Hydro chemical changes in two eutrophic lakes of Central India after immersion of Durga and Ganesh idol

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Abstract

India is the country of rich cultural heritage and festivals. Peoples here religiously follow the rituals and enjoy festivity. In Indian mythology, water is one out of the five elements, which form the universe. Water bodies play the significant vital role in performing rituals. These rituals including taking holy dip in scared rivers idol immersion and tazia immersion.
Thousands of these idols, tazias are immersed in different water bodies such as lakes, reservoirs, ponds, rivers and canals in and around different parts of India. Similarly during the mohhrum festival, muslim community immerses tazias every year[1], These idols are made up of plaster of paris, clay and cloth supported by small iron rods, and is painted with different metal-based paints. On immersion of these idols in the water bodies, the water is contaminated with these metal paints and a change in chemical load in the water body is expected. When idols immersed, these colored chemicals dissolve slowly leading to significant alteration in the water quality. Thousands of Ganesh & Durga idols of various sizes reaching heights up to 45 to 50 feet are immersed in different parts of the country.
Key Words: Immersion, Idol, Ritual, Ganesha, Durga

Introduction

India is the country of rituals. Peoples have deep believed in these rituals and they follow it. Most of the rituals are performed near the bank of water bodies. Among the various rituals, two major festivals are i. Immersion of idols of Lord Ganesha in the month of August or September, after ten days of worship.

Immersion of Deity Durga idols are also immersed after performing nine days Durga pooja. Durga idol immersion started from asthami to dusshera. Thousands of these idols are immersed in different water bodies such as lakes, reservoirs, ponds, rivers and canals in and around different towns and cities in Maharashtra, Madhya Pradesh, Karnataka, Calcutta and Andhra Pradesh. These idols are made up of plaster of paris, clay, cloths supported by small iron rods, bamboo and are decorated with different types of paints such as varnish, water colors etc. When idols are immersed in the water, these metallic paints, clay, etc. dissolve slowly leading to significant alteration in the water quality. According to Mukharjee[2] the biodegradable matter after decomposition recycles to the system while non-biodegradable substances form sediments. The nonbio-accumulation of heavy metal in biological system transfers the toxic element from producer to consumer level, which can be a future health hazard. Thousands of Ganesh and Durga idols of various sizes reaching heights up to 20 to 40 feet are immersed every year in different water bodies of the city[3].

Lot of study had been performed on upper lake and lower lake of Bhopal (M.P.) by taking the above aspect; Shahpura Lake is still untouched regarding this aspect. Loading of idol immersion is reduced after the construction of separate Prempura Ghat

over upper lake of Bhopal, but it is not totally banned. The people living near water bodies use to immerse idols to nearest water bodies. Shahpura lake, lower lake, Sarangpani Lake, Char Imli Lakes are used by common peoples living in Shivaji Nagar, Shahpura, Arera Colony, BHEL area. They cannot approach to the separate ghat because of distance.

Due to tremendous population growth of the city (from just over 0.1million in 1951 to about 1.8 millions in 2007) and rapid urban development of the city lakes are facing various environmental problems resulting in deterioration of its water quality. The major cause of environmental problem is idol immersion activity especially in Bhopal lakes. The two eutrophic lakes Shahpura and lower lake were studied.

Shahpura Lake: Third Lake of Bhopal city is also known as Shahpura Lake or Mansarover Lake. The lake is situated in New Bhopal City, the capital of Madhya Pradesh (La $23^0 12' 00''$E and Long.$77^0 25' 30''$N). The lake has a catchments area of 8.29 km^2 and a submergence area of 0.96 km^2. This lake is surrounded by human habitation and receives untreated sewage from various point and non point sources. It was constructed in the southern part of city near Chuna Bhatti village in the year 1974-75 under the Betwa irrigation scheme. The lake water has been used for irrigation and fish culture. The water quality is deteriorating day by day not only sewage inflow, but also by siltaton, domestic sewage, washing of clothes and vehicles and dumping of solid wastes[4].

