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ORIGINAL ARTICLE

Physico-Chemical Analysis of a Freshwater Lake in Siddipet: Telangana State

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ABSTRACT
The present study is about water analysis, seasonal variations of some physico - chemical parameters such as Temperature, pH, Turbidity, DO, BOD etc. for Narsapur Lake in Siddipet of Telangana state. This study was carried out for two years (February 2015 to January 2017) in monthly intervals. The samples were collected from three sampling points of lake during morning hours and were analysed in the laboratory. Analysis was carried out by using the standard methods given by APHA (1998). During the present study, lake water showed pollution due to anthropogenic activities such as immersion of idols and dumping of sewage directly into lake. The condition is alarming therefore immediate action is required for lake existence.
Key words: *Physico-Chemical parameters, Water Quality, Narsapur Lake, Siddipet, Water pollution.*

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INTRODUCTION

Water is prerequisite of life. Fresh water is limited resource. Adequate quantity and quality of fresh water is essential for sustainable development. Lakes are freshwater lentic ecosystem. [1]. Lakes are the main sources of water for mankind [2]. Water quality is directly linked with human health. Direct discharge of domestic and industrial waste into natural water is the main cause of water pollution.[3].Pollutants change the physico-chemical properties of lakes which affects the ecological balance. Water quality assessment by analysis of Physico chemical parameters provides a good indication about water quality [4]. The general effect of pollution is increase in oxygen demand, Nitrates, Phosphates etc. Many organisms will grow in clean water; whereas polluted water would yield just a few organisms. [5]. The abundance of Algae depends upon the number of factors like temperature, Phosphorus and organic matter [6]. A large number of examples of eutrophication of lakes are available in literature; Lake Erie in USA is an example [7]. In India large number of studies has been conducted on Eutrophic lakes [8].
According to different surveys, 75% of Indian water sources are polluted. [9]. Nowadays extinction of lakes has become a major issue in the world. [10]. Water sources are very precious to mankind. Direct dumping of sewage, Industrial waste and agriculture runoff are the main factors of aquatic pollution. It is quite essential to study the quality of lake water with a view to restore, so that these serve for a useful purpose to the society [11].

OBJECTIVES

- To estimate physical properties of lake water in different time periods.
- To estimate chemical properties of lake water in different time periods.
- To seasonal variation of lake water in different time periods
- To estimate the pollution levels in the lakes.

MATERIALS AND METHODS

Study Area: Narsapur Lake is situated at longitude of 780.511E and latitude of180.051N in Siddipet city of Telangana state. The total catchment area of lake is 144.36 sq.kms. It is a seasonal rainfall dependent watershed. Lake is currently used to dispose sewage. Water Samples were collected from three sampling stations.

Photograph of Narsapur Lake

Water Samples were collected from three sampling stations of Lake. The Sampling station -I is the location of Sluice of the Lake. The Sampling station -II is the East side location of the Lake. The Sampling station -III is the location of Mattadi area of the Lake. The results have been recorded for two years during February 2015 to January 2017.Water Samples were collected from three sampling stations of lake in plastic cans at monthly intervals and estimated in the laboratory for the physico-chemical parameters of water.

- Temperature and pH were recorded at the time of sample collection. Turbidity of water measured in the lab using Digital Nephelo Turbidity Meter. Carbonates, Bicarbonates, Chlorides were estimated by titrimetric method recommended by Wilcox and Hatcher [12].
- Nitrites estimated by EDTA method, total Hardness, Calcium, Phosphates, Sulphates, Magnesium, Nitrates and BOD estimated by the method recommended by APHA [13].
- Dissolved oxygen estimated by D.O. meter in the field and subsequently cross checked in the lab by Winkler's modified method recommended by Mackereth [14].

RESULTS AND DISCUSSION:

Water plays an important role in phytoplankton growth rate. The analysis of physico-chemical parameters is most important feature to decide the quality of water.

Temparature: The temperature of Site –I ranges from 28 ^{o}C to 18.80^{o}C. The temperature of Site –II ranges from 29^{o}C to 18^{o}C.The temperature of Site–III ranges from 27^{o}C to 19^{o}C the highest temperature was noted during the summer season and the lowest was recorded during the winter season.

P^{H} : The pH value of Site –I ranges from 7.2 to8.7. The pH value of Site –II ranges from 7.2 to 8.4. The pH value of Site –III ranges from 7.2 to 8.4.The highest value of p^{H} was recorded during summer season and the lowest was recorded during monsoon season. The low value during monsoon may be due to dilution of rain water.

Turbidity (NTU): The amount of Turbidity recorded in Site –I range from 82 NTU to 20 NTU at Site –II ranges from 82 NTU to 34 NTU and at Site –III ranges from 80 NTU to 18 NTU. The maximum amount was recorded during summer season were as minimum amount was recorded during monsoon season. The

maximum values of turbidity in monsoon may be due to rainfall and surface runoff of water bringing a lot of sediments from the surrounding area.

