

# STUDIES ON THE LIMNOLOGY OF FUTERA ANTHROPOGENIC POND OF DAMOH DISTRICT (M.P.)

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**Abstract:** Present paper limnological investigation of Futera pond of Damoh District, (M.P.) India which was carried for a period of one year 2011-2012. The topographical situation of Futera pond is 23°5' N longitude and 79°26' E latitude in central India and situated in Futera ward No.5 besides the railway line from Bina to Katni in Damoh district. The area of Futera pond is about 36.923 hectares and depth is 4.50 meter. The depth of pond is variable from season to season. The water storage capacity of Futera pond is about 48 MCFT. The pond is anthropogenic and pond water is used for domestic purpose, irrigation, aquaculture etc. The surrounding area of pond is semi urban and semi agricultural. The need to define quality of water has development with the increasing demand of water, which is suitable for specific uses and confirms to desired quality. The most fundamental need is for water suitable for drinking, personal hygiene and food preparation and that pose no risk to human health. Physico-chemical characteristics of Futera pond was studied for a period of 12 months from June 2011- May 2012. In view of above, an attempt was made to study certain limnological parameters such as Temperature, pH, conductivity, turbidity, total hardness, Ca and Mg contents, total alkalinity, BOD, and COD etc. For examination of above all mentioned parameters American Public Health Association (APHA), American Water Works Association was made. Present research work concludes that Futera pond which was basically made for irrigation point of view is now highly polluted water body due to continuous discharge of municipal sewage.

**Keywords:** Municipal sewage, Physico chemical characteristic, aquatic ecosystem and water quality deterioration.

## I. INTRODUCTION

Water is nature's most wonderful, abundant and most useful chemical compound gifted by nature with physico-chemical and biological properties and unique characteristics. It is essential for the survival of all organisms on this earth planet. Out of total water available on earth's surface only 0.3% to 0.5% issuable therefore, its judicious use is imperative. In today's scenario, unplanned urbanization, rapid industrialization and indiscriminate use of chemicals are the cause of heavy and varied pollution in aquatic environments, leading to deterioration of water quality and depletion of aquatic fauna including fish. Without the knowledge of water chemistry, it is difficult to understand the biological phenomenon of water fully, because the chemistry of water reveals much about metabolism of the ecosystem and explains the general hydro-biological interrelationship with physico-chemical characteristics are highly important with the regard of to the occurrence and abundance of species.

Today most of the aquatic ecosystems receives million liters of sewage, industrial and agricultural effluents containing highly toxic substances. Anthropogenic nutrient enrichment causes serious alteration in aquatic ecosystem (Ansari and Khan; 2006). The health of fresh water body and their biological diversity are directly related to health of almost every component of ecosystem. Monitoring of water quality is initiative step to be taken up for the management and conservation of any aquatic ecosystem. Hence, an assessment was conducted to relevant limnological conditions of Futera pond located in Damoh District (M.P.).

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## II. STUDY AREA

The present study has been carried out on Futera pond of Damoh district in Madhya Pradesh. The topographical situation of Futera pond is  $23^{\circ}5'$  N longitude and  $79^{\circ}26'$  E latitude in central India and situated in Futera ward No.5 besides the railway line from Bina to Katni in Damoh district. The area of Futera pond is about 36.923 hectares and depth is 4.50 meter. The depth of pond is variable from season to season. The water storage capacity of Futera pond is about 48 MCFT(Fig. No. 1). The pond is anthropogenic and pond water is used for domestic purpose, irrigation, aquaculture etc. The surrounding area of pond is semi urban and semi agricultural. The need to define quality of water has development with the increasing demand of water, which is suitable for specific uses and confirms to desired quality.



Fig. 1 Satellite map of Futera Pond Damoh Dist. (M.P.).

## III. MATERIAL AND METHODS

Samples were collected monthly from Five different sampling stations namely A, B, C, D, and E for one year (June 2011 to May 2012). The samples were collected at 11 am -1pm during second week of each month. Some of the physico-chemical characteristics of water were analyzed at the spot such as water temperature, color, transparency, pH which were determined by thermometer, visual sechi disc, and digital pH meter respectively. While, others like D.O., Total alkalinity, total hardness, Chloride, Ca and Mg contents were analyzed by titric method in laboratory. And other parameters like turbidity, conductivity, TDS, nitrate Phospahte, BOD and COD were analyzed within 24 hrs. as per the procedure given in APHA (1995) , and Trivedy and Goel(1986).

