Asian J. Exp. Sci., Vol. 20, No. 2, 2006, 289-296

Environment Impact of Idol Immersion Activity Lakes of Bhopal, India

Anju Vyas[1]*, D. D. Mishra[2], A. Bajapai[3], S. Dixit[4] and N. Verma[5]

1. Department of Chemistry,
   Govt. Geetanjali Girls P.G. College, Bhopal and Chitransh
   A.D.P.G. College, Bhopal, MP, India 462016
2. Department of Chemistry,
   Govt. College Udaipura, Bhopal, M.P, India
3. LCA (EPCO) Bhopal, M.P., India
4. Applied Chemistry Department,
   Maulana Azad National Institute of Technology,
   Bhopal - 462007, (M.P.), India
5. Applied Chemistry Department,
   MANIT & Govt. Geetanjali Girls P.G. College, Bhopal - 462016, M.P., India.

Abstract : The immersion of idol of Lord Ganesh and Durga during Ganesh Ustav and Navratris festival is a major source of contamination and sedimentation to the lake water. Environmental impact due to idol immersion in Upper and Lower Lakes, it is situated in Bhopal, the capital city of M.P. The lakes constructed respectively in the 11th and 18th century is typical Example of urban water bodies. While the Upper Lake has been one major source of potable water for the people of Bhopal for ever a century, the Lower lake remains a source of raw water for the urban development which mushroomed around it as well as on the north eastern fringe of Upper lake during the last few decades. Idol immersion is a cause of water pollution peculiar to India with its large number of adherent to the Hindu religion.

Idol are made of clay but non–biodegradable thermocol and paints containing heavy metals are also used .The immersion practices leads to degradation of water quality and siltration .The parameters like Turbidity, Total Hardness, Dissolved Oxygen (DO), Biochemical Demand, (BOD) Chemical Oxygen Demand (COD), Oil and Grease have been studies to Upper and Lower lakes, Bhopal. Parameter Turbidity, Dissolved Oxygen (DO), Biochemical Demand (BOD) and Chemical Oxygen Demand (COD) become higher on immersion idols have grown in number and size over the years and urban water bodies are facing on increasing nutrient load.

Key wards : Contamination, Idol Immersion, Lake ecosystem, water quality parameter.

Introduction :

Water supports life on earth and around which the entire fabric of life is woven. The requirement of water is in all lives, *i.e.* from micro-organisms to man, is a serious problem today because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization (Singh *et al.,* 2002).

Generally speaking, water pollution is a state of deviation from pure condition, whereby its normal functioning and properties are affected. Aggravated environmental problems often reflect the misuse or misunderstanding of technology (Petak, 1980). In one of the studies the effectiveness of aeration units was selected for the Lower Lake in Bhopal, the capital city of Madhya Pradesh, India. The Lower lake (Lat 230 16' 00" N and Long 770 25' 00" E) is an artificial lake and is situated towards the east end of the Upper lake and is an integral part of the latter (Verma et al, 2006). It has a small catchment area 9.60 Sq.Km. and water spread of 1.29 Sq.Km. The

* **Corresponding Author :** Anju Vyas, Govt. Geetanjali Girls P.G. College, Bhopal, Chitransh A.D.P.G.College, Bhopal, MP, India; **E-mail :** anjuv22@rediffmail.com

pollution of this lake is a matter of great concern, since it has reached an alarming level due to inflow of large volume sewage and solid wastes. The quality of water in Lower Lake has far more deteriorated than that in the Upper Lake (Pani and Mishra, 2000). The Lower Lake receives a large amount of raw sewage from its densely populated habitation. The water body is an urban eutrophic lake where the amount of nutrient is very high and O_2 depletion is very prominent (Varughese *et al*., 2004). The untreated wastewater contains effluent rich in phosphate, caustic soda and detergent, etc. Organic enrichment of the lake through floral offerings, idol immersion and decomposition of aquatic weeds are also the significant causes of its eutrophication.

Ganpati festival is one of the prominent festivals celebrated by all communities irrespective of cast creed and religion. The requirement of water is in all lives, i.e. from micro-organisms to man, is a serious problem today because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization (Singh *et at*., 2002). The major concern here is pollution of water. It was recognized that mankind, animals and plants, all face a variety of problems arising from various kinds of environmental pollution (Petak, 1980).