Dissolved Oxygen (mg/l): The amount Dissolved Oxygen of recorded at Site –I ranges from 6.8mg/l to 4.2mg/l,at Site –II ranges from 6.8mg/l to 4mg/l. and at Site –III from 6.6mg/l to 4.1mg/l. The maximum value of dissolve oxygen was recorded during monsoon season and the minimum value was recorded during summer season. Low dissolve oxygen during summer may be due to higher temperature and low solubility of oxygen in water consequently affecting the BOD [15].

Carbonates (mg/l): The amount of Carbonates recorded at Narsapur Lake in the summer season only and very low concentrations of Carbonates were recorded. The highest value of Carbonates recorded at Site –I was 20mg/l, at Site –II and at Site –III was 10 mg/L in the summer season. There was no trace of Carbonates in monsoon and winter seasons.

Bicarbonates (mg/l): The amount of Bicarbonates recorded at Site –I ranges from 180mg/l to 110mg/l. at Site –II ranges from 180mg/l to 110mg/l and at Site –III of Narsapur lake ranges from 190 mg/l to 120 mg/l. The maximum amount was recorded during monsoon season.

Total Hardness (mg/l): The amount of total Hardness recorded at Site –I ranges from 498mg/l to 260mg/l, at Site –II ranges from 520mg/l to 250mg/l and at Site –III ranges from 498mg/l to 240mg/l. The maximum amount was recorded during summer season were as minimum amount was recorded during monsoon season.

Calcium (mg/l): The amount of calcium recorded at Site-I ranges from 148mg/l to 120 mg/l, at Site-II ranges from 146mg/l to122 mg/l and at Site-III ranges from 145mg/l to120 mg/l. The amount of calcium recorded was maximum during summer season were as minimum during winter season.

Magnesium (mg/l): The amount Magnesium of recorded at Site –I ranges from 86.86mg/l to 29.77mg/l, at Site –II ranges from 91.50 mg/l to 27.82mg/l. and at Site –III ranges from 86.13mg/l to 25.86mg/l. The maximum amount was recorded during summer season were as minimum amount was recorded during monsoon season.

Chlorides(mg/l): The amount of Chloride recorded at Site –I ranges from 16.62mg/l to 35.65 mg/l at Site –II ranges from 17.32mg/l to 35.15 mg/land at Site –III ranges from 18mg/l to 35 mg/l. The high amount of chloride was recorded during summer season and low value was recorded during the October month. The concentration of chloride was used as parameter for finding of pollution by sewage [15].

Phosphates(mg/l): The amount of Phosphate recorded at Site –I ranges from 0.42mg/l to 3.50mg/l, at Site –II ranges from 0.40mg/l to 3.57mg/l and at Site –III ranges from 0.41mg/l to 3.48mg/l. High amount of was recorded during winter season and the low amount was recorded during rainy season.

Nitrates (mg/l): The amount of nitrate recorded in Site –I ranges from 0.07 mg/l to 0.43 mg/l. at Site –II ranges from 0.06 mg/l to 0.45 mg/l and at Site –III ranges from 0.06 mg/l to 0.45 mg/l. The high amount of nitrate was recorded during rainy season and the low amount was recorded during end of winter season. Nitrate concentration in water usually shows pollution made by human and animal wastes or fertilizer runoff [15].

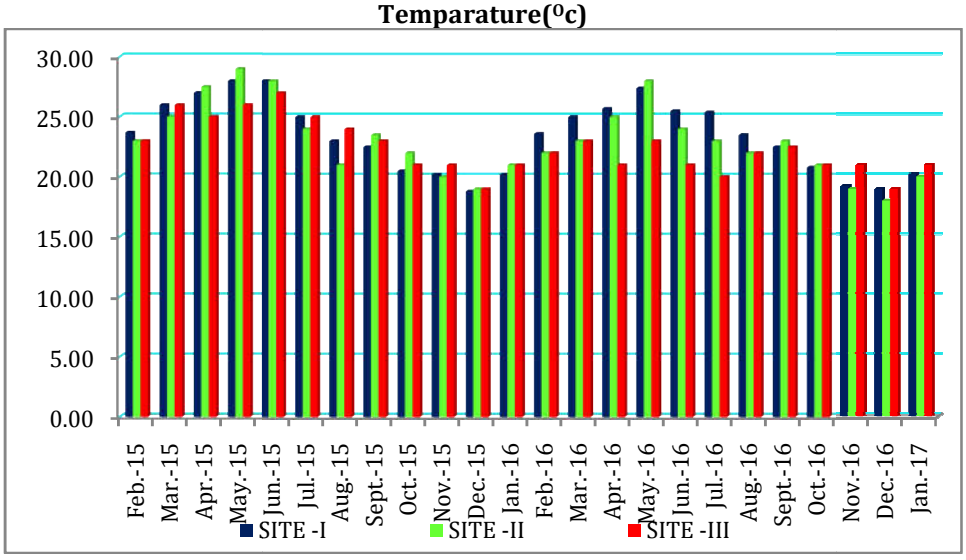
Nitrites (mg/l): The amount of nitrite recorded at Site –I ranges from 0.13 mg/l to 0.01 mg/l at Site –II ranges from 0.12 mg/l to 0.01 mg/l and at Site –III of ranges from 0.13 mg/l to 0.01 mg/l. The high amount of nitrate was recorded during rainy season.