## IV. RESULTS AND DISCUSSION

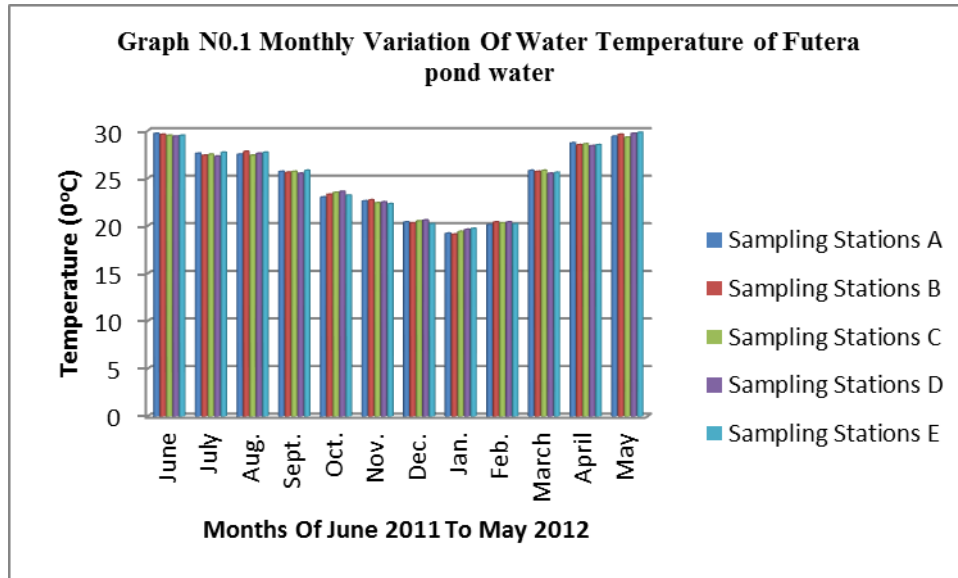
The mean monthly variation in the surface water temperature of the five sampling stations is presented in Graph no.1. The temperature ranged between the lowest values of  $19.4\pm 0.25^{\circ}\text{C}$  obtained from mean values of five sampling Station in January 2012 and the highest of  $29.56\pm 0.21^{\circ}\text{C}$  obtained from mean values of five sampling Station May, 2012. Dry season temperature was not significantly higher ( $P=1$ ) than the wet season. No significant difference was seen among

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the sampling station and in one year. This type of observation for shallow water bodies is in conformity with the earlier findings (Malhotra *et al.*, 1986).