To the study extent pollution in water. Upper and Lower lakes of Bhopal were selected for the study. Both are easily approachable for idol immersion. The immersion of idol of Lord Ganesh and Goddess Durga during Ganesh Ustav and Navratris festival is a major source of contamination and sedimentation to the lake. These idols are made up of plaster of Paris, clay and clothes supported by small iron rods and types of paints such as varnish and water colours (Bajpai *et.al*.,1993). The input of these bio-degradable and non bio-degradable substance cause deterioration of water quality. 1000 of idols of various size reaching height up to 20 to 40 feet are immersed in Lower and Upper lakes Bhopal (Reddy *et al.*, 2001).

Study Area :

The study area is Upper and Lower lakes of Bhopal. Upper lake (Lat 23°12' E - 23°16’ N Log77° 18' - 77° 23' E) situated in Bhopal, was created by Raja Bhoj in 11 century. The Lake has large catchment area of 361 sq. km. and at present has water spread area of 31 sq. km. The Upper lake is a major source of potable water and used for purpose of idol immersion also (Kulshrestha *et al.,* 1988). The Lower lake (Lat 23^o 16’ N and long 72^o 25’ E) situated in Bhopal is an artificial lake created in 1794 AD. It is situated towards the east end of the Upper lake and is an integral part of the latter. It has a small catchment area of 9.60 sq. km and water spread of 1.29 sq.km Idol immersion in the water bodies is a religious belief that is transferred from one generation to next. The Urban water bodies are easily approachable and so the idol immersion activities are localized at various sites of the lakes.

The over all impact has resulted in deterioration of the water quality, accumulation of toxic chemical and sediments, shrinkage of lake area and above all a loss of aesthetic value. The research study has been carried out to understand the status of lake. There is a need for continuous monitoring of pollution level in order to promote better living condition around the lake.

Materials and Methods :

A number of religious activities take place every year, which affect the water quality of Upper and Lower lakes .The festival of Ganesh idol immersion is observed once a year when the large number of idols are immersed into the lakes.

Samplings was done from two sites of

Upper lake namely **Prempura as U-1** and **Kamla Park as U-2** two sites of Lower lake namely **Kali mandir as S-1** and **Khatlapura as S-2**. The water samples were collected from the site of idol immersion at different intervals *i.e.* pre immersion, during immersion and post immersion. Pre-idol immersion samples were collected a week before the immersion activities. During idol immersion samples were collected in during immersion activities. Post-idol immersion samples were collected 15 days after the completion of immersion activities. The samples were subjected to physico-chemical analysis following the procedures prescribed by standard methods. The parameters namely Turbidity, Total Hardness, BOD, COD and Oil and Grease were analyzed.

Physico-chemical characteristics :

- **Turbidity :** It is determined by HACH UV-VIS spectrophotometer (De, 2001).
- **Total Hardness :** The hardness of water body was determined as per standard methods (APHA, 1995).
- **Dissolved Oxygen :** The water sample was collected and Dissolved Oxygen was fixed instantly on the spot and analyzed immediately as per the Wrinkler's method with Azide modification.
- **Biochemical Oxygen Demand :** The water sample was collected and incubated at 20^0C for 5 days (NEERI, 1991).
- **Chemical Oxygen Demand :** COD was determined by potassium dichromate open reflex method.
- **Oil and Grease :** Solvent Extration Method (Sharma and Kr, 1997-98).

Results and Discussion :

Observations are based on the samplings done at Station 1 and Station 2 of the lake.

