 7.1 | 7.1 |
| Total hardness | 315.5 | 321.36 | 323.5 | 351.65 | 356.12 | 365.5 | 374.56 | 382.54 | 364.22 | 356.23 | 365.5 | 351.21 |
| Chloride | 141 | 148 | 156 | 169 | 153 | 135 | 154 | 162 | 171 | 181 | 183 | 188 |
| Nitrates | 3.25 | 3.35 | 3.62 | 3.88 | 3.65 | 4.50 | 4.22 | 4.65 | 3.22 | 3.13 | 3.26 | 3.96 |
| Fluoride | 2.02 | 2.02 | 2.24 | 2.75 | 2.83 | 2.75 | 2.35 | 2.41 | 2.45 | 2.89 | 2.89 | 2.98 |
| BOD | 15.5 | 15.7 | 14.8 | 17.5 | 16.5 | 17.5 | 15.26 | 17.5 | 17.85 | 15.75 | 17.25 | 14.23 |
| COD | 128 | 134 | 127 | 138 | 132 | 125 | 122 | 126 | 135 | 130 | 138 | 131 |

ANASAGAR LAKE 2S 2016-17

| Period / Parameters | Rainy | | | Winter | | | Spring | | | Summer | | |
|---------------------|---------|--------|--------|--------|--------|--------|--------|--------|----------|----------|--------|---------|
| | July 16 | Aug 16 | Sep 16 | Oct 15 | Nov 16 | Dec 16 | Jan 17 | Feb 17 | March 17 | April 17 | May 17 | June 17 |
| Air temp. | 30.0 | 30.5 | 33.5 | 26.5 | 28.5 | 22.25 | 21.5 | 27.5 | 31.25 | 32.0 | 37.5 | 34.0 |
| Water Temp. | 17.5 | 17.5 | 18.5 | 20.2 | 20.5 | 17.0 | 16.5 | 17.2 | 25.2 | 26.3 | 28.53 | 28.25 |
| Ph. | 7.8 | 7.4 | 7.7 | 7.5 | 7.8 | 7.5 | 7.5 | 7.5 | 7.8 | 8.4 | 8.4 | 8.6 |
| Turbidity | 78 | 87 | 82 | 75 | 76 | 88 | 85 | 86 | 71 | 84 | 76 | 84 |
| Alkalinity | 45.62 | 420.26 | 452.25 | 424.25 | 425.6 | 465.25 | 489.25 | 459.45 | 495.26 | 541.65 | 564.23 | 569.25 |
| TDS | 988 | 989 | 995 | 1014 | 1015 | 1095 | 1104 | 1220 | 1285 | 1244 | 1245 | 1370 |
| DO | 7.4 | 7.4 | 6.8 | 7.5 | 7.3 | 7.4 | 7.5 | 7.5 | 6.8 | 6.9 | 6.7 | 6.7 |
| Total hardness | 325.5 | 330.25 | 342.66 | 380.75 | 366.25 | 384.25 | 364.56 | 373.54 | 356.12 | 358.25 | 368.75 | 370.85 |
| Chloride | 152 | 158 | 146 | 170 | 164 | 163 | 166 | 163 | 161 | 173 | 185 | 189 |
| Nitrates | 4.26 | 4.26 | 4.75 | 3.88 | 3.86 | 4.75 | 4.92 | 4.68 | 3.89 | 4.03 | 4.26 | 4.96 |
| Fluoride | 2.32 | 2.25 | 2.28 | 2.75 | 2.95 | 2.65 | 2.44 | 2.32 | 2.56 | 2.98 | 2.89 | 2.98 |
| BOD | 14.5 | 14.6 | 15.7 | 16.5 | 17.25 | 18.8 | 16.25 | 16.64 | 16.36 | 15.83 | 17.25 | 15.23 |
| COD | 131 | 135 | 131 | 135 | 127 | 126 | 128 | 125 | 139 | 138 | 137 | 138 |

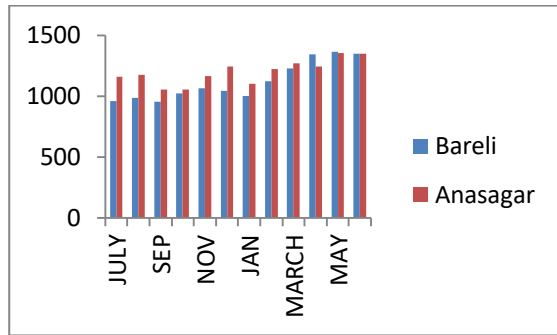


Fig 1. comparison of TDS of Anasagar and Barali lake in 2015-16

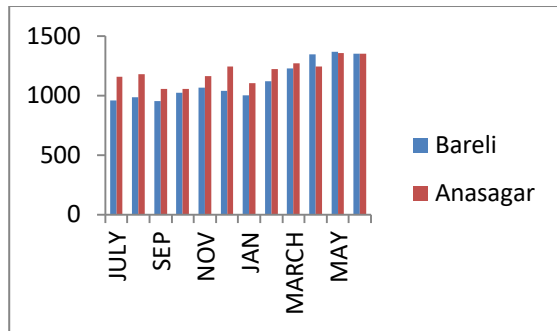


Fig. 2. comparison of TDS of Anasagar and Barali lake in 2016-17

BOD

The BOD, a widely accepted parameter in determining water quality, it varies between 15.5 to 17.9 mg/l in 2015-16 and 2016-17 in Barali lake water whereas it varies between 14.0 to 17.0 mg/l in 2015-16 and 2016-17 in Anasagar lake water. Barali lake water has more BOD than Anasagar lake water.