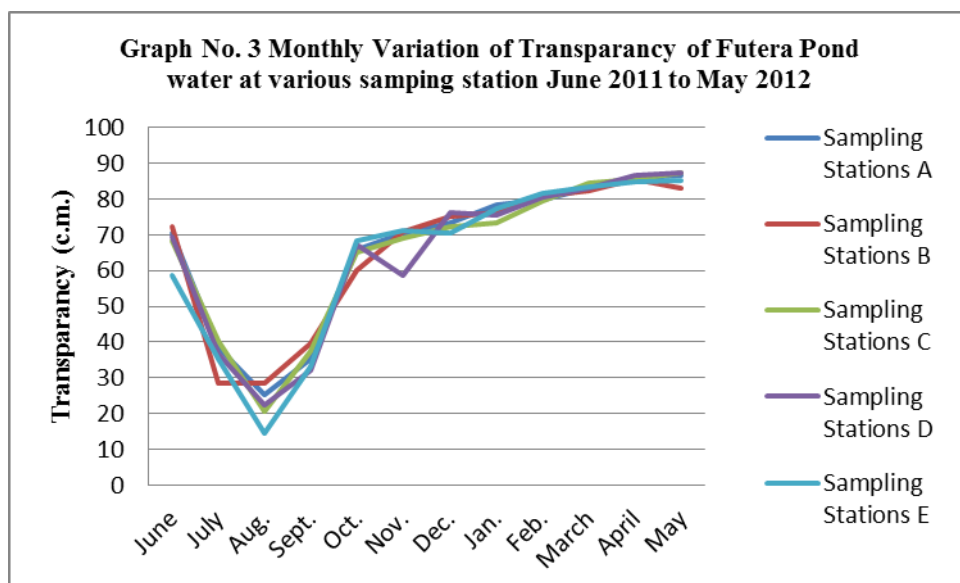
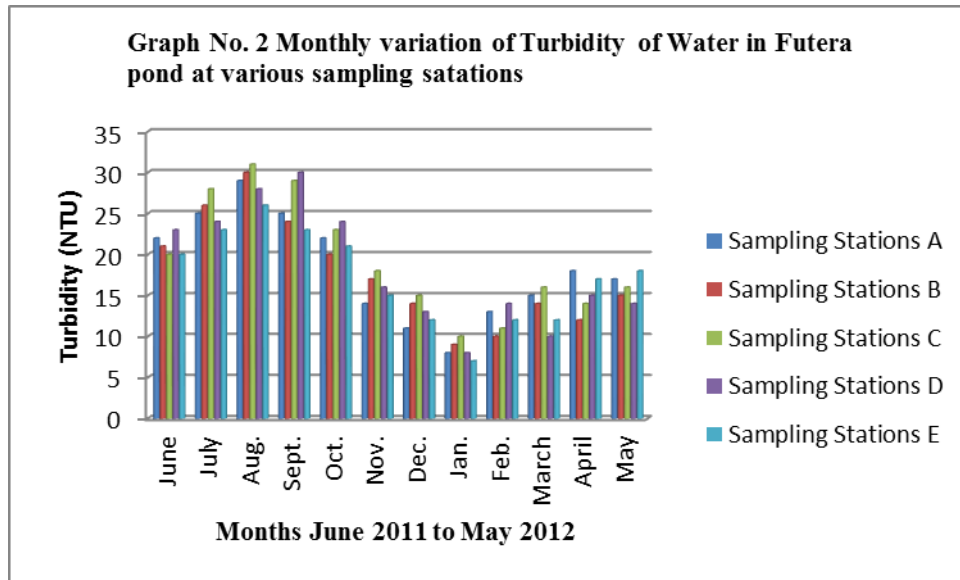
Water turbidity fluctuated between the lowest monthly mean of sampling station  $8.40 \pm 1.14$  mg/L obtained in January 2012 and the highest monthly mean of sampling station  $28.80 \pm 1.92$  mg/L recorded in August 2011 from (Graph 2). Statistical difference at  $P=0.916$  was noticed in the turbidity concentration among the stations. Higher turbidity affects the life indirectly as its cut of light to be utilized by plants for photosynthesis there by lowering the rate of primary productivity and Verma *et al.*(2012) Thus our results are supported by previous workers.

Secchi disc transparency was the highest mean value of sampling station  $85.88 \pm 1.49$  c.m obtained in May 2012 and lowest mean value recorded  $22.26 \pm 5.26$  c.m. in August of 2011 (Graph 3). During the dry season, Station 2 and year 2012 not significantly higher transparency ( $p=0.965$ ). The high values of transparency observed during the period of November to March may be attributed to the low plankton population. The transparency of water is affected in various seasons due to algal blooms and suspended sediments (Horn and Goldman, 1994).

