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# Seasonal Analysis of Soil Sediment of Shahpura Lake of Bhopal (M.P.)

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***Abstract*—Soil gets polluted due to dumping of waste. Solid waste is garbage, refuse, sludge, and other discarded materials (including solids, liquids and contained gases) resulting from industrial, commercial, mining, and agricultural operations, and from community operations. The soil samples were taken from Shahpura lake of Bhopal to assess the soil quality. During the study period physico–chemical parameters viz pH, Moisture content, Bulk Density, Chloride of soil was assessed as per the standard methods. High chloride value indicates pollution of soil sediment due to urbanization, industrialization and modernization in agricultural system results in extensive use of chemical fertilizers and pesticides.**

***Index Terms*—Bulk density, Moisture content, Chloride.**

## I. Introduction

**Soil** is derived from the Latin word "Solum" which means earthly material in which plant growth takes place. **Soil** is a natural body consisting of layers (soil horizons) of mineral constituents of variable thicknesses, which differ from the parent materials in their morphological, physical, chemical, and mineralogical characteristics. It is composed of particles of broken rock that have been altered by chemical and environmental processes that include weathering and erosion. Soil is essential for survival of the living world, especially for human population. Soil is a dynamic medium made up of minerals, organic matter, water, air and living creatures including bacteria and earthworms. It was formed and is forever changing due to physical factors; the parent material, time, the climate, the organisms present.

**Photo:Solid waste on Shahpura lake sediment** Solid wastes are unwanted materials thrown away in solid form, arising from the normal community activity.

It includes garbage i.e. kitchen and food wastes, rubbish materials like paper, rag, glass bottles, metallic cans, plastics, fibers, residues from home fuels, street sweeping, building debris, rubbles and abandoned vehicles. Urban solid waste is also called as municipal waste or garbage or trash.

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Modernization in agricultural system results in extensive use of chemical fertilizers and pesticides**.** Agricultural practices are one reason for deterioration of the soil fertility. Excessive pollution results in change of soil environment and also decreases the fertility of soil. Industrial pollutants change the soil fertility, **Sastry ,et. al.(2001).**Industrial toxic effluent contaminating the soil .One of these contaminants is the introductions of heavy metals such as lead in adjacent soils of roads especially those with high vehicular traffic ,Ubogu,2006.Some of the industries dispose off solid waste and effluents in the open ground which ultimately affect the domestic animals and crops,**Pria ,et. al., (1998** ).

Study Area

TABLE : Morphological features of Shahpura lake

| S .No. | Features | Shahpura lake |
|---|---|---|
| 1 | Period of construction | 1974-75 |
| 2 | Type of Dam | Man made perennial lake |
| 3 | Latitude | 23°12N |
| 4 | Longitude | 77°25E |
| 5 | Catchment area(sq.km) | 8.29 |
| 6 | Full tank level(msl) | 488.30 |
| 7 | Storage capacity $10^6 m^{-3}$ | 2.29 |
| 8 | Max. depth(m) | 5.6 |
| 9 | Mean depth(m) | 1.5 |
| 10 | Source of water | Rain sewage water of residential colony ,irrigation, recreation, Aquaculture |
| 11 | Main use of water | Irrigation ,recreation & aquaculture |

## II. Material And Methods

Present study was primarily being focused on the testing of soil quality of Shahpura lake . Present study was carried out for one year i.e March 2008 to February 2009. Season wise sampling was done i.e. pre- monsoon (March 2008 to June 2008), during monsoon (July 2008 to October 2008) and post monsoon (November 2008 to February 2009).The soil sediment is sampled using Eckmen's dredge. Samples were analyzed for physico-chemical parameters such as pH, moisture content, bulk density and chloride by employing standard methods**(Trivedy *et al* .,2001).**

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## III. OBSERVATTION AND DISCUSSION

### A. pH

During the study pH of soil varied from 6.3 to 7.9 (fig.1). Soil of lake is more acidic during rainy season .Soil acidification may occur due to decomposition of organic matter, acid-forming fertilizers. Rainfall also affects soil pH, it decreases during rainy season **(De S ,2009)** Water passing through the soil leaches basic nutrients such as calcium and magnesium from the soil **(Bernstein L. 1975) .** Soil formed in dry condition has higher pH than that of rainy season. Higher the pH promote solubilization of Pb in soil, increase in quantity of lead decease the enzyme activity in soil and also lower microbial activities **(Marzodoni C *.et al.*,1975)** ,decrease in enzyme activity in soil is the sign of soil pollution. Comparatively pH is less in post monsoon than pre monsoon may be due to idol immersion.Presence of clay in the water bodies also makes soil acidic. Clay enters into water bodies due to Idol immersion and many other reasons. The idols are being made up of clay, hay, cloth, paper, wood, bamboo, thermo coal, adhesive material, paints, colored pigments etc **(Bajpai A. *et al.,* 2002)**

### B. Moisture content

Soil moisture is the water that is held in the spaces between soil particles. Surface soil moisture is the water that is in the upper 10 cm of soil. The moisture content ranged from 47.62 % to 59.80 % (fig.2).But it was maximum during monsoon, lowest in pre-monsoon and after monsoon. In pre-monsoon season moisture content is less as compared to monsoon. The moisture content of the soil was found to be varying between 2.10% at Kotawali during summer i.e. minimum and 22.58% at Ghanekunt during monsoon (**Mane, S.Y.2006).**

### C. Bulk density

Bulk density is the dry density of soil. The bulk density of soil depends greatly on the mineral make up of soil and the degree of compaction. Factor such as organic matter, soil structure & porosity influence the level of bulk density. The bulk density values varied from 0.84g/cc to 3.9 g/cc (fig. 3). Bulk density value is minimum in pre-monsoon may be due to high rate of evaporation, deep percolation and moist extraction by cultivated plants and trees which ultimately lost from transpiration. **(Jat,B.L.2002) .**The lowest value of bulk density is found in April-May.

