

Study of the Impact of Plaster Of Paris (Pop) and Clay Idols Immersion in Water

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Abstract— *Idol immersion activities during certain festive occasions are adding to the pollution load of the water-bodies. Non-biodegradable materials and synthetic paints used for making these idols are posing serious threat to aquatic life and environment. Present study was conducted to assess the impact of idol immersion on water. For this purpose, water sample were collected from Nanpura immersion point at morning during pre immersion, immersion and post immersion periods of Ganesh idols. The significant changes in certain physicochemical properties of water revealed decrease in the dissolved oxygen, BOD and free CO₂, whereas increase in the total alkalinity, total hardness, total Calcium, COD, Oil and Grease, temperature and pH were observed during immersion period. In view of the observed changes in the water quality, there is need to aware masses to use eco-friendly material for idol so that culture and environment can be preserved in a cohesive manner.*

Keywords— Idol immersion, water pollution, plaster of perish, heavy metals.

I. Introduction

The most vital resource for life on the planet is water. There cannot be life without fresh water, which is only 2.7 % of total water on the earth. The issues of water are becoming increasingly important to environment particularly with respect to human health and their food. Festivals are an integral part of rich and diverse cultural heritage of India. In India idol immersion is another anthropogenic activity (Kaur, 2012). The immersion of idols in the river water can change physicochemical property of water and making it unpalatable and affect both flora and fauna present in the river. Similarly, pollution is also increasing due to certain religious activities like Ganesh Puja, Durga Puja, Moharam etc.

The country like India, Idol worship is very common. Idols are made of so many materials like wood, stone, bamboo, jute, grass, clay and plaster of paris (PoP). To make these idols decorative and attractive they are painted with bright synthetic colour or lead oxide (Sindoor-orange colour) mixed with oils which contain large amount of heavy metals. Wood, stone, grass, jute, flowers, germinated seeds, leaves etc. Such material may contain a wide variety of organic and inorganic pollutants including oil, grease, plastics, heavy metals and suspended

solids and cause short term deterioration of water quality due to their decay.

On the other hand, paints with plenty of heavy metals cause health hazards in the long run. Pollution of water bodies is a major concern in today's era. Idol immersion activities during certain festive occasions are adding to the pollution load of the water bodies. Non biodegradable materials and synthetic paints used for making these idols are posing serious threat to aquatic life and environment. Water quality assessment is an important exercise to evaluate the nature and extent of pollution in order to take appropriate control measures.

Toxic exposure of the larger community through these deadly chemicals and heavy metals used for making the idols is now being placed under the scanner of authorities and civil society groups with greater focus than ever. In terms of health impacts, paints are a greater source of hazard and most of those used for decorating idols are chemical-based. They contain heavy metals like mercury, cadmium and lead, which are neurotoxin and nephrotoxin. These metals are bioaccumulative, implying that once they enter marine life forms like fish; they pass-up the food chain and end up in the food that we eat. Incidentally, the brighter the colour, the greater is its toxicity. Red, blue, orange and green colors are known to have higher content of mercury, zinc oxide, chromium and lead. Even a single drop of mercury on a person's skin can be fatal. One drop in a 20-acre lake can make the fish poisonous to the birds, animals, and people that eat them.

The higher amount of lead (Pb) in the harbour waters of Vizag cause marked decrease in biochemical constituents like carbohydrates, proteins and lipids of mullet *Liza parsia* which indicates negative impact on the nutritive value of the same (Bharatha et al., 2001).

Mahajan and Zambare, 2001 study showed that the effect of acute and chronic doses of copper sulphate and mercuric chloride on oxygen consumptions of the fresh water bivalve *Corbicula striatella* and the results shows reduction in the uptake of oxygen.

The present study was carried out in the laboratory condition to assess the impact of PoP, clay and other Idols on immersion in water on physicochemical parameters, heavy metals and bio-assay test. Two experiment have been carried

out to assess the impact of idol immersion on water. The first experiment was conducted using PoP idol for immersion and the second experiment was conducted using both PoP and clay idols for immersion.