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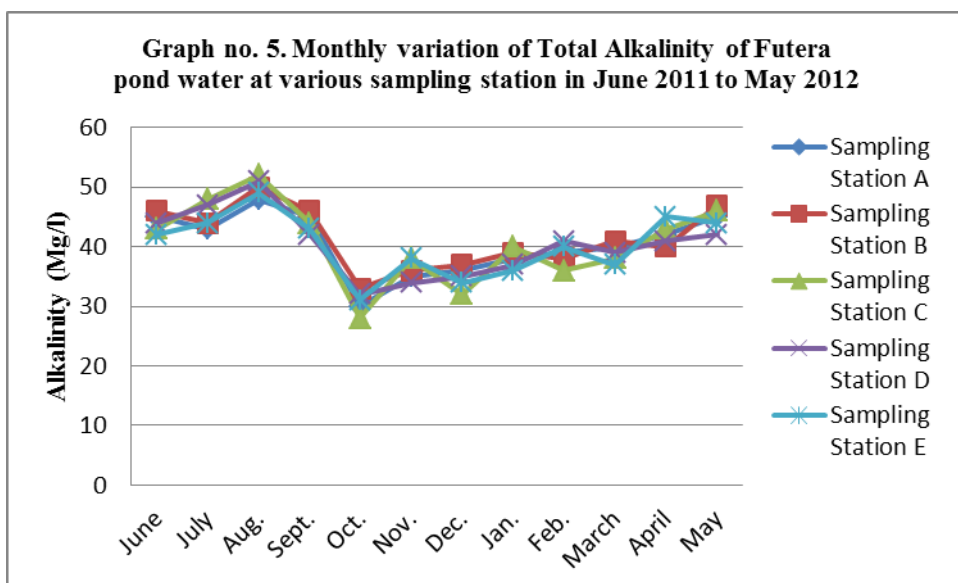
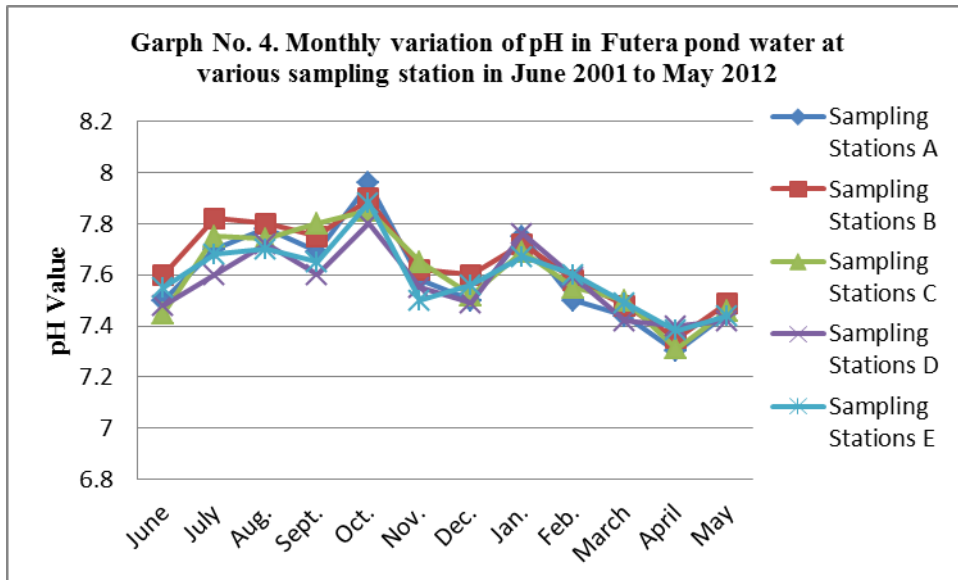
The Hydrogen ion concentration fluctuated between the lowest monthly mean of sampling sites  $7.34 \pm 0.04$  mg/L obtained in April 2012 and the highest monthly mean of sampling sites  $7.87 \pm 0.06$  Mg/L recorded in October 2011 from (Graph 4). There was no significant difference in the concentration of hydrogen ions between sampling site and months of year ( $p=0.086$ ). Similar results was observed in Lake PanduBodhan, Andhra Pradesh State, India by Solanki V.R., Hussain M.M. and Raja S.S. (2009).

The total alkalinity fluctuated between the lowest monthly mean of sampling station  $30.8 \pm 1.92$  mg/l obtained in October 2011 and the highest monthly mean of sampling stations  $45.2 \pm 2.17$  Mg/L recorded in July 2011 from (Graph 5). Total alkalinity showed there is a not significant difference between sampling sites ( $p=0.997$ ). The total alkalinity of water is usually by the carbonates, bicarbonates, hydroxyl, iron and less frequency by Borates, silicates and phosphate (APHA) 1985. The pattern of fluctuation was similar in all the above studies with the results obtained in the present study.