Lower Lake The lower lake, which is one of the twin lakes, is situated midst the thickly populated area of the lake city Bhopal (Lat., $23^0 16' 00''$N, Long.$77' 25' 00''$E), the lake was constructed on the seepage point of upper lake[5]. It was constructed by Nawab Chhote Khan in 1974 AD. It has a catchments area of 9.60 sq. km. and water spread area of 1.2 sq. km. The lake water is not suitable for drinking it is being used by large number of people living near or around the lake for daily needs of bathing, washing clothes and vehicles. It also forms a dividing line between the old and new Bhopal town. The whole lake is thus converted into a large septic tank making the lake shallower and shallower day by day. Diversion of immersion ghat reduced the loading of idol of idol immersion but unable to stop completely. 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[6]. Biodegradable matter after decomposition recycles to the system while non-biodegradable substances form sediments. The bioaccumulation of heavy metal in biological system transfers the toxic element from producer to consumer level, which can be a future health hazard[2].

Materials and Methods

Samples were collected and preserved from both the lakes as per standard methods mentioned in APHA[7]. Sample collection was scheduled in such a way that it can cover most of important sampling points at different time. Samples were collected from each station before the idol immersion that was before Ganesh idol immersion and the post immersion samples were collected after the immersion of Durga idols. Six samples were collected from each lake from different sampling points. After collecting the samples, samples were analyzed as per standard methods given in[7,8]. Identification of sampling points was based on the gratitude and degree of idol immersion.

Result and Discussion

pH: pH was analyzed by pH meter. Value of pH was found to be increased after immersion of idol in Shahpura lake. It might be due to the addition of organic matter and material used in the preparation of idols. Maximum change in pH was observed at SL3 south eastern part of the lake, it is one of the site for idol immersion. (Fig. SL-1). Remarkable variation in pH at SL2 eastern zone, SL3 south eastern zone, SL4 southern zone. Impact at SL6 was negligible because of its location in the center of lake. Trend observed in both year are identical.

In case of lower lake pH was increased after immersion of idol. At most of the station in both the years' pH was observed higher (Fig. LL-1).

Conductivity: Conductivity increases with the increase of cation and anion in the water. It was analyzed by conductivity meter. Results indicating that after immersion conductivity increases in both the years in 2007 and 2008 (Fig. LL-2). Similar observations were observed in case of Shahpura lake (Fig.SL-2).

Total Hardness: Total Hardness was analyzed by titremetric EDTA method. In the year 2007 maximum change in hardness was observed in southeastern and southern part of Shahpura lake. Similar pattern was also observed in the year 2008. In Southeastern part maximum immersion takes place at sluice gate because of easy accessibility. Material used for the preparation of idols is responsible for increasing hardness. (Fig.SL-5)

In lower lake maximum variation observed in south western zone of the lake where old dhobi ghat is situated n the year 2007. Whereas in the year 2008 maximum variation was observed in northern and eastern zone of the lake. (Fig.LL-5)

Nitrate: Nitrate in samples were analyzed by spectrophotometric phenol di sulphonic acid method at 420 nm. It is one of the pollution indicating parameter. Nitrate was observed well with in the range (BIS std.45.0 mg./l). But general observation is that it was increased after idol immersion because of the addition of organic matter along with idol immersion. Variation in nitrate concentration was observed more in 2008 in Shahpura lake. (Fig.SL-6) Maximum variation was observed in southern and southeastern part of the lake. In southern and southeastern part Sluice Gate and Manisha market is situated respectively.

As compare to Shahpura Lake concentration of Nitrate observed was low in lower lake. In the year, 2007 maximum variation was observed at southeastern and southern part of the lake. In 2008 variation was observed at northern and eastern part of the Lake, indicating that loading of immersion at various points' changes year to year. (Fig.LL-6).

Ortho-Phosphate: Ortho phosphate is also increases after idol immersion, because of addition of organic matter. In lower lake maximum variation was observed in northern zone of the lake in 2007. In the year 2008 variation takes place at western part of the Lake (Fig.LL-8).

In Shahpura lake in the year 2007 maximum variation observed in Southeastern part of the Lake However in the year 2008 maximum variation observed in Northern part of the lake Fig.(SL-8).