- **Turbidity :** It was comparatively higher during the period at the stations S-1. It was found in the range of 30-82 FAU. in pre-, while 45-154 FAUand 35-100 FAU. during and past-samples, respectively, for both the stations. (Fig-1). The water colour is disturbed completely during the idol immersion causing high turbidity.
- **Total Hardness :** Total Hardness as $CaCO_3$ was noticed comparatively higher during and in post-period at both the stations. It was found in the range of 32 - 96 mg/l in pre-, while 56-156 mg/l and 96 – 198 mg/l. during and past samples, respectively, for both the stations (Fig-2). The hardness of water is not a pollution parameter but indicates water quality.
- **Dissolved Oxygen :** Dissolved Oxygen in water is of great importance to all aquatic organisms and is considered to be the factor that reflects the biological activity-taking place in a water body and determines the biological changes. DO was noticed comparatively higher in during period at the station U-1. It was found in the range of 6.1 – 9.6 mg/l. in pre-, while 7.2 - 9.4mg/l. and 7.1 – 8.4 mg/l. during and post samples, respectively, for both the stations. For drinking water limit is 6.0 mg\l accordingly (WHO, 1968) (Fig-3). On account of disturbance in the water column, mainly DO increase at surface layer due to mixing of atmospheric oxygen.
- **Biochimical Oxygen Demand :** BOD was noticed comparatively higher in during and post period at both the station. It was found in the range of 5 – 15 mg/l. in pre, while 8 – 26 mg/l. and 12.2-39 mg/l. during and past samples respectively for both the Stations .The higher values of BOD means present of more biodegradable organic material. Accordingly (ICMR, 1975). During the study higher values that cross the permissible limits at the both station (Fig-4). The higher values of the BOD has direct correlation with the increase in nutrient level of the lake due to immersion

activity (Mc Coy and Olson, 1986).

- **Chemical Oxygen Demand :** COD was noticed comparatively higher in during and post period at both the station. It was found in the range of 42 – 65 mg/l. in pre, while 55- 92 mg/l. and 62 – 115mg/l. during and past samples (Fig-5). Maximum limit for drinking water is 150 mg\l (ISI,1991).
- **Oil and grease :** It was noticed comparatively higher in during and post period at the station S-1. It was found in the range of nil mg/l. in pre, while o-0.0100 and 0-0.0230mg/l. mg/l. during and past samples .the permissible limit for oil in boiler feed water is 7 ppm as prescribed by American Boiler Manufacturer's Association (Fig-6).

The physico-chemical status of Upper Lake (Bhopal, India) with special reference to phosphate and nitrate has been investigated during the year 2003-2004. The phosphate and nitrate are two important nutrients in the lake loading through point and non-point pollution sources such as washing, bathing, agricultural activities in fringe area, joining of domestic raw sewage, cultivation of trapa and huge growth of aquatic macrophytes. These nutrients support the fast growth of the aquatic plants (mainly Eichhornia crassipes, Hydrilla, Ceratophyllum etc.) as a result these plants lead to gradual shrinking of wetland area along with other complications like low light penetration, reduces oxygen concentration, clogging of water channels, lowers entertainment value of lake and some time the level of oxygen depletes so that it can lead to fish mortality also (Tamot and Sharma, 2006).

There are various sources of phosphate to the lake water, such as firm rock deposit, runoff from surface catchments, and interaction between the water and sediment from dead plant and animal remains at the bottom of the lake.

Phosphate is considered to be the most significant among the nutrients responsible for eutrophication of lakes, as it is the primary initiating factor. Phosphate enters the lakes in domestic wastewater, accounting for the condition of eutrophication. Atmospheric input, as well, may account for a significant proportion of the influx of nutrients to the lake. For phosphates, the U.S. Environmental Protection Agency (1976) suggested that 0.08 ppm was the critical level for the occurrence of eutrophication in lakes and reservoirs.

The present study on assessment of idol immersion on physico-chemical characteristics of Bhopal lakes revealed that idol immersion activity has negative impact on water quality of the lake. The total hardness was also reported higher in post-idol immersion. The values of DO, BOD, COD and Oil and Grease have shown an increase during and after immersion of idols as same reported (Dhote *et al.,* 2001). The input of biodegradable and non-biodegradable substances deteriorates the lake water quality and enhances silt load in the lake. The floating material released through idol in the lake, after decomposition result in eutrophication of the lake (Leland, *et al.,*1991).

The present study on Impact of idol immersion on water quality of Bhopal lakes" revealed that idol immersion activities have negative effect on water quality of lakes.

Acknowledgement :

The authors are grateful to Dr. Nayan Tara Pathak, Principal Govt. Geetanjali Girls P.G. College, Bhopal (M.P.) for her guidance and encouragement.