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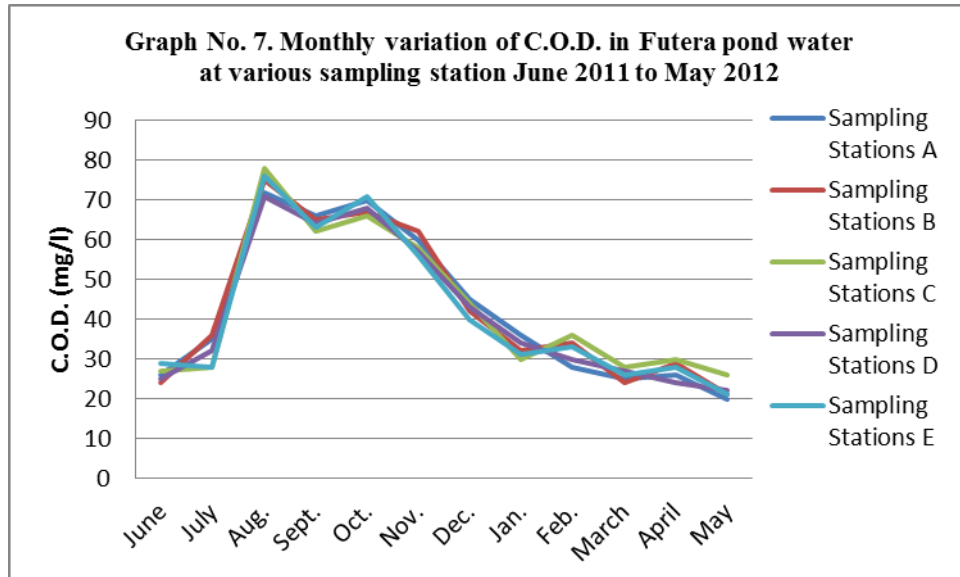
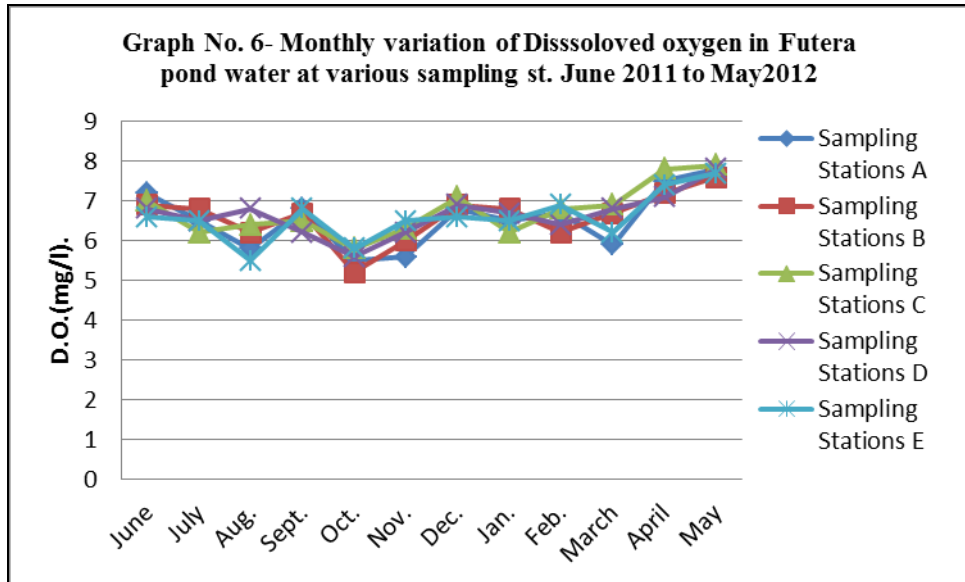
Dissolved oxygen fluctuated between the lowest monthly mean of sampling stations  $5.58 \pm 0.25$  mg/L obtained in September 2011 and the highest monthly mean of sampling stations  $7.76 \pm 0.11$  mg/L recorded in May 2012 from (Graph 6). Statistical difference at  $P = 0.0001$  was noticed in the dissolved oxygen concentration among the stations significant difference. Present observations are also in agreement with the findings of Kannan and Job (1979), Moundiotiya et al (2004), Rani et al (2004), Thakur and Bais (2006), Mishra et al (2008), Sharma and Capoor (2010) and Arya et al (2011).

Chemical oxygen demand (COD) varied between  $22.00 \pm 2.35$  mg/L and  $74.40 \pm 2.88$  mg/L COD was not significantly ( $p=0.911$ ) higher in the rainy season with mean of Sampling Station recording (Graph 7). There was no statistical difference in COD between the one year of study. APHA (1995), however, recommended COD levels of  $<2$  mg/L in drinking water. High COD has been linked with pollution (Tepe *et al.*, 2005).