Biological Oxygen Demand: It was analyzed by Five days incubation method[8]. BOD is one of the pollution indicating parameter. Concentration of BOD also increases after immersion. A higher BOD value indicates the presence of organic material [9]. Decomposition of organic matter helps in increasing concentration of organic matter. Maximum change in Concentration of BOD was observed at Northern and Southern part of the Lake. Both zones have temples Kalimandir and Khatlapura. Rituals are performed regularly at these points (Fig.LL-9).
In Shahpura lake value of BOD varies very much on Northern and South Eastern part of the lake.(Fig. SL-9)

Chemical Oxygen Demand: Chemical Oxygen Demand is an important parameter for knowing the quality of water. It was analyzed by potassium dichromate open reflux method[7]. By addition of pollutants, the concentration of COD also increases. In the study if idol immersion the results observed was higher after the immersion of idols. In lower lake, maximum variation was observed in the northern zone of the lake Fig. (LL-10).

In Shahpura lake maximum variation was observed in northern and southern zone of the Lake (Fig. SL-10).

Heavy Metals: Samples for heavy metals were collected as per standard method of sample collection given[7] and acidify with 5 ml of 1N HNO3

and bringing down the pH to near about 4. After acidifying samples concentration of heavy metal were analyzed by atomic absorption spectrophotometer.

Lead: Lead occurs naturally in the environment. However, most lead concentrations that are found in the environment are a result of human activities. Due to the application of lead in gasoline an unnatural lead-cycle has consisted. In car engines lead is burned, which results into lead salts. These lead salts enter the environment through the exhausts of cars. Lead is also used in leaded pipes, car batteries, ceramic glazes, screen of computers, in paints, enamels etc. Lead is present in the paints used for decorating idols i.e. the concentration of lead also increases after the immersion of idols. It not only affects human being it also affects water organisms and soil organisms. The result also supports that level of lead increased after immersion.

Results show that maximum concentration varies at northern and Southeastern zone of Shahpura lake (Fig.SL-11). In lower lake, maximum variation was observed at Northern and Southern part of the lake in both the years 2007-2008 (Fig.LL-11).

Chromium: Chromium mainly used in preparation of alloys such as stainless steel, in chrome plating and in metal ceramics. Chromium plating was once widely used to give steel a polished silvery mirror coating. Chromium is used in metallurgy to impart corrosion resistance and a shiny finish; as dyes and paints, its salts colour glass an emerald green and it is used to produce synthetic rubies. For decorating the idols paints are used which is the main source of Cr during idol immersion. Usually Cr is negligible in both the lake but after immersion it increased little bit.

In lower lake concentration of chromium is very less, some times it was BDL. After immersion, concentration increased little Bit at Northern and western zone of the lower lake (Fig.LL-12). In Shahpura lake maximum, variation in lead concentration was observed at Western and Central part of the Lake (Fig.SL-12).

Conclusion

From results observed we can infer that the DO values of the samples indicated only little or no significant changes. There was slight variation in heavy metal concentration like chromium and lead. The contamination observed during idol immersion had been carried away during the lapse of time it is not permanent.

By interpreting, the data we can say that in lower lake maximum variation was observed at northern and southern part of the Lake. In Shahpura lake maximum variation was observed at northern, southeastern and Southern part of the Lake. It may be due to maximum idol immersion on particular location. At these points concentration of turbidity, TDS, BOD, COD, total hardness, nutrients, lead, and chromium observed high after the immersion of idols.

West bengal pollution control board report[10] mentions that these variations are not permanent. After some time impact of idol immersion reduces because of dilution. If we aware the people without harming religious sentiments of the people it could be beneficial for people as well as for environment. It will be nice gift for our coming generation.

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Impact of idol immersion on various parameters of Lower Lake 2007 & 2008