Sulphates (mg/l): The amount of Sulphate recorded in Site –I ranges from 156mg/l to 116mg/l., at Site –II ranges from 152 mg/l to 112mg/l. and at Site –III ranges from 160mg/l to 116mg/l. The high amount of Sulphate was recorded during rainy season and the low amount was recorded during summer season.

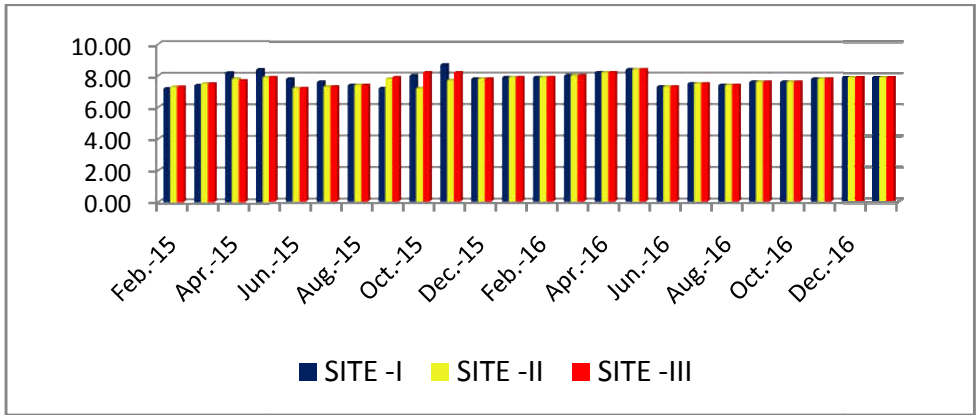
BOD (mg/l): BOD refers to the amount of oxygen used by microorganism in the aerobic oxidation of organic matter. The amount of BOD recorded at Site –I ranges from 1.4mg/l to 0.4mg/l.at Site –II ranges from 1.4mg/l to 0.4mg/l. and at Site –III ranges from 1.4mg/l to 0.5mg/l .The maximum value of BOD was recorded during summer season and the minimum value was recorded during monsoon season.

The results of different physico-chemical parameters of three sites are presented in the graphs. Monthly time periods were taken on the X-axis and physico- chemical parameter units were taken on the Y-axis.

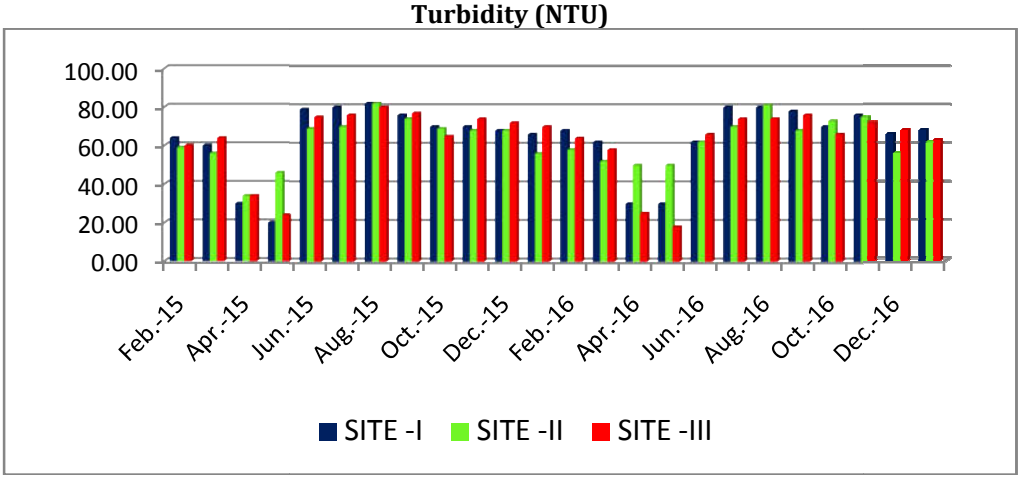
Temparature(^{o}c)