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The highest monthly mean concentration of nitrate recorded was  $1.38 \pm 0.02$  mg/l which was obtained from mean of sampling stations at the peak of the hot seasons May 2012. A decrease was observed in the rainy season with the lowest concentration of  $0.16 \pm 0.08$  mg/l recorded from mean of sampling station in August 2011 (Graph 8). ANOVA at  $P < 0.0001$  shows significant difference in the nitrate concentration during the seasons and within the stations. Therefore the present result agree with the view of Gosh et al. (1992); Trivedi and Goel (1986) and Bhatt et al (1999) have also reported the occurrence of  $N_2$  of water with high temperature, as is established in present study.

The highest monthly mean concentration of phosphate recorded was  $1.268 \pm 0.03$  mg/l which was obtained from mean of sampling stations at the peak of the after rainy seasons. A decrease was observed in the rainy season with the lowest concentration of  $0.13 \pm 0.02$  mg/l recorded from mean of sampling station in April 2012 (Graph 9). ANOVA at  $P = 0.24$  shows no significant difference in the phosphate concentration during the seasons and within the stations. The higher

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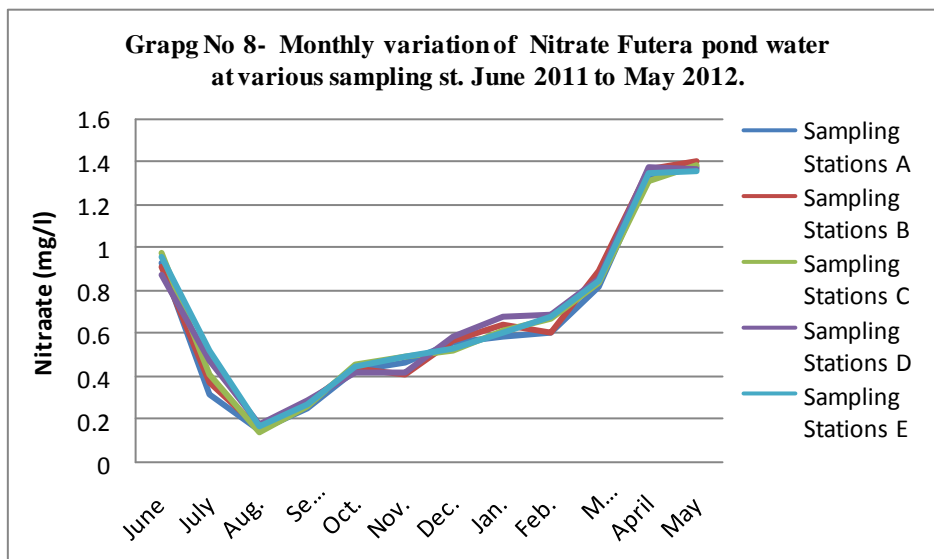
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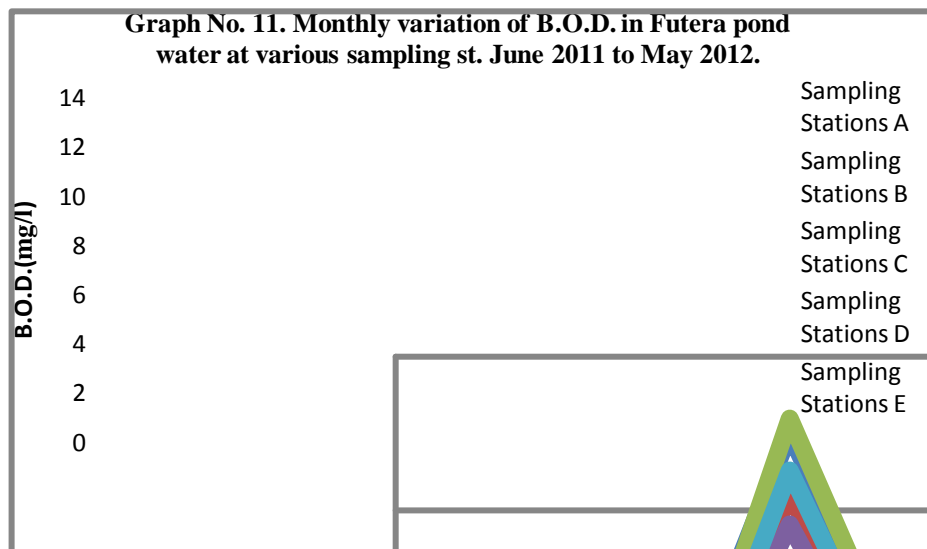
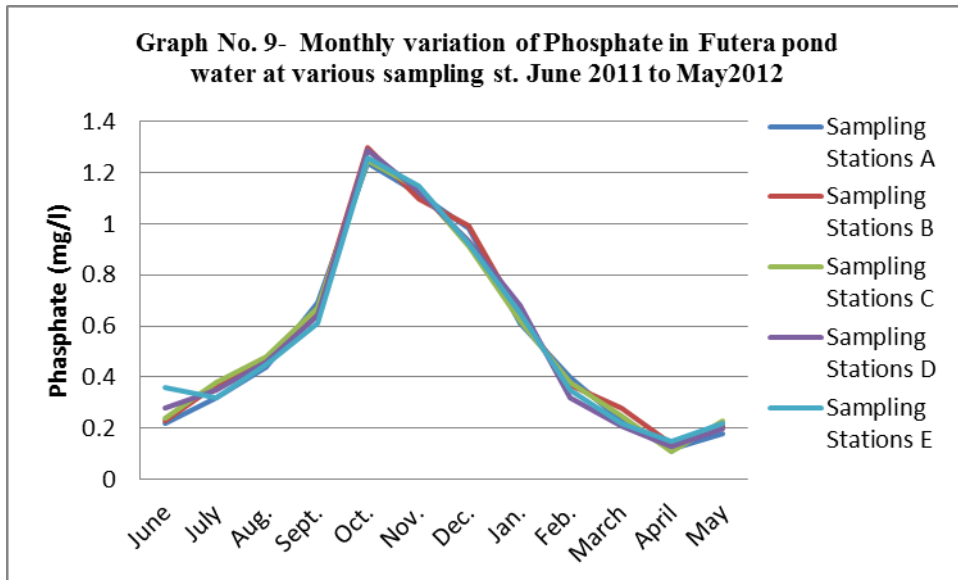
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concentration of was due to inflow of domestic waste, washing and bathing as there is scarcity of water in Damoh. Similar result have also been reported by Verma et al (2012) in lake of Ahmedabad.

