# Assessment of Physico-Chemical parameters of Wainganga River at Ambhora, Bhandara District. (MS), India

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## Abstract

Water plays a dynamic role in human life. Water is the most widely circulated and abundant substances found in environment. The healthy water ecosystem is depended on the physico-chemical parameters of water bodies. In present study the physico-chemical parameters of the Wainganga river at Ambhora in Bhandara district are studied during Feb 2015 to Jan 2017. The parameters were investigated by using standard procedures described in APHA (1992) and IAAB (2006). These samples are analyzed for physico-chemical parameters like Temp, pH, Free $Co_2$, DO (Dissolved Oxygen), Carbonate, Bicarbonate, TA (total alkalinity), $Cl^-$ (chloride), (TH) total hardness, $Ca^{2+}$ (calcium), $Mg^{2+}$ (magnesium), Phosphorus, Nitrate and EC (electrical conductivity) are analysed. The results are compared with standards prescribed by WHO. The results indicate that there was significant variation in some physico-chemical parameters the Wainganga River at Ambhora water is non-polluted and can be suitable for drinking water, Domestic, Irrigation and Pisciculture.

**KEYWORDS** :Physico-chemical Parameters, Wainganga River, Ambhora.

## Introduction

Water is one of the abundantly available substances in nature, which man has exploited more than any other resources for the sustenance of life. Possible pathways for aquatic contamination are treated or untreated domestic/ municipal wastewater, surface runoff and industrial wastes (Heininger et al., 1998; Tariq et al., 1996; Moll and Mansfield, 1991).The polluted water caused serious problems for human health as well as hampered ecological and environmental agents (Zaidi, 1994). Shahare (2015) studied Assessment of Physico-Chemical parameters of Chulband dam in Gondia District. Shahare (2016) investigated the physico-chemical parameters from Chulband River at Dodake-Jambhali in Gondia District. By considering immense importance of physico-chemical parameters of water studies, present work is undertaken for the assessment of Physico-Chemical parameters of Wainganga River at Ambhora, Bhandara District. (MS), INDIA.

## Materials and Methods

### Sampling and analysis of water

The water samples of Wainganga river at Ambhora were collected and analyses at regular monthly intervals for a period of 2 years from Feb 2015 to Jan 2017. The sample were collected between 9:00 AM to 11:00 AM from sampling site (fig.1) in pre-cleaned, BOD bottle, polythene containers of one litre capacity and brought to the laboratory for the analysis of various physico-chemical parameters. The parameters were analysed were Temp, pH, Free $Co_2$, DO (Dissolved Oxygen), Carbonate, Bicarbonate, TA (total alkalinity), $Cl^-$ (chloride), (TH) total hardness, $Ca^{2+}$ (calcium), $Mg^{2+}$ (magnesium), Phosphorus, Nitrate and EC (electrical conductivity). The

parameters were analyzed by using standard procedures described in APHA (1992) and IAAB (2006).