II. Material and Methodology

The present study were carried out in the laboratory to find the impact of PoP, clay and other idols on immersion in water. The study has been divided into two part – In the first part only PoP Idol was taken for study and in the second part PoP, Clay and other Idols jointly taken for study. The Idols were immersed in 5 litre. of bore well water for 48 hours. One part has been kept in stagnant condition and another part has been kept on mechanical shaker device at 50 RPM for 48 hours. After 48 hours the water samples were taken out for analysis of physicochemical parameters (Conductivity, Turbidity, pH, Alkalinity, Total Hardness, Calcium Hardness, Magnesium Hardness, Chloride, Total Solids, Dissolved Solids, Suspended Solids, Oil & Grease, B.O.D and C.O.D), Heavy Metals (Chromium, Lead, Zinc, Copper, Iron, Mercury, Nickel and Cadmium) and bio-assay test as per the standard procedure (APHA, 2005). The same procedures were applied for mixed idols made of PoP, clay and other materials.

III. Results and Tables

The lab scientific study were focused on assessment physico-chemical characteristics of the water revealed that idol immersion activity has negative impact on water quality. The physico-chemical parameters particularly conductivity, turbidity, conductivity, alkalinity, total hardness, calcium hardness, magnesium hardness, chloride, total solids, dissolved solids, suspended solids B.O.D and C.O.D shows higher concentration after 48 hours of PoP and PoP with Clay idol immersion. The results of pH and Oil & Grease do not show any remarkable impact after idol immersion and it may be due to because fresh idol has been taken for study (Table 1). The study on assessment of idol immersion on heavy metals concentration in the water shows that the increase concentration of lead and cadmium were found after 48 hours of immersion. On the other hand concentration of chromium, zinc and copper were found decrease after 48 hours of immersion which may be due absorption or reaction of metal with PoP or clay (Table 2). The fast synthetic colors are being used in the making of idols which is insoluble in water in short duration and may deteriorate in long duration of time.

IV. Conclusion

After 48 hours of immersion in lab condition the PoP idol does not dissolved and remains as it was before immersion. The color of the idol also remains as bright as it was before start of the test. The clay idols were dissolved completely after 48 hours of immersion resulting in the increase of solids in the immersion water. It could be assumed that the PoP idols after immersion in the natural water bodies remain as it is causing

problem of sedimentation and slow pollution in the water bodies for long duration of time in comparison of Clay idols.

The heavy metals concentration in the water after 48 hours of idol immersion in lab condition shows increase in the concentration of Lead and Cadmium which may be toxic and harmful to the aquatic environment as well as human being. The concentration of chromium, zinc and copper decreased from control water concentration which may be due to absorption of metals in PoP or clay during continuous immersion for 48 hours in the water in lab condition. The water after 48 hours of immersion does not show any toxicity in bio-assay test which shows that the impact of heavy metals use in color manufacturing do not show their effect in short duration but it may be harmful for aquatic life as well for human beings slowly in long time.

The present study was conducted for 48 hours using few idol for immersion in the lab condition though there are a variety of idols available in the market hence before finalizing any guideline detail study by an expert agency should be conducted to reach on any conclusion on exact impact of idol immersion particularly of PoP idol in the water bodies.

Recommendations

On the basis of above study following recommendations is suggested for immersion of idols during festive occasions.

1. The immersion of PoP made idols should not be allowed in the natural water bodies since it remains insoluble in water for long time causing problem of sedimentation and slow impact on water body for long duration of time.
2. Specific areas should be marked for immersion and related activities to prevent indiscriminate disposal and facilitate retrieval of reusable materials.
3. Temporary confined pond near river locations should be identified and develop as per CPCB guidelines for immersion of idols and materials to prevent pollution of main river.
4. The pond water may be disposed appropriately.
5. The offerings like flowers and leaves may be collected in separate containers or in pits for composting.
6. After immersion, the recyclable articles like jari, plastics, aluminium foil, wood and bamboo may be taken out from the water bodies.
7. Regular awareness activities should be carried out to educate people in this regards.
8. Environment friendly practices such as use of biodegradable dyes and paints should be encouraged.
9. Use of permanent idols made of brass or stone should be promoted.
10. Use of idols made by clay using natural color should be promoted instead of PoP made idols.
11. During survey of the market PoP idols are not found more than 16 inch in height. All the bigger idols are made of grass and clay but it was found during survey that the colors used are not natural. In this regards to control the idols should be made in natural colors.