### D. Chloride

Excess accumulations of salts make soil alkaline. Salt contain ions responsible for salinization of soil. Due to accumulation of ion such as Chloride ion$^-$, soils can become sodic. Sodic soils present particular challenges because they tend to have very poor structure which limits or prevents water infiltration and drainage.The chloride of the soil was found to be varying between 255.8 mg/kg to 530.6 mg/kg (fig.4). Rainfall leaches salt out of soil,that may be the reason of lowest value of chloride during monsoon and highest in pre-monsoon **(De S. 2009).**The higher values may be due to input of organic matter of animal origin. **(Bajpai A.1994) .**

## IV. CONCLUSION

Present study concludes that pollution in and around the wetlands of Bhopal city not only affect the water quality but also the quality of soil . Untreated sewage and city garbage which is coming to the lakes is responsible for decreasing soil quality. Decrease in soil quality shows the extent of pollution in water of these wetlands. Sewage contaminating water containing variable amount of heavy metal increases the concentration of metal in soil and vegetation. Toxic chemicals through soil and water enter into vegetables, fruits, grains etc and indirectly enter into food chain of human beings and are responsible for number of diseases. Today, there is need to making people awrare, so that we can save the gift of soil that nature has bestowed to us.

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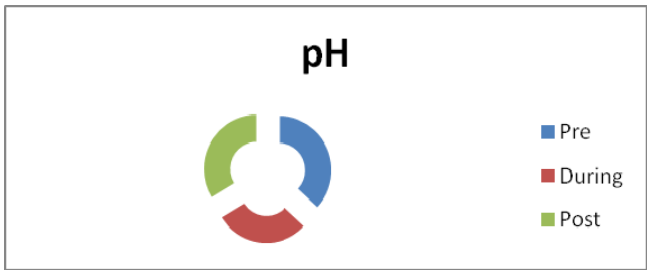


Fig 1 Seasonal variation in pH of Shahpura Lake sediments

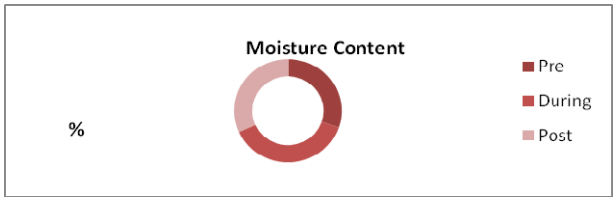


Fig 2 Seasonal variation in moisture content of Shahpura Lake sediments

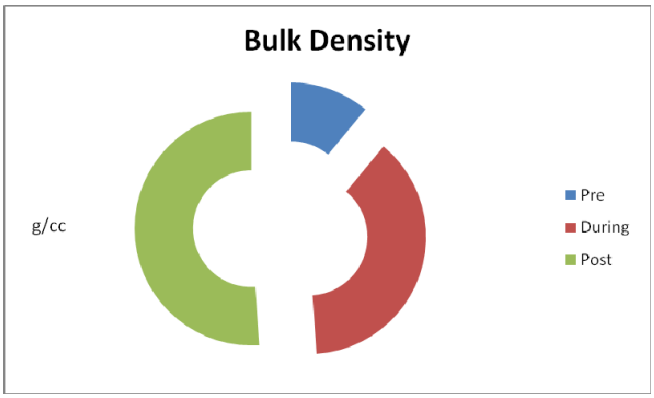


Fig 3 Seasonal variation in pH of Shahpura Lake sediments

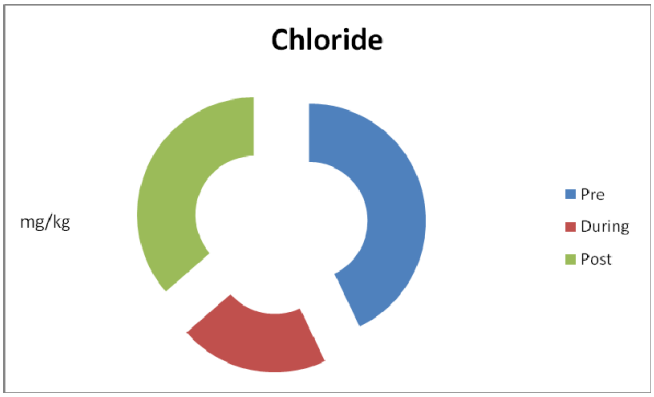


Fig 4 Seasonal variation in pH of Shahpura Lake sediments