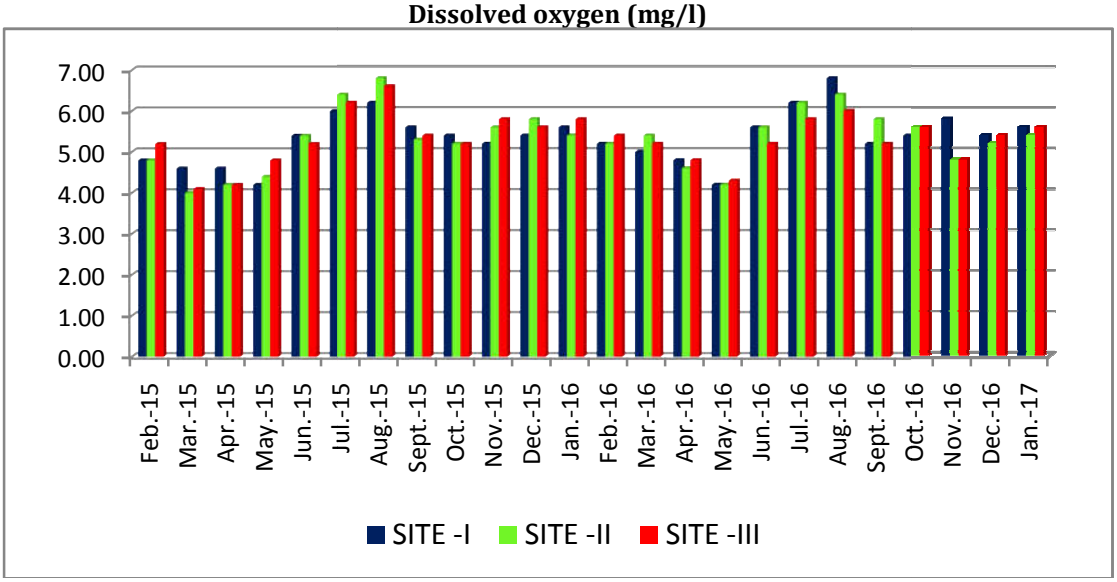
PH



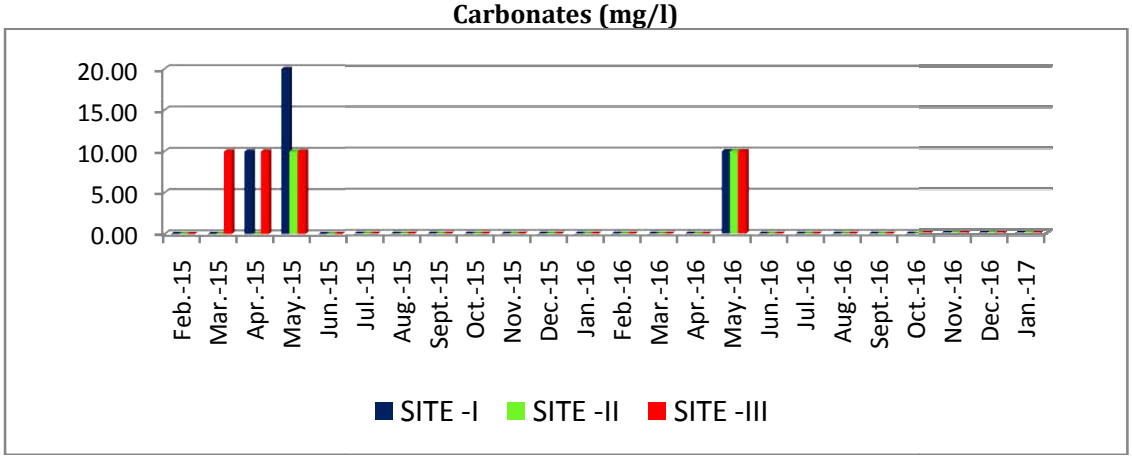
Turbidity (NTU)