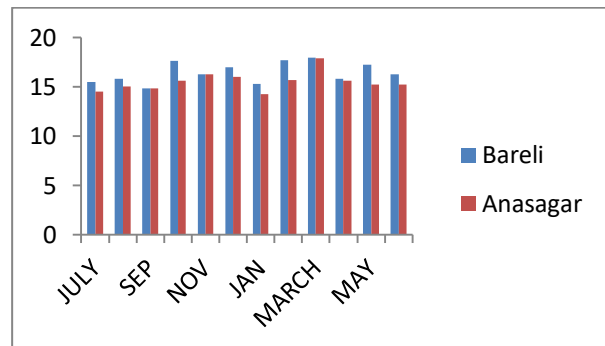


Fig.3. comparison of BOD of Anasagar and Barali lake in 2015-16

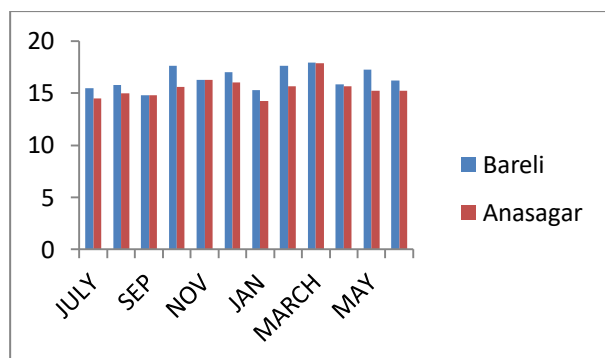


Fig.4. comparison of BOD of Anasagar and Barali lake in 2016-17

COD

COD is an important parameter for stream and industrial waste studies and control of waste in treatment plants. The COD is a measure of pollution in aquatic ecosystem. It estimates carbonaceous factor of organic Matter. The permissible upper limits of COD for drinking and irrigation water are 20 and 150 mg/l respectively. COD varies from 120 mg/l to 140 mg/l in Barali lake in 2015-16 and 2016-17 whereas COD varies also from 120 mg/l to 140 mg/l in Anasagar lake in 2015-16 and 2016-17.

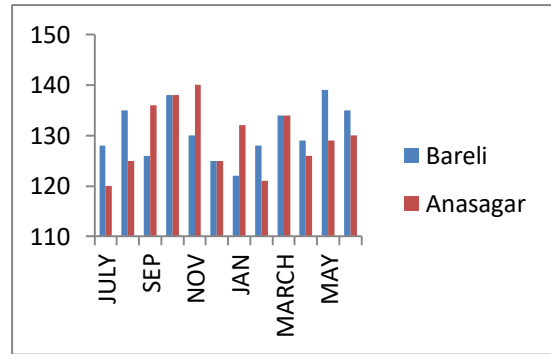


Fig.4. comparison of COD of Anasagar and Barali lake in 2015-16

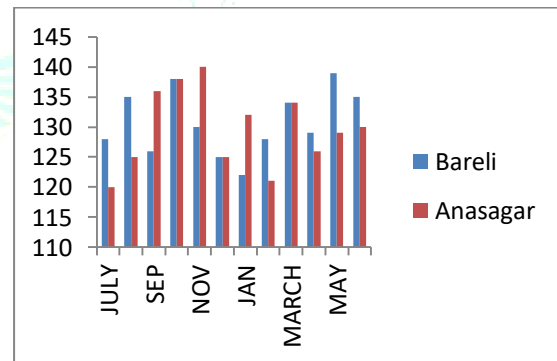


Fig.5. comparison of COD of Anasagar and Barali lake in 2016-17

RESULT:

The overall average value of air and water temperature was 36°C and 27.3°C respectively. A good synchronization between temperature and dissolved oxygen was seen. Temperature showed a significant inverse relationship with dissolved oxygen. Such an inverse relationship has also been observed in monsoon 2015-16 and 2016-17. pH fluctuated between 6.9 to 8.5. The minimum pH was recorded in monsoon 2015-16 and 2016-17 which was mainly attributed to rain water after a long dry period, and maximum pH was recorded during summer 2015-16 and 2016-17. According to the study, Anasagar lake was characterized by low levels of dissolved oxygen with average value of 7.1mg/l. Total alkalinity shows a positive relationship with temperature, pH, total hardness, TDS, conductivity, chloride and nitrate. The average value of total hardness during the study was lowest value of 315 mg/l in 2015-16 and 2016-17 and highest value of 375mg/l in 2006-07. This increase in total hardness during summer period is due to higher photosynthetic activity, free carbon dioxide is utilized and bicarbonates are converted into carbonates and precipitated as calcium salts. Total Dissolved Solid (TDS) ranged between 950 mg/l to 1400 mg/l with lowest during winter 2015-16 and 2016-17 and highest during summer 2015-16 and 2016-17

respectively. Higher concentration of TDS also due to the discharge sewage and organic matter by the interference of human. Chloride concentration varied between 140 mg/l to 190 mg/l in 2015-16 and 2016-17. Higher chloride concentration during the summer because high temperature and consequent evaporation. In rainy season, lower concentration of this factor due to dilution. According to the study, rich contents of nitrates were observed, with maximum of 4.5mg/l during summer 2015-16 and 2016-17 and minimum of 2.1 mg/l during monsoon 2005-06. This can be attributed to high evaporation which increases the concentration during summers. Nitrate showed positive relation with temperature, pH, alkalinity, total hardness, TDS, chloride and fluoride and productivity, and negative relation with dissolved oxygen. In the present study, the values of fluoride varied between 2.1 to 2.9 mg/l, with maximum value during summer 2015-16 and 2016-17 and minimum during monsoon 2015-16 and 2016-17. Fluoride showed positive correlation with pH, dissolved oxygen, hardness and nitrate.

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