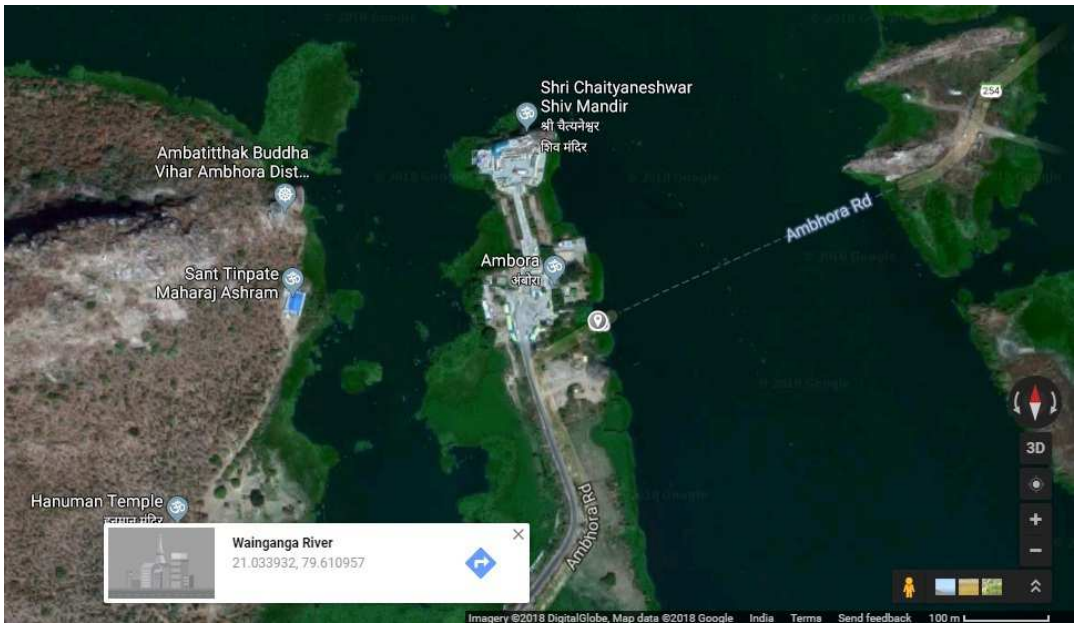


Fig.1: Sampling site at Wainganga River, Ambhora (Source: Google Map)/.

**Results & Discussion:**

Results of various physico-chemical parameters of Waingangariver water have been represented in Table 1.

**Temperature:** The water temperature was maximum in the month of May and minimum in the month of January. The water temperature is one of the essential parameter in aquatic ecosystem. In the present study of Wainganga river, difference in the fluctuation of water temperature was recorded $34^{o}$C to $22^{o}$C (Graph.1).

**pH :**In the variation of pH were recorded 9.3 to 6.9. The pH value was maximum in the month of Nov and minimum in the month of July (Graph.2). Hydrogen ion concentration plays avital role in the biological processes of almost all aquatic organisms.

**Free Carbon dioxide :** The Carbon dioxide was varied from 2.8 to 6.2 mg/lit. The Carbon dioxide was maximum in the month of December and minimum in the month of August (Graph.3). Free $Co_2$ is released through the decomposition of certain substances and metabolic activities of the living organism.

**Dissolved Oxygen (DO):** DO is most essential factor of the water ecosystem, as it regulates the metabolic processes of the most organisms. The DO was varied from 5.3 to 8.3 mg/lit (Graph.4). The DO was maximum in the month of December and minimum in the month of Sepember.

**Carbonate:** The results revealed that,the Carbonate values varies from 15.7 to 26.7 mg/l, which are within the permissible limit of WHO. The Carbonate was maximum in the month of June and minimum in the month of January (Graph.5).

**Bicarbonate: In** present study, the Bicarbonate values varies from 138.6 to 248.9 mg/l, which are within the permissible limit of WHO. The Bicarbonate was maximum in the month of May and minimum in the month of December (Graph.6).

**Total Alkalinity (TA):** In present study, the alkalinity values varies from 156.5 to 274 mg/l, which are within the permissible limit of WHO. The Total Alkalinity was maximum in the month of May and minimum in the month of January (Graph.7). Total alkalinity is the measure of capacity of water to neutralize the strong acid. It is usually imparted by salts of carbonates, bicarbonates, phosphates, nitrates, borates, silicates etc. together with hydroxyl ions in Free State (Trivedy and Goel, 1986).

**Chloride: In** the present study Chloride was varied from 22.5 to 46.5 mg/lit. The Chloride was maximum in the month of March and minimum in the month of October (Graph.8).

**Hardness:** Hardness was found to vary between 65.6 mg/l in the month of September and 145.3 mg/l in the month of June (Graph.9).Total hardness of water is due to the existence of calcium and magnesium ions in the water.

**Calcium:** In present study, the calcium values varies from 26.8 to 57.8 mg/l. The Calcium was maximum in the month of May and minimum in the month of February (Graph.10). The presence of calcium in the water is more likely in the form of carbonate, which is also shown by high values of hardness in water samples.