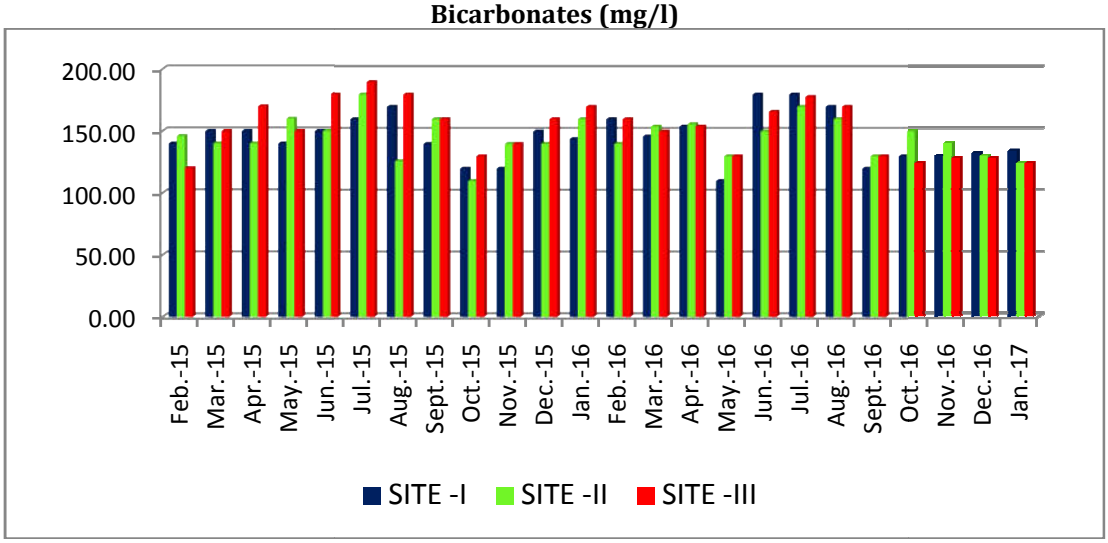
Dissolved oxygen (mg/l)



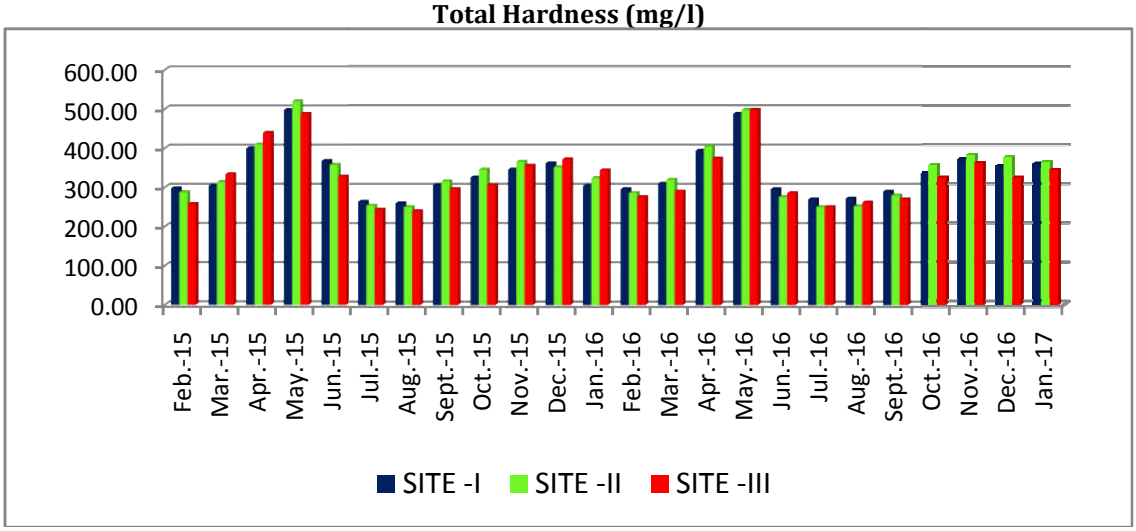
Carbonates (mg/l)



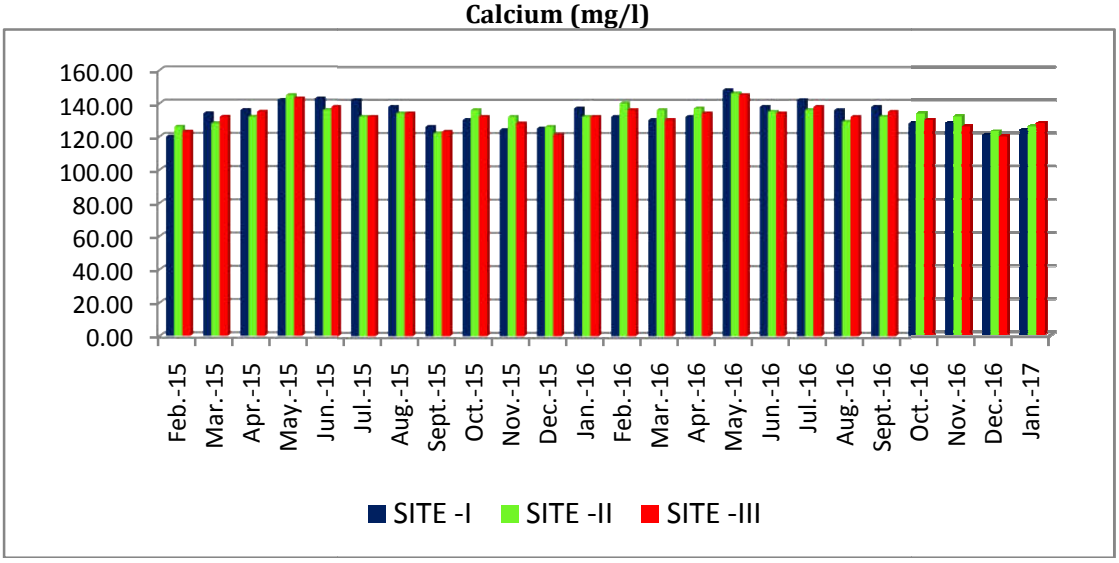
Bicarbonates (mg/l)