Reference :

APHA (1995) : Standard methods for examination of water and wastewater, American Public Health Association, Washington, D.C., 19th Ed.

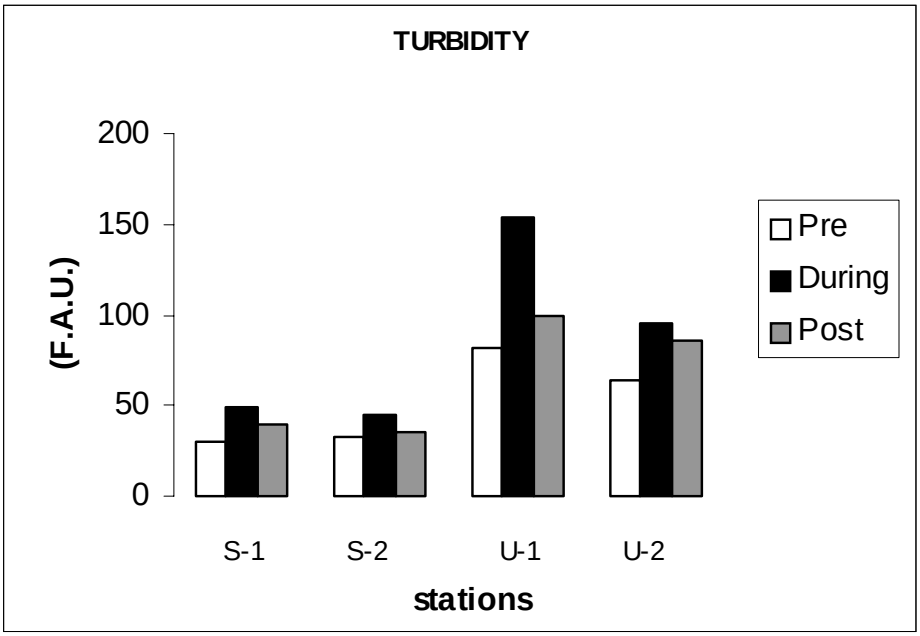

Fig. 1 : Variation in Turbidity at different stations. S-1 : Kalimandir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

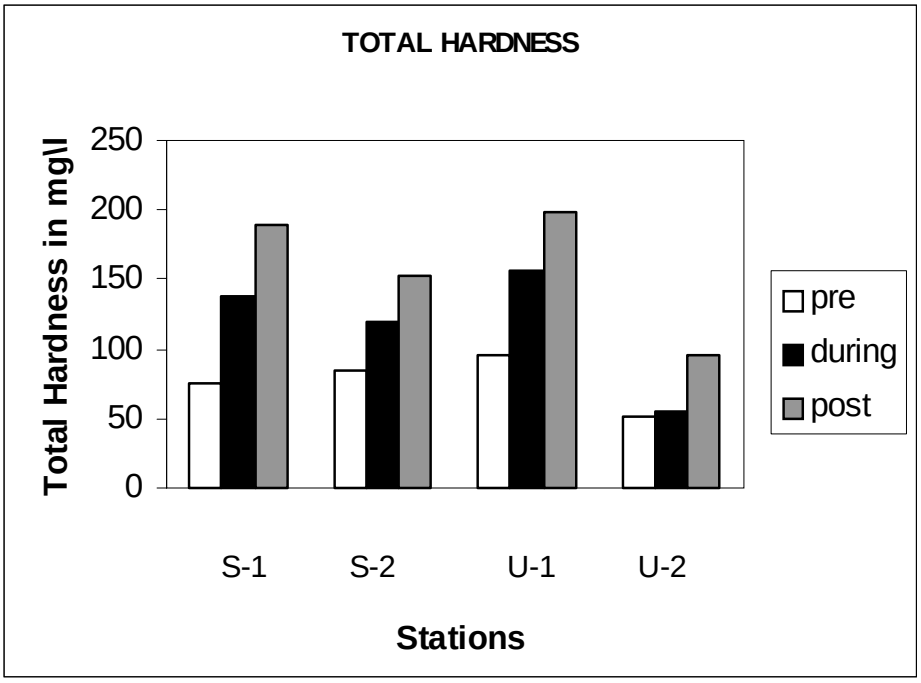

Fig. 2 : Variation in Total Hardness at different station. S-1 : Kalimandir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