Fig.LL1

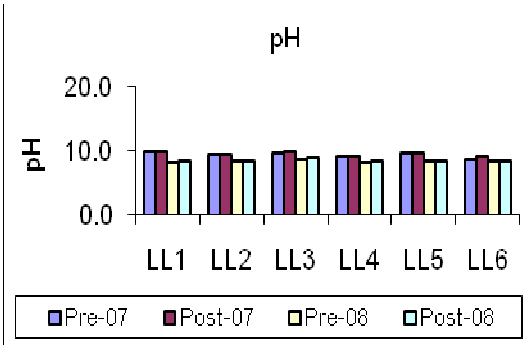


Fig.LL2

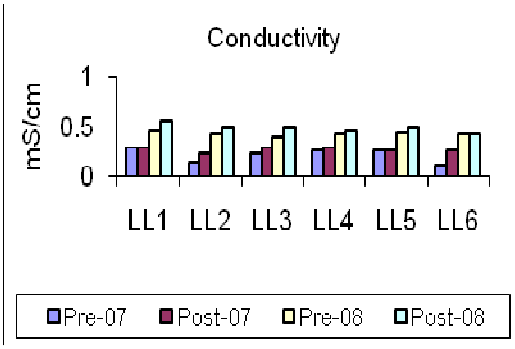


Fig. LL3

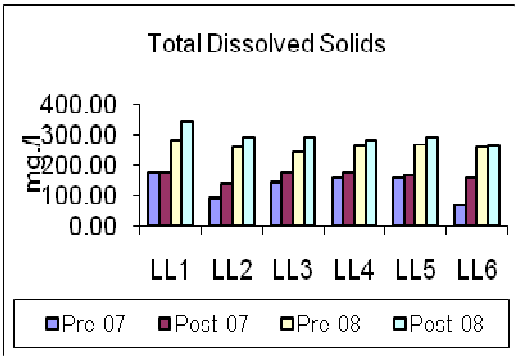
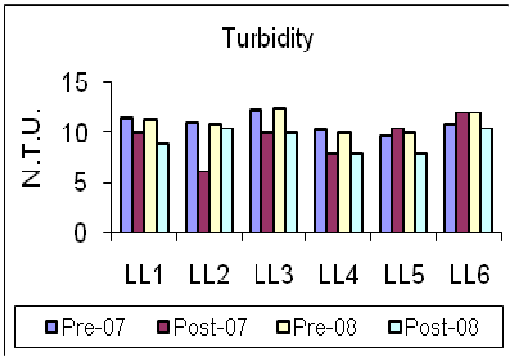


Fig LL4



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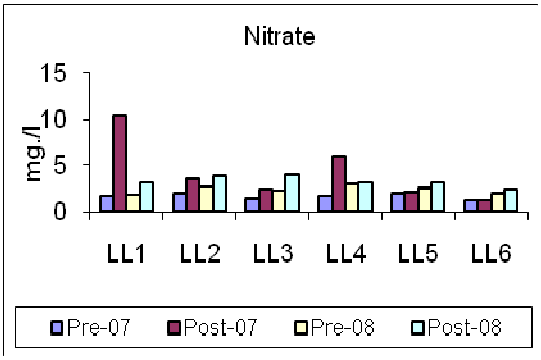

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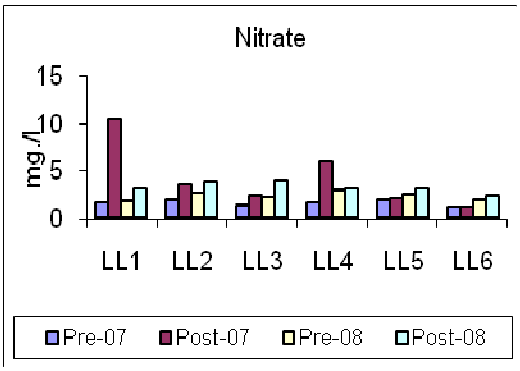

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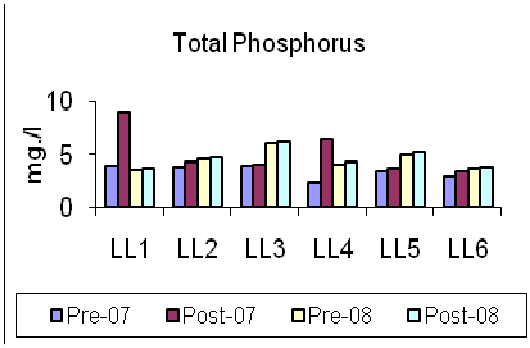

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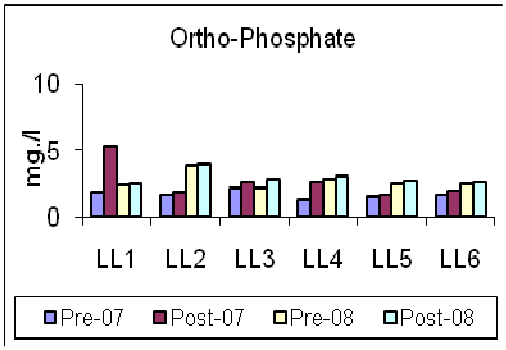