**Magnesium:** The Magnesium of the water sample varied between 29.1 mg/l in the September month and 97 mg/l in the month of June (Graph.11). Magnesium is an essential element for all living organisms as it takes part in chlorophyll biosynthesis and enzymatic transformation (Weztel, 1975).

**Phosphorus:** The Phosphorus was varied from 1.2 to 2.3 mg/lit. The Phosphorus was maximum in the month of August and minimum in the month of February (Graph.12). Similar result was reported by Chavan (2009) in Wainganga river near Bramhapuri District Chandrapur. Phosphorus is an important nutrient to living organisms. Phosphorus is one of the most essential nutrients limiting the growth of autotrophs and biological productivity of the system.

**Nitrate:** The Nitrate was varied from 0.4 to 2.1 mg/lit (Graph.13). The Nitrate was maximum in the month of June and minimum in the month of October. Nitrate is the most oxidised form of nitrogen and the end product of the aerobic breakdown of organic nitrogenous matter. The assessment of nitrogen is therefore an important parameter in understanding the nutritional status of water bodies.

**Electrical Conductivity (EC):** In present study, the Electrical Conductivity values varies from 237.1 to 374.6 micro-Siemens. Conductivity is directly related to the concentration of ionized substances in water. The EC was maximum in the month of September and minimum in the month of January (Graph.14).

**Conclusion:**

The present baseline information of the physico-chemical properties of water would form a useful tool for further ecological assessment and monitoring of this Wainganga river, Ambhora. The results revealed that there was significant variations in the physicochemical parameters and most of the parameters were within the desirable

limit and indicated better quality of river water. The results specify that the Wainganga river is non-polluted and can be used for domestic, irrigation and pisciculture.

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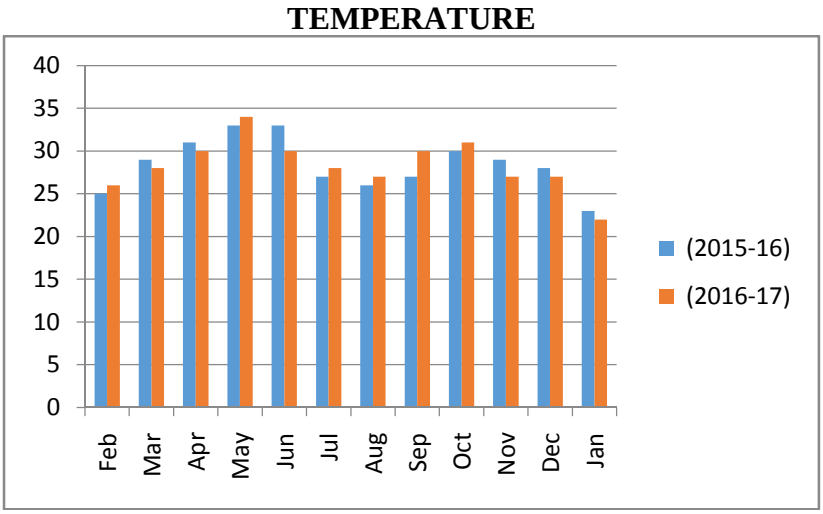
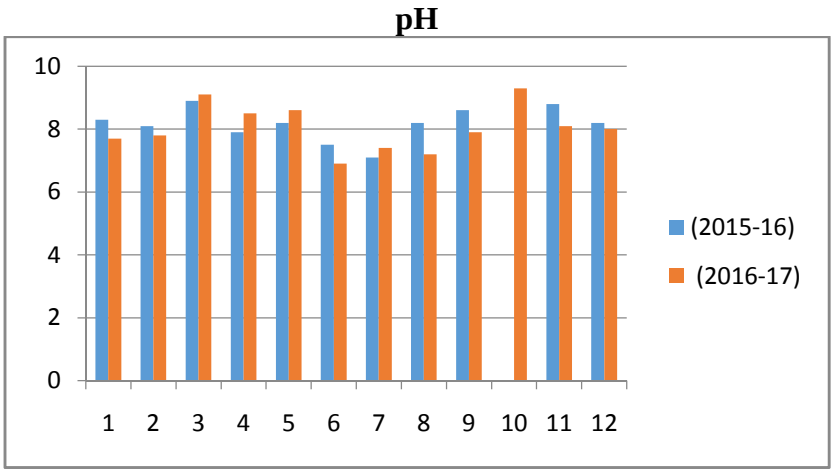
**Table No. 1**: Physico-chemical parameters of Wainganga River, Ambhora.
(All parameters are in mg/l except pH and EC. EC is in micro-Siemens)