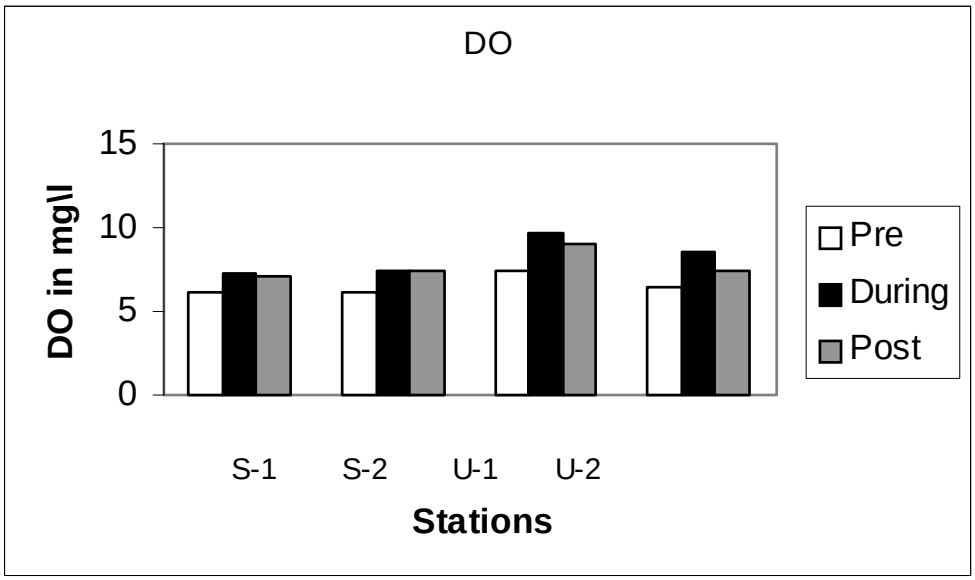

Fig. 3 : Variation in DO at different stations. S-1 : Kalimandir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

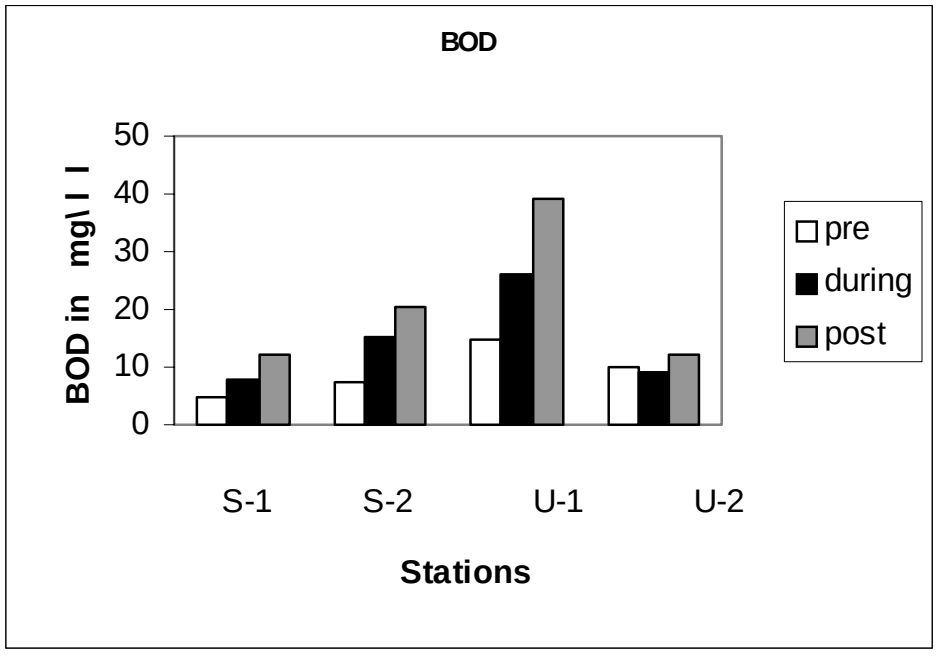

Fig. 4 : Variation in BOD at different stations. S-1 : Kalimandacir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