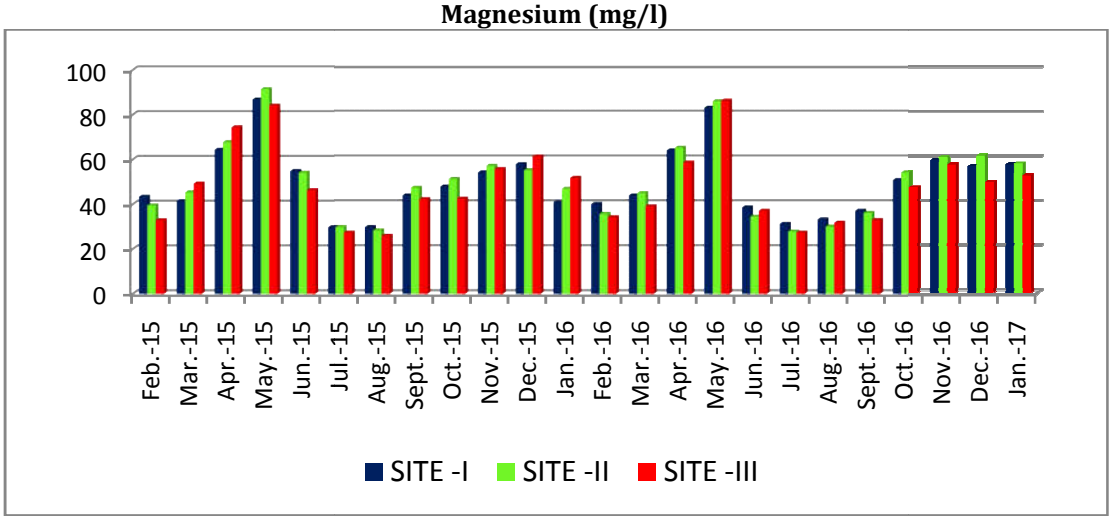
Total Hardness (mg/l)



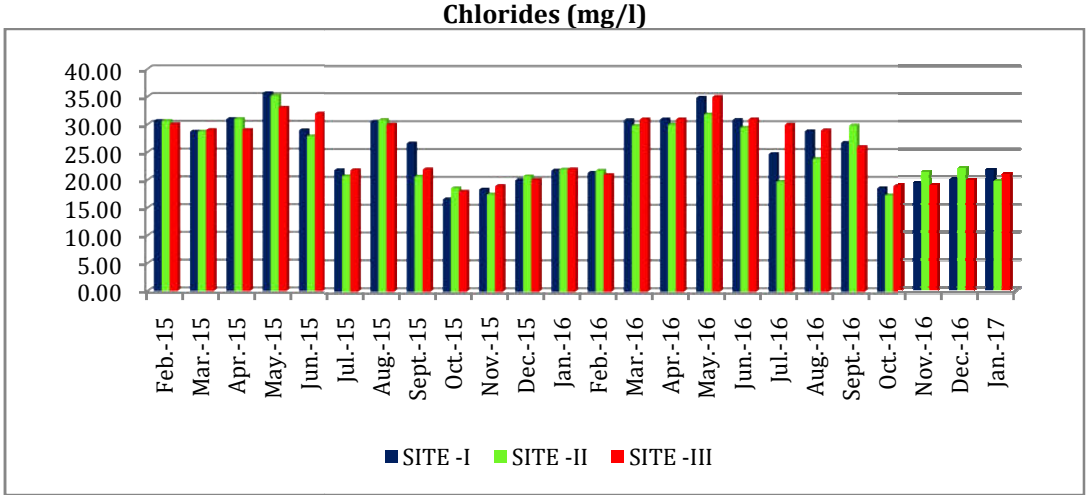
Calcium (mg/l)