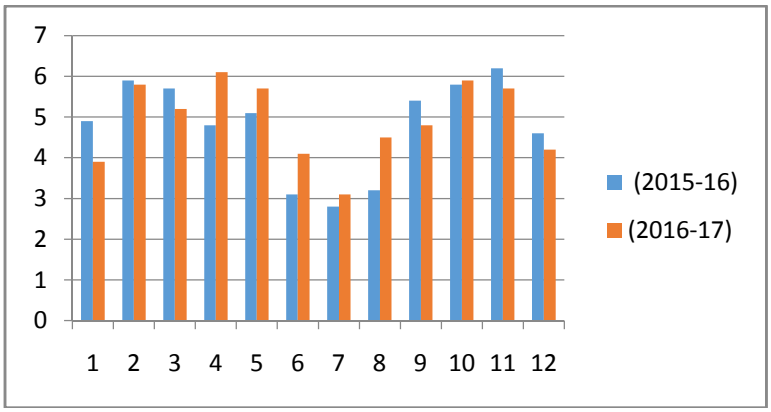
| Parameters | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temp. (2015-16)** | 25 | 29 | 31 | 33 | 33 | 27 | 26 | 27 | 30 | 29 | 28 | 23 |
| **(2016-17)** | 26 | 28 | 30 | 34 | 30 | 28 | 27 | 30 | 31 | 27 | 27 | 22 |
| **pH (2015-16)** | 8.3 | 8.1 | 8.9 | 7.9 | 8.2 | 7.5 | 7.1 | 8.2 | 8.6 | 8..1 | 8.8 | 8.2 |
| **(2016-17)** | 7.7 | 7.8 | 9.1 | 8.5 | 8.6 | 6.9 | 7.4 | 7.2 | 7.9 | 9.3 | 8.1 | 8 |
| **Free Co2 (2015-16)** | 4.9 | 5.9 | 5.7 | 4.8 | 5.1 | 3.1 | 2.8 | 3.2 | 5.4 | 5.8 | 6.2 | 4.6 |
| **(2016-17)** | 3.9 | 5.8 | 5.2 | 6.1 | 5.7 | 4.1 | 3.1 | 4.5 | 4.8 | 5.9 | 5.7 | 4.2 |
| **DO (2015-16)** | 6.8 | 5.8 | 6.2 | 6.8 | 7.2 | 6.8 | 6.6 | 5.1 | 7.1 | 7.8 | 8.3 | 7.5 |
| **(2016-17)** | 6.8 | 7.2 | 6.5 | 7.5 | 7.6 | 5.8 | 5.7 | 5.8 | 7.2 | 7.9 | 8.3 | 8.1 |
| **Carbonate (2015-16)** | 17.6 | 19.4 | 20.6 | 25.1 | 26.7 | 23.4 | 22.6 | 21.9 | 26.3 | 25.1 | 23.7 | 15.7 |
| **(2016-17)** | 20.8 | 21.7 | 19.9 | 24.9 | 22.3 | 19.5 | 19.2 | 19.8 | 20.4 | 19.8 | 18.8 | 18.39 |
| **Bicarbonate (2015-16)** | 145.6 | 165.9 | 185.6 | 248.9 | 220.5 | 182.6 | 175.6 | 184.6 | 147.5 | 154.6 | 138.6 | 140.8 |
| **(2016-17)** | 159.4 | 147.2 | 192.4 | 230.6 | 235.1 | 175.3 | 189.1 | 176.6 | 156.8 | 210.3 | 172.3 | 153.1 |
| **Total alkalinity (2015-16)** | 163.2 | 185.3 | 206.2 | 274 | 247.2 | 206 | 198.2 | 206.5 | 173.8 | 179.7 | 162.3 | 156.5 |
| **(2016-17)** | 180.2 | 168.9 | 212.3 | 255.5 | 257.4 | 194.8 | 208.3 | 196.4 | 177.2 | 230.1 | 191.1 | 171.49 |