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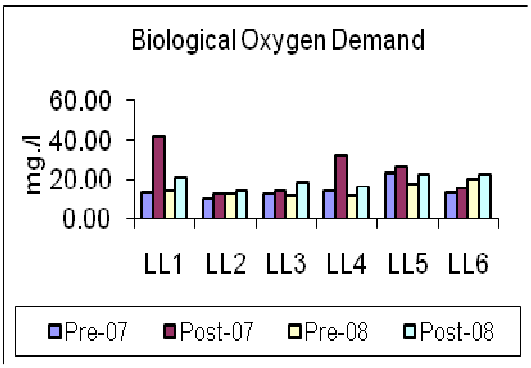

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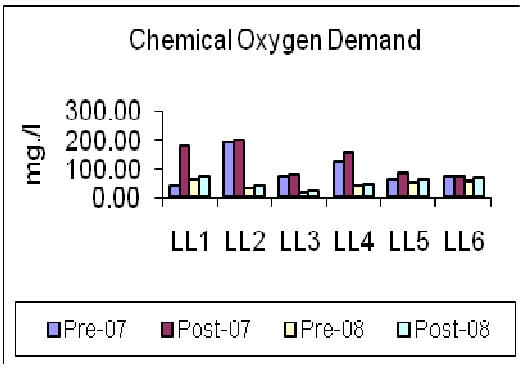
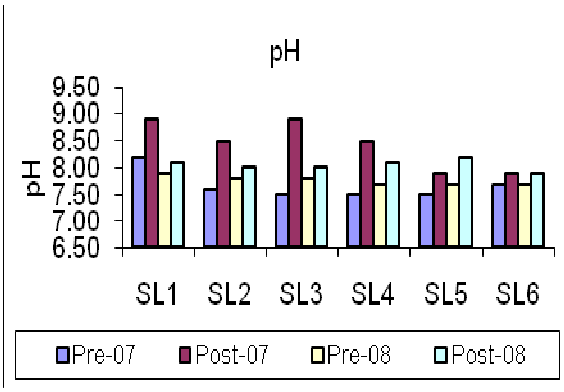


LL1-Northern Zone	LL4-Southern Zone
LL2-Eastern Zone	LL5-South Western Zone
LL3-Western Zone	LL6-Central Zone

Impact of idol immersion on various parameters of Shahpura Lake 2007 & 2008

Fig.SL1



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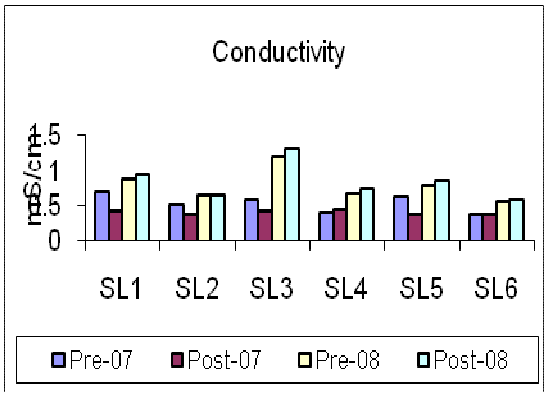

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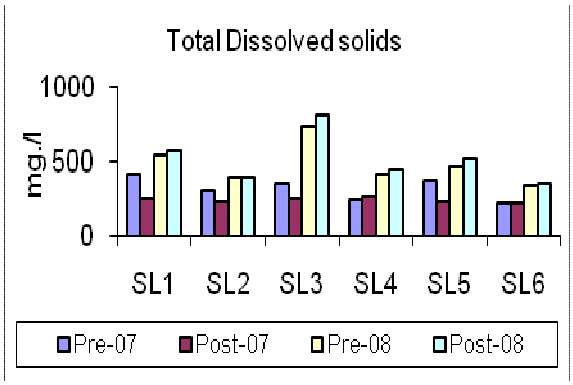

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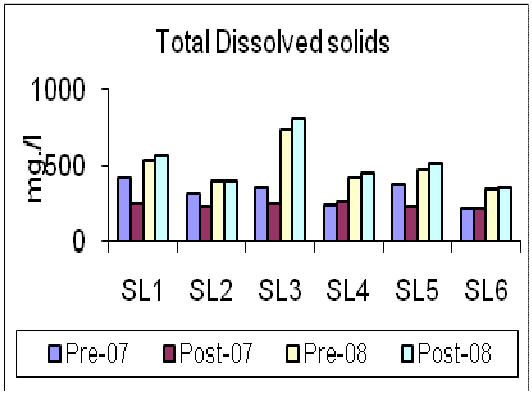