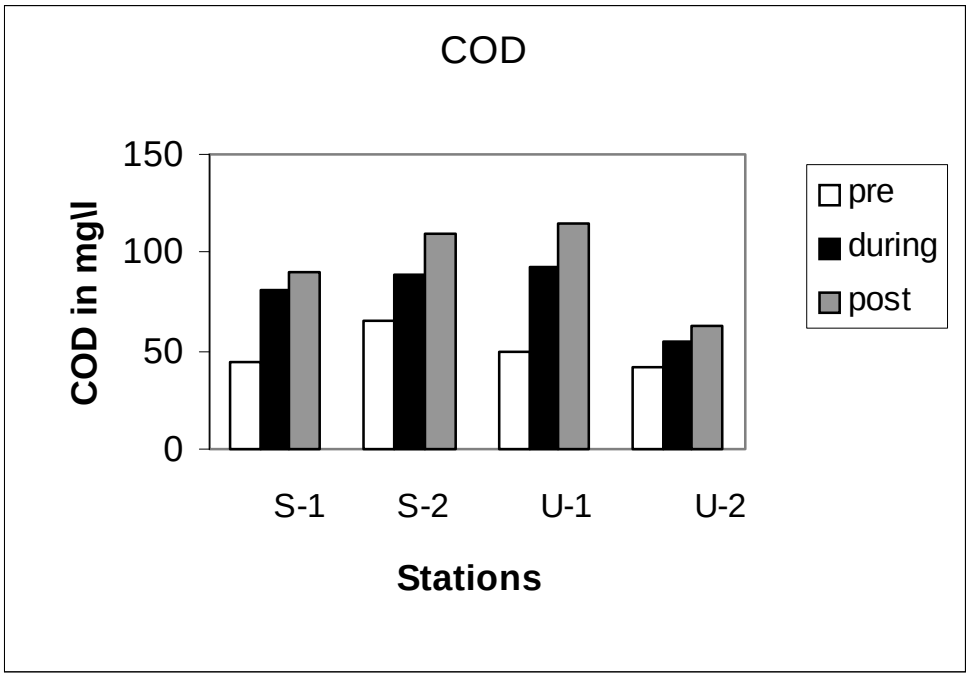

Fig. 5 : Variation in COD at different stations. S-1 : Kalimandir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

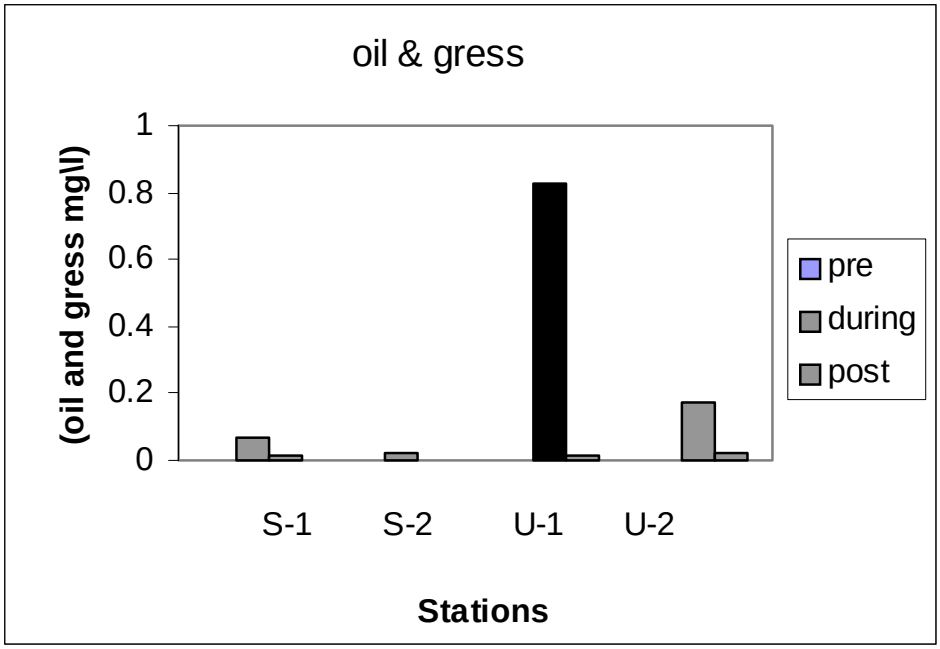

Fig. 6 : Variation in Oil & Gress at different stations. S-1 : Kalimandir, S-2 : Khatlapura, U-1 : Prempura, U-2 : Sheetal Das ki Bagiya

Bajpai A. *et.al*. (1993) : Limnological studies to assess water quality of Upper Lake, Bhopal *abst. Nat. Seem. On conserve and Dev. of Aqu. Resource*, 23-24.3 (Not seen in original).