| **Chloride (2015-16)** | 37.6 | 46.5 | 41.6 | 42.8 | 35.9 | 35.6 | 28.6 | 27.6 | 25.6 | 32.6 | 29.2 | 40.5 |
| **(2016-17)** | 41.3 | 43.5 | 44.5 | 43.7 | 42.1 | 36.7 | 27.3 | 24.3 | 22.5 | 37.9 | 35.4 | 39.1 |
| **Hardness (2015-16)** | 84.6 | 89.5 | 114.2 | 124.6 | 125.6 | 98.5 | 67.8 | 65.6 | 67.4 | 78.4 | 84.4 | 95.3 |
| **(2016-17)** | 116.4 | 122.6 | 126.3 | 142.6 | 145.3 | 119.5 | 85.6 | 78.9 | 89.2 | 112.8 | 96.3 | 110.5 |
| **Calcium (2015-16)** | 26.8 | 29.4 | 41.3 | 55.7 | 46.5 | 41.2 | 32.1 | 36.5 | 31.2 | 34.5 | 29.4 | 29.3 |
| **(2016-17)** | 37.8 | 45.7 | 52.6 | 57.8 | 48.3 | 36.8 | 29.7 | 32.5 | 28.7 | 36.1 | 32.5 | 38.2 |
| **Magnesium (2015-16)** | 57.8 | 60.1 | 72.9 | 68.9 | 79.1 | 57.3 | 35.7 | 29.1 | 36.2 | 43.9 | 55 | 66 |
| **(2016-17)** | 78.6 | 76.9 | 73.7 | 84.8 | 97 | 82.7 | 55.9 | 46.4 | 60.5 | 76.7 | 63.8 | 72.3 |
| **Phosphorous (2015-16)** | 1.4 | 1.6 | 1.8 | 1.4 | 2.2 | 1.8 | 2.3 | 1.6 | 1.8 | 1.3 | 1.7 | 1.3 |
| **(2016-17)** | 1.2 | 1.3 | 1.5 | 1.7 | 2.1 | 2.3 | 1.9 | 1.7 | 1.6 | 1.4 | 1.6 | 1.5 |
| **Nitrate (2015-16)** | 1.3 | 1.3 | 1.2 | 1.5 | 2.1 | 1.3 | 0.9 | 0.6 | 0.4 | 0.7 | 1.5 | 1.4 |
| **(2016-17)** | 1.5 | 0.9 | 1.5 | 1.4 | 1.3 | 1.5 | 1.2 | 0.4 | 0.5 | 0.8 | 1.4 | 1.3 |
| **EC (2015-16)** | 263.1 | 296.3 | 355.2 | 365.1 | 321.7 | 269.1 | 345.4 | 374.6 | 362.4 | 341.6 | 365.8 | 257.6 |
| **(2016-17)** | 275.4 | 321.5 | 345.2 | 364.2 | 362.2 | 356.4 | 325.1 | 284.6 | 310.5 | 345.7 | 355.1 | 237.1 |



