

SUMMARY AND CONCLUSION

CHAPTER V

Ganesh festival is celebrated traditionally in Maharashtra and rest of India in a big way and the worshiped idols are immersed in different water bodies like lakes, reservoirs, rivers, wells, estuaries and open beaches deteriorating the quality of that water body. Along with the idols decorations, flowers and other offerings are also immersed in the water courses have great environmental and ecological implications. These idols are made up of a typical clay 'shadoo' or Plaster of Paris, bamboo hay and supported by small iron rods. Different water soluble colours are used to decorate the idols which contain mica for luster. Many times varnish is used to give luster to the idols.

The colours used for colouring the idols contain different heavy metals such as copper, zinc, lead, chromium, iron, cadmium, etc. These heavy metals do not undergo degradation and have unique tendency to accumulate in the ecosystem. Cycling of these toxic trace metals in nature generates long term impact on all living creatures dependant on the natural ecosystem. Any natural body of water has disintegrating biomass resulting from the habitats of insects, microorganisms as well as microplants present in the ecosystem. This disintegration process gives rise to natural organic carbon which has the ability to react with the trace metals present in the water body. Such organometallic complexes accelerate transportation and mobilization of toxic trace metals in natural ecosystems. These organo-metallic complexes enter in food chain and show the effect of biomagnification. Therefore, it is very important to avoid the entry of heavy metals in the water bodies. When the idols are immersed in water bodies, after dissolution they alter the physicochemical characteristics of the particular water body.

In the present study, the effect of idol immersion on the water quality during the Ganesh festival has been studied. For this purpose seven sites from Kolhapur city were selected considering the more number of immersions. The

seven sites include, Rajghat and Sandhyamath from Rankala lake, Irani Khan, Kotiteertha Lake, Rajaram Lake and Panchganga Ghat and Rajaram Bandhara from Panchganga river. The toxic effect of the colour pigments on the freshwater bivalve, *Lamellidens marginalis* was observed. The toxicity study was carried out by exposing the bivalves to 400 ppm and 900 ppm colour pigments for 10 days and 20 days. The effect of Shadoo clay and PoP idols on the bivalves was also studied. Biochemicals like proteins, glycogen, cholesterol, lactic acid were studied. The effect of colour pigments on the enzymatic activity was also studied. Heavy metal accumulation study was carried out and the changes in the histological structures of gills and hepatopancreas of the bivalves were recorded after exposure to colour pigments. Following are some conclusions drawn from the observations of the study conducted.

1. The immersion of idols in the water bodies takes place on 1 ½ day, 5th day and 10th day of the Ganesh festival. As on the 1½ day very small number of idols are immersed in water bodies no significant alteration in the water quality was observed.
2. pH of the water bodies showed significant rise in values after the immersion of idols during festival as compared to values before immersion. Increase in pH is due to the addition of plaster of paris which mainly composed of calcium sulphate which also increases the hardness of the water body. Thus calcium and magnesium content changes the pH and hardness of the water body.
3. Turbidity of the water bodies showed significant increase in values after immersion of idols. This is true in case of lentic water bodies such as Rankala, Irani Khan, Kotiteertha Lake and Rajaram Lake. In case of lotic water bodies like river increase in turbidity cannot be correlated only with idol immersion practices as many other non point sources also contribute in the water quality as well as subsequent dilution due to continuous flow. In case of

other parameters also the results of the river water body cannot be correlated with only Ganesh festival and idol immersion.

4. Immersion of idols in the water bodies increases the BOD and COD values as various organic and inorganic substances such as decorations, offerings, etc. along with idols are immersed in water. This reduces the dissolved oxygen levels of water bodies.
5. Nitrates and phosphates of water bodies showed increase in values after immersion of idols due to addition of Plaster of Paris and degradable matter in the water.
6. Due to heavy metals released from paints and decorations, chemical oxygen demand of water bodies increases. These heavy metals adversely affect the aquatic biota by entering through food chain. Heavy metals alter the biological constituents of the organisms.
7. The protein contents of the bivalve, *Lamellidens marginalis* exposed to colour pigments, PoP and clay idols showed decrease as compared to control indicates proteolysis and impaired protein synthesis.
8. The glycogen contents of the bivalves showed reduction when exposed to colour pigments, PoP and clay idol because of increased energy requirement under stress of toxicants and increased glycogenolysis.
9. The cholesterol content in the bivalves exposed to colour pigments showed decrease in all tissues due to its consumption for providing energy demands.
10. Accumulation of lactic acid in the bivalves exposed to colour pigments, clay and PoP idols was observed suggests "hyperlactimia" or "lactic acidosis" under stress condition.

11. Acid and alkaline phosphatase activities in the bivalves exposed to colour pigments, PoP and clay idols showed increase indicating the oxidative stress caused by toxicants.
12. GOT and GPT activities in the bivalves exposed to the colour pigments, clay and PoP idols showed significant increase as compared to control bivalves suggests damage to the organs, disease multiplicity and cytotoxic injury to the animal.
13. Decrease in lactate dehydrogenase activity was observed in the bivalves exposed to colour pigments, clay and PoP idols for long periods which in turn causes accumulation of lactic acid in the animal body indicating the situation of hypoxia.
14. Heavy metals like copper, zinc, lead and chromium were found to be accumulated in the soft body of the animal after exposure to colour pigments. Increase in accumulation of metals in the animal body increases with concentration and duration of exposure.
15. Changes in the biochemicals were reflected in the histological structure of the bivalves. The gills of the bivalves exposed to stress of colour pigments, clay and PoP idols showed marked changes such as increased filament and interfilament cavity, damage to basal filament, vacuolation in the connective tissue and accumulation of dark stained material in the gill filaments. Thus altered microscopic structures suggests the adverse effect of colour pigments used for colouring of the idols.
16. The light microscopic structure of the hepatopancreas of the bivalves exposed to colour pigments, clay and PoP idols showed elongated irregularly shaped digestive tubules with reduced lumen and large vacuolation in the

connective tissue indicating the effect of colour pigments, PoP and clay idols at cellular level, disturbing metabolism of the organism, which is also supported by biochemicals and enzymes.

From the foregoing it can be concluded that the idol immersions in the water bodies is causing damage to the biota which is very clear from the results obtained from toxicity studies as well as the water gets contaminated and becomes unfit for drinking purpose. Various efforts such as dry immersion, use of ecofriendly colours for colouring the idols, artificial tank construction for immersion, use of permanent idol for worship should be taken into consideration before celebrating the festival. It may be useful to take steps and start the reforms and make efforts to also publicize the measures by educating all stakeholders in the government and community. The journey of thousand miles always starts by taking one step in the right direction.