De A.K. (2001) : Environmental chemistry, 4th edition, New Age International (P) Ltd., Publisher New Delhi, 378.

Dhote S., Varghese B. and Mishra S.M. (2001) : Impact of Idol immersion on water quality of Twin Lakes of Bhopal. *Indian Journal Environmental protection.*, **21,** 998-1005.

Goldman C.R. (1965) : Primary productivity and limiting factors in the lake of the Alaska Peninsula. *Ecol. Manogr*. **30,** 207-230.

ICMR (1975) : Manual of standards of quality for drinking water supplies Special report series No. 44, 2nd edition.

ISI. (1991) : Indian Standard Specification for drinking water, IS 10500.ISI, New Delhi.

Kulshrestha S.K., George M.P. and Khan A. A. (1988) : Preliminary studies on the impact of certain religious activities on water quality of upper lake, Bhopal. *Nat. Symp. Past Present and Future of Bhopal lakes*,:253-257

Leland H.V. *et al.* (1991) : Transport and distribution of trace elements in a watershed ecosystem.in Environment .Ed W. R. Boggess and B.G. Wixsion. Castle House Publication. pp 105-134 (Not seen in original).

Mc Coy, W.F. and Olson B.H. (1986) : Relation ship among turbidity particle counts and bacteriological quantity with in water distribution lines. *Water Res*., **20,** 1023.

NEERI (1991) : *Manual of water and pollution control* **1,** 9.

Nema P., Rajgopalan S. and Mehta C.G. (1984) : Quality & treatment of Sabarmati river water Ahmedabad. *J.I.W.W.A.* **16(1),** 99-107.

Pani S. and Mishra S.M. (2000) : Impact of hydraulic detention on water quality Characteristics of a tropical wetland (Lower Lake) Environmental pollution and its management. Pankaj Shrivastava, Ed. ABS Publication, New Delhi, pp. 286.

Petak W.J. (1980) : Environmental planning and management; The need for an integrative perspective, *Environ. Managem*. **4,** 287-295.

Reddy Vikram M., and Kumar Vijay A. (2001) : Effect of Ganesh Idol Immersion on some water quality parameter of Hussain Sagar, *Current Science*, **81,** 1412

Sharma B.K. and Kr H. (1997-98) : Environmental Chemistry Krishna Prakashan Media (P) Meerut (U .P.)

Singh R. and Mahajan I. (1987) : Phytoplankton & water chemistry of Rawalsar and Renuka lake. H.P. India. *J. Ecol*. **14(2),** 273-277.

Singh S.P., Pathak D. and Singh R. (2002) : Hydrobiological studies of two ponds of satna (M.P.), India, *Eco. Evn. and Cons*., **8(3),** 289-292.

Tamot S. and Sharma P. (2006) : Physico-chemical Status of Upper Lake (Bhopal, India) Water Quality with Special Reference to Phosphate and Nitrate Concentration and Their Impact on Lake Ecosystem. *Asian J. Exp. Sci*., **20 (1),** 151-158

Varughese B., Dhote S., Pani S. and Mishra S.M., (2004) : Impact of artificial aeration and ozonization on pathogenic bacteria of a tropical sewage fed lake, *Poll. Res*., **23(1),** 199-203.

Verma N., Mishra D. D. and Dixit S. (2006) : Effectiveness of Aeration units in improving water quality of lower lake, Bhopal , India, *Asian J.Exp Sci*., **20(1),** 87-95.

Vollenweider R.A. (1976) : Advances in defining critical loading levels for phosphorus in lake eutrophication. Hydrobiology, **33,** 53-83.

WHO (1968) : World Health Organization Tech. Report Sr. No. 406.