The highest monthly mean concentration of sulphate recorded was  $34.40 \pm 2.3$  mg/l which was obtained from mean of sampling stations at the peak of the rainy seasons July 2011. A decrease was observed in the rainy season with the lowest concentration of  $13.0 \pm 2.77$  mg/l recorded from mean of sampling station in April 2012 (Graph 10). ANOVA at ( $p=0.0001$ ) shows significant difference in the sulphate concentration during the seasons and within the stations. Govindan and Sudarsan (1979) reported sulphate range of 30 mg/l to 127 mg/l in polluted zones of Adyar River.

The highest monthly mean concentration of B.O.D. recorded was  $12.54 \pm 0.57$  mg/l which was obtained from mean of sampling stations at the peak of the July 2011 rainy seasons. A decrease was observed in the rainy season with the lowest concentration of  $4.44 \pm 0.3$  mg/l recorded from mean of sampling station in April 2012 (Graph 11). ANOVA at  $P=0.0001$  shows significant difference in the B.O.D. concentration during the seasons and within the stations. These findings are also in accordance with Ahmad(1989), Parashshar et al (2008), Sharma and Capoor (2010) and Arya et al (2011). The heavy human settlements around the pond are responsible for adding municipal waste water thus creating organic pollution in the pond. It is also an important factor in enhancing the BOD value Sharma and Gupta ( 2004).





**V. CONCLUSION**

Therefore it can be concluded through this study that the age old Futera pond with social and cultural importance is degrading at an alarming rate. In the past two decades the pond has shown drastic changes regarding the productivity. The rapid increase of human activities and assemblage of livestock are creating pollution in the pond water and needs immediate measure. At this critical juncture the local representatives, Government and Non-Government bodies, the educated bodies, the village heads and the reputed figures of the society should come forward and formulate conservational model for the sustainability of this beautiful water body.

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