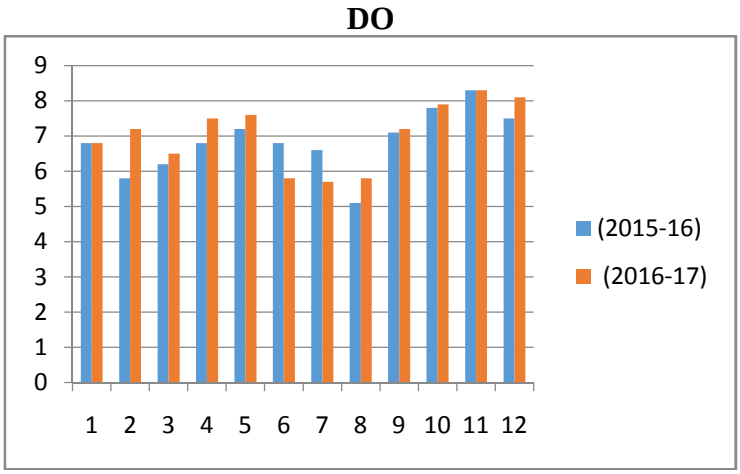

**Graph.1: Temperature** fluctuations during the investigation period



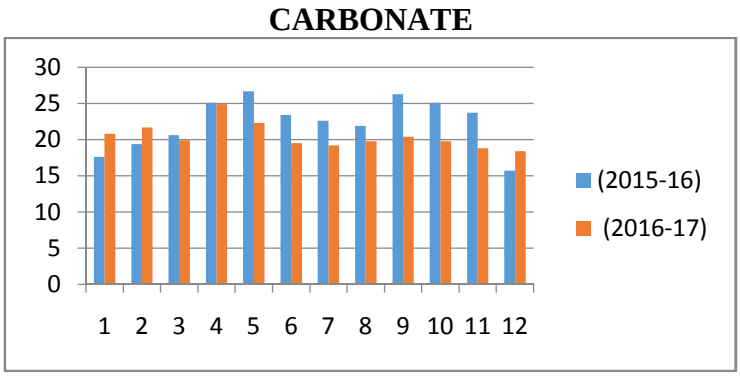

**Graph.2: pH fluctuations during the investigation period**



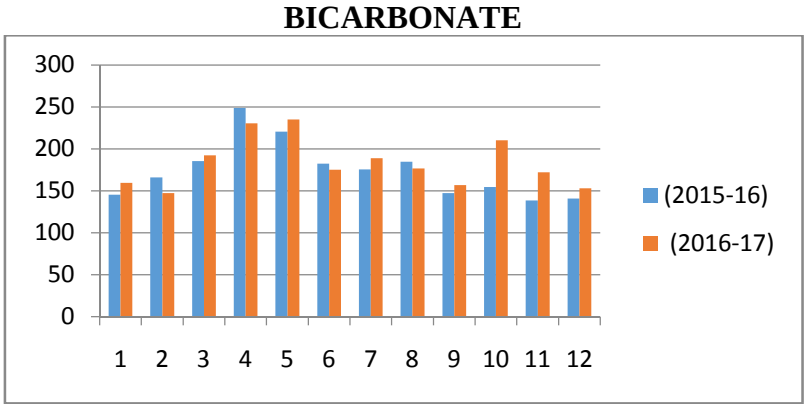

**Graph.3: Free $Co_2$ fluctuations during the investigation period**



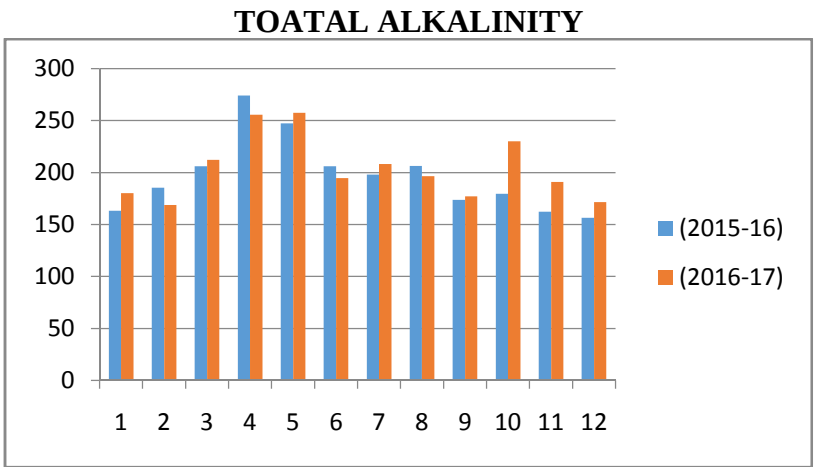

**Graph.4: DO fluctuations during the investigation period**



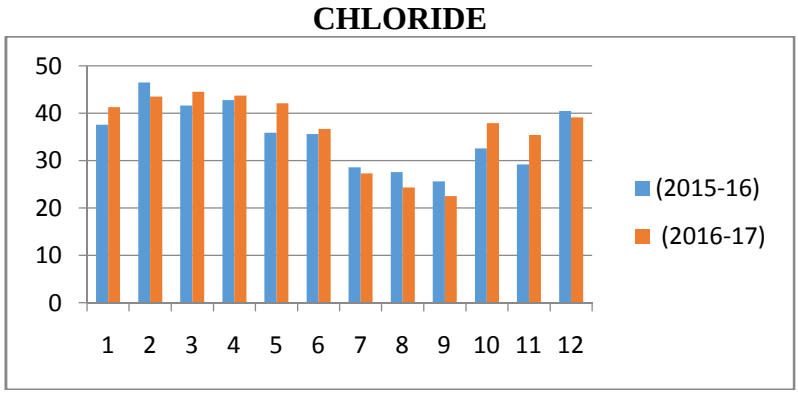