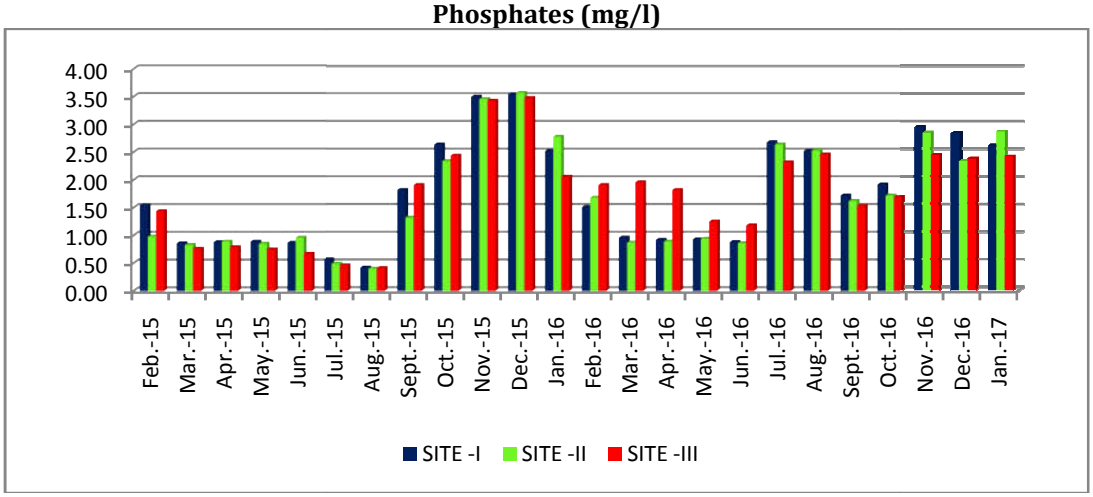
Magnesium (mg/l)



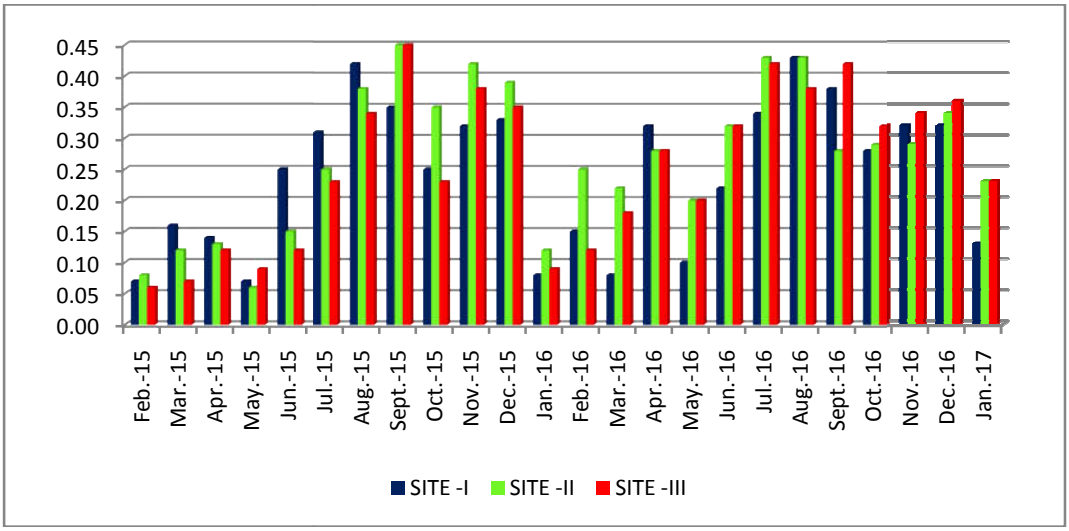
Chlorides (mg/l)