12. PoP idols should be allowed to dispose in artificial ponds.

13. The present study is a preliminary study conducted for 48 hours using few idols for immersion in the lab condition. There are a variety of idols available in the market hence before finalizing any guideline detail study by an expert agency is recommended to be conducted to find out the exact impact of idol immersion particularly of PoP idol in the water bodies.

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Table 1. Physico-chemical parameters.

S.N	Parameters	Unit	Control Water Sample	Water after 48 hours of PoP Idol immersion in still water	Water after 48 hours of PoP Idol immersion in shaking water	Water after 48 hours of PoP & Clay Idol immersion in still water	Water after 48 hours of PoP & Clay Idol immersion in shaking water	IS: 10500-1991 (Specification for Drinking Water)	
								Desirable Limits	Permissible Limits
1.	Turbidity	NTU	1.0	10.0	24.0	12.0	26.0	5.0	10.0
2.	Specific Conductivity	µmho/cm	386.0	1528.0	3399.0	1830.0	3254.0	-	-
3.	pH	-	7.22	7.20	7.25	7.30	7.38	6.5-8.5	-
4.	Chloride	mg / l	12.4	64.0	72.0	70.0	125.0	250.0	1000.0
5.	Total Alkalinity	mg / l	30.0	90.0	95.0	150.0	175.0	200.0	600.0
6.	Total Hardness	mg / l	260.0	810.0	1015.0	820.0	1625.0	300.0	600.0
7.	Calcium	mg / l	88.1	300.5	376.6	328.5	601.0	75.0	200.0
8.	Magnesium	mg / l	11.5	17.2	21.6	20.1	36.0	-	-
9.	Total Solids	mg / l	357.0	1610.0	3530.0	1862.0	3572.0	-	-
10.	Dissolved Solids	mg / l	345.0	1466.0	3360.0	1788.0	3180.0	500.0	2000.0
11.	Suspended Solids	mg / l	12.0	144.0	170.0	74.0	392.0	-	-
12.	Oil & Grease	mg / l	Nil	Nil	Nil	Nil	Nil	-	-
13.	B.O.D. (3 days, 27°C)	mg / l	0.6	1.8	2.0	2.0	2.2	-	-
14.	C.O.D.	mg / l	16.0	60.0	112.0	60.0	104.0	-	-

Table 2. Heavy metals and bio-assay test.

S . N .	Parameters	Unit	Control Water Sample	Water after 48 hours of PoP Idol immersion in still water	Water after 48 hours of PoP Idol immersion in shaking water	Water after 48 hours of PoP & Clay Idol immersion in still water	Water after 48 hours of PoP & Clay Idol immersion in Shaking water	IS: 10500-1991 (Specification for Drinking Water)	
								Desirabl e Limits	Permis sible Limits
1 . .	Chromium	mg / l	0.0771	0.0437	0.0309	0.0349	0.0380	0.05	-
2 . .	Zinc	mg / l	0.5435	0.1129	0.0018	0.0060	0.0009	5.0	15.0
3 . .	Copper	mg / l	0.0192	0.0064	0.0135	ND	ND	0.05	1.5
4 . .	Lead	mg / l	0.0811	0.2673	0.1855	0.1087	0.1853	0.05	-
5 . .	Cadmium	mg / l	0.0047	0.0007	0.0147	0.0313	0.0197	0.01	-
6 . .	Bio-assay	LC ₅₀	Nil	Nil	Nil	Nil	Nil	-	-

ND= Not Detectable