**Graph.5: Carbonate fluctuations during the investigation period**



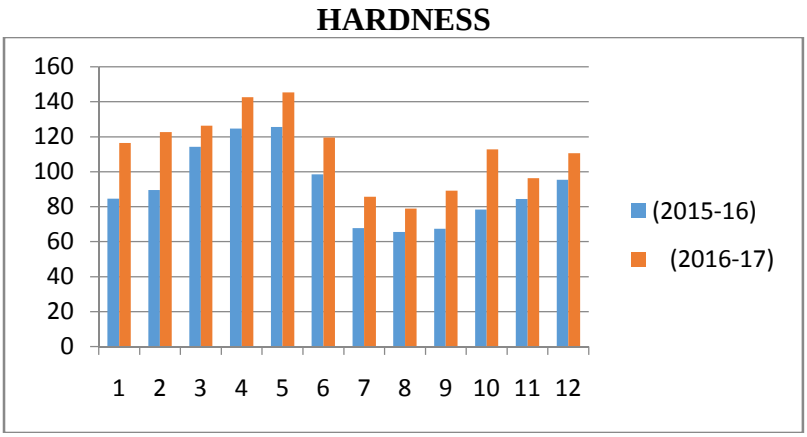

**Graph.6: Bicarbonate fluctuations during the investigation period**



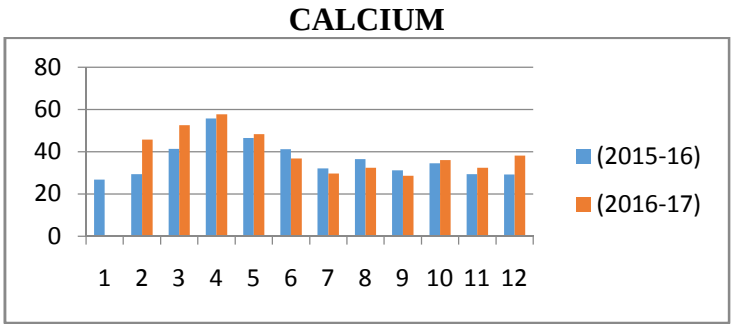

**Graph.7: Total Alkalinity fluctuations during the investigation period**



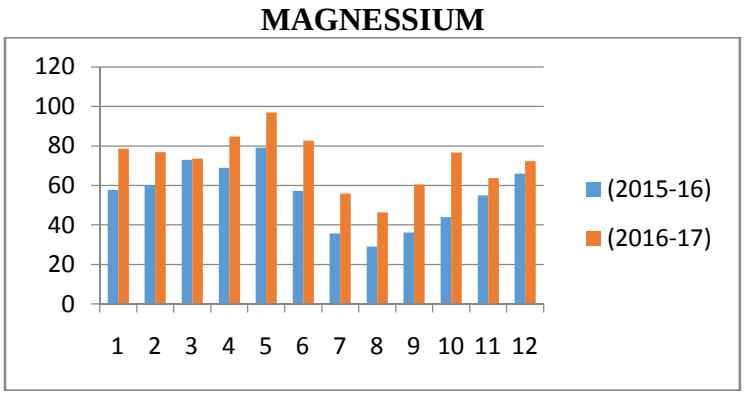

**Graph.8: Chloride fluctuations during the investigation period**



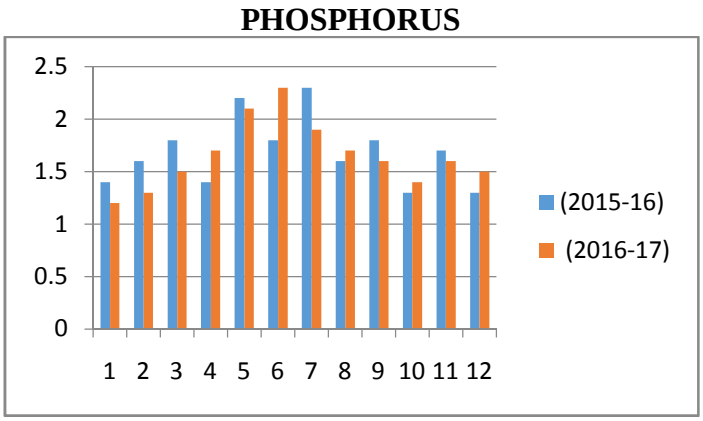