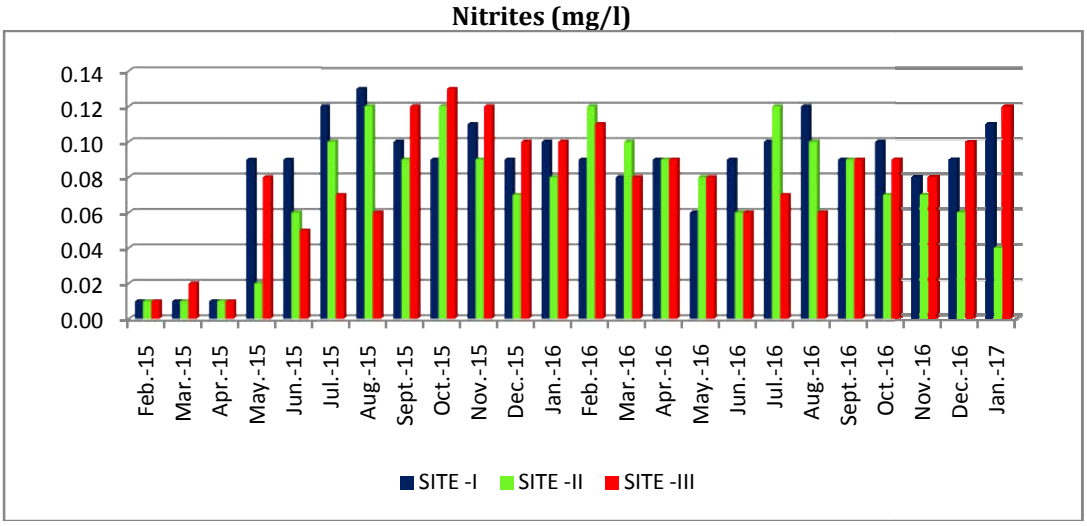


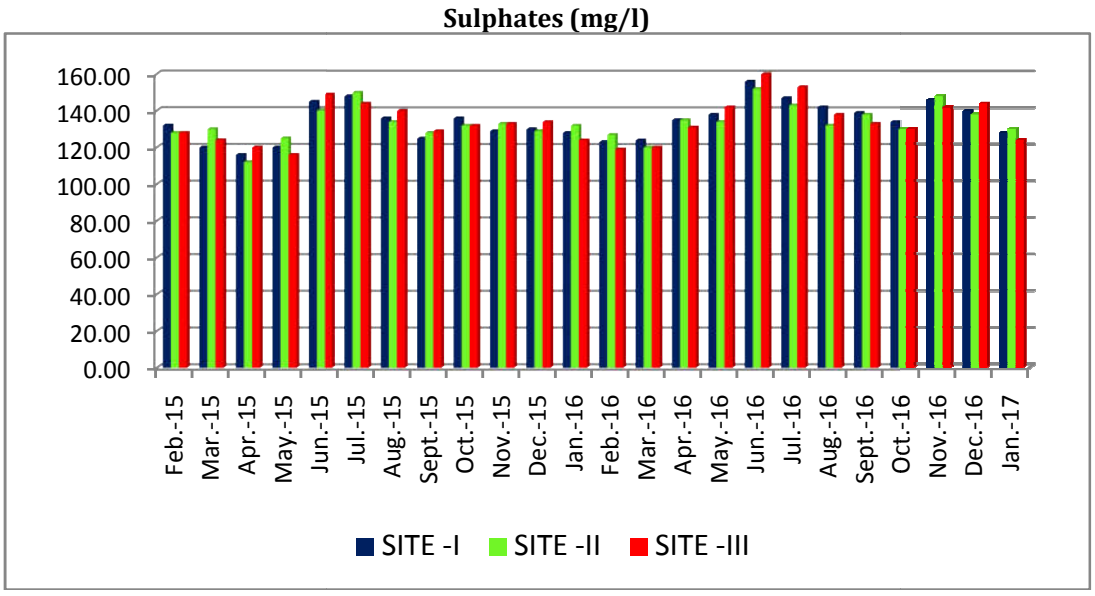
Phosphates (mg/l)

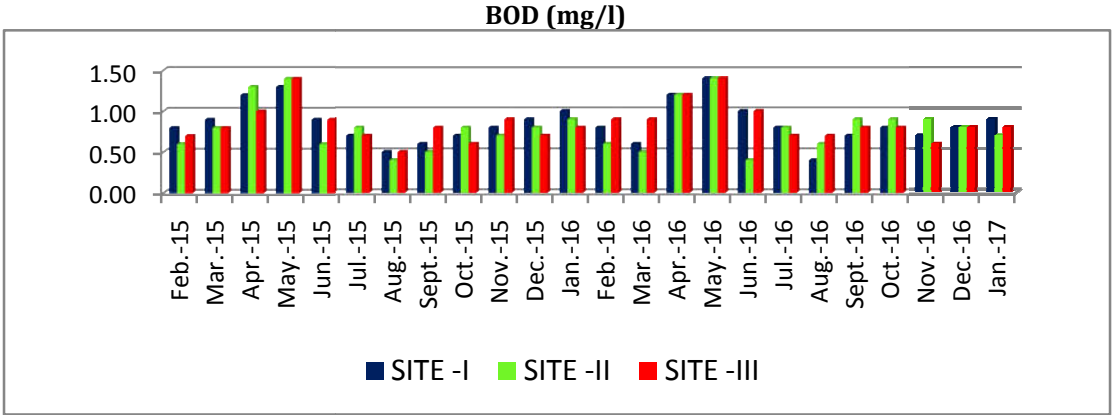


Nitrates (mg/l)









CONCLUSION

Physico chemical parameters in Narsapur lake showed distinct variations and seasonal changes throughout the study period. Lake water analysis revealed that values are generally higher in summer season. Lake water was polluted and the quality of water was no longer good to support life. As per the BIS [16] the present study of lake water showed pollution. Anthropogenic activities such as immersion of idols and dumping of sewage directly into lake were the reason for pollution. The condition is alarming

therefore immediate action is required for lake existence. So there is an urgent need to protection of this lake.

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