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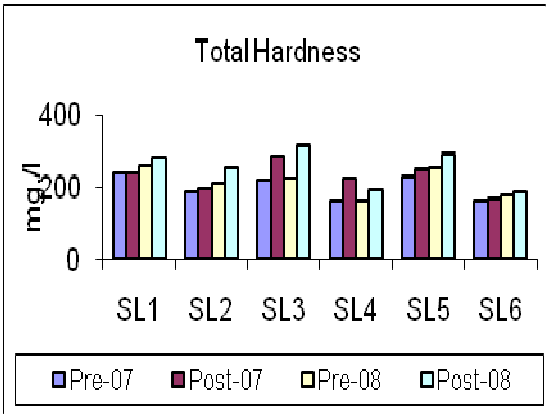

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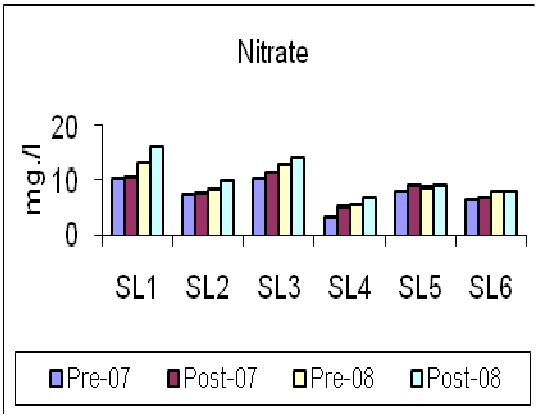

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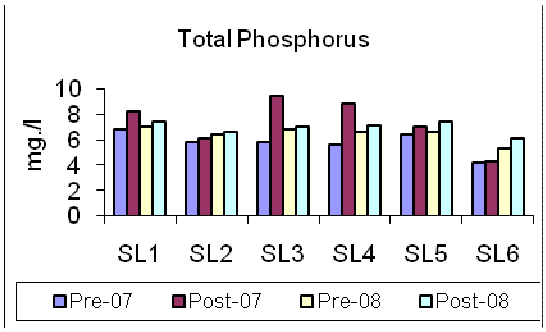

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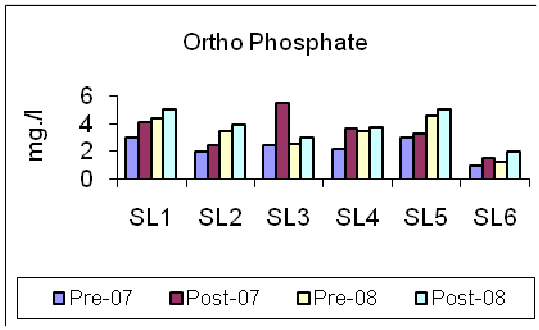

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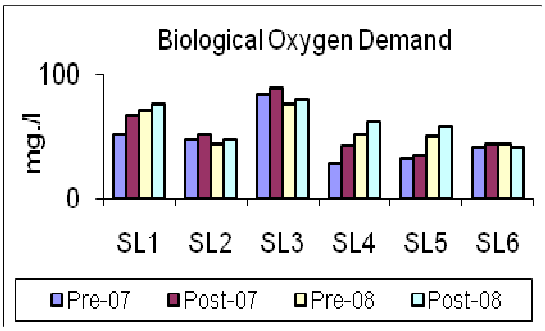

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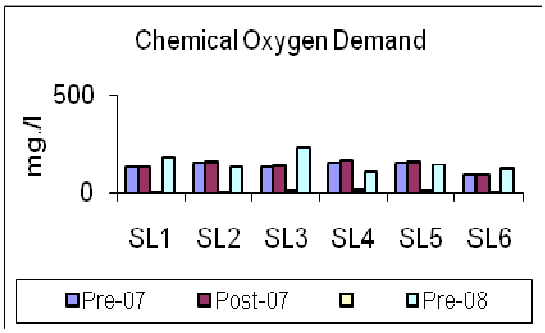

SL1-Northern Zone	SL4-Southern Zone
SL2-Eastern Zone	SSL5- Western Zone
SL3-South Eastern Zone	SL6-Central Zone