**Graph.9: Hardness fluctuations during the investigation period**



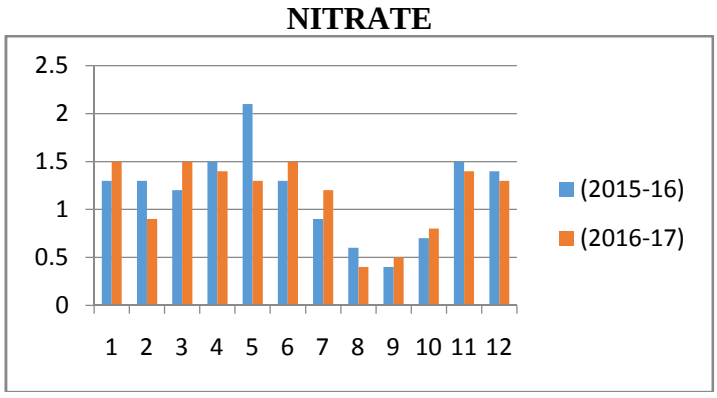

**Graph.10: Calcium fluctuations during the investigation period**



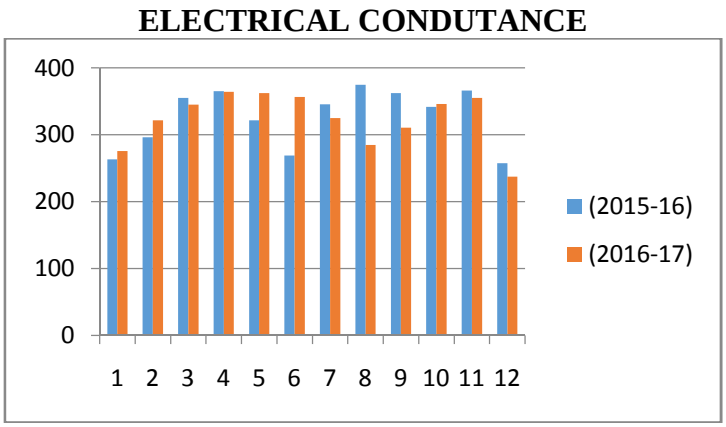

**Graph.11: Magnesium fluctuations during the investigation period**




**Graph.12: Phosphorus fluctuations during the investigation period**




**Graph.13: Nitrate fluctuations during the investigation period**




**Graph.14: Electrical Conductivity fluctuations during the investigation period**