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# Pollution of soil due to Birla cement factory of Satna, Madhya Pradesh, India

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**Abstract**
The study aimed to explore the brief status of soil fertility and important for increasing of food productivity to satisfy the increasing of population needs. Four soil samples of industrial area taken from the different zones of Satna, Madhya Pradesh, India based on the land use and land cover pattern. Most of the soil samples were sandy nature and low soil moisture content may cause the soil erosion and not suitable agriculture and industrial activities. Agricultural soil were high amount of sand, silt contents low nutrient availability may decrease the crop yield and not suitable for agricultural purpose. It may reason for continuous using of chemical fertilizers and improper agricultural methods. Organic farming and crop rotations are increased the crop yield.

**Keywords:** soil quality and crop yield, Satna

## 1. Introduction

Soils are at the heart of the Earth's critical zone, the thin outer veneer between the top of the tree canopy and the bottom of groundwater aquifers that humans rely on for most of their resources (US NRC 2001, Planet Earth 2005) [1-2]. Soil is a vital part of the earth and also important to plants. It also helps for agriculture and farmers for planting crops. It shows and records human activities from the past. Soils are nonrenewable resource, formed at the rate of 1 inch every 250 to 1,200 years under most conditions (Medeley, 2002) [3]. To make agriculturally productive land, it usually takes 3,000 to 12,000 years. The health of soils has a direct relationship with the nutrition of the food they yield. Moreover, soil ecosystems are intricate and diverse with many inter-connections and interactions.

In the recent years, increasing day by day soil pollution and contamination is a serious problem especially in a country as densely populated as India (Shiva Kumar *et al.*, 2014) [4]. A wealth of information on occurrence of changes in properties of soils due to discharge of effluents from various industries is also available (Swaminatha and Ravi, 1987; Monanmani *et al.*, 1990; Kannan *et al.*, 1993; Parvej and Panday, 1994; Sivakumar and John de Brito, 1995; Narasimha *et al.*, 1999; Kansal *et al.*, 2005; Nagaraju *et al.*, 2007) [5-12]. Healthy soils are the foundation for healthy harvests. Once soil is destroyed it is basically gone forever.

However soils can be cared for and their fertility maintained. In the present study area, soils are red soils with clay base predominate in Satna district.

## 2. Materials and Methods

Satna is located between 81°15' east longitude and 24°42' north latitude and is situated on the Vindhyan plateau at the height of 318 m above msl. There are many river, viz., Satna, Tamas, Beehar, Asrawal and Simrawal, and most of the land has been irrigated by these rivers. The land becomes fertile due this irrigation facilities. There are a hills of Kaimore and Panna. In Satna district many minerals are found, due to this many industries are running. There are two big cement factory Satna and Maihar.

Sampling points were selected based on population, where the industrial activities were high, far from city, sub-urban area and around agricultural areas. A very small fraction of the huge soil mass was used for analysis, it becomes extremely important to get a truly representative soil sample of the field. Soil samples were collected from different locations i.e. in wheat growing site exposed to effluents PGSEE, in wheat growing site without exposure to effluents PGSWE, Fallow lands without exposure to effluents FEE were collected from different locations of Satna.

The soil samples were dried in shade about 48 hours. Crush the clods lightly and grind with the help of wooden pestle and mortar. Pass the entire quantity through 2mm stainless steel sieve. For certain types of analysis, grind the soil further so as to pass it through 0.2- 0.5 mm sieves. Remix the entire quantity of sieved soil thoroughly before analysis using standard operating methodology (Carter and Gregorich, 2006) [13].


**Fig 1:** Showing sampling points of the Study Area.

## 3. Result and Discussion

Soil texture is the single most important physical property of the soil and alone will provide status of water flow potential, water holding capacity, fertility potential, and suitability for many urban uses. Texture in terms of sand, silt and clay ranges were all the sampling points were low clay percentages and highest percentage of silt and sandy nature so, its indicates that water infiltration capacity were high and viz. water holding capacity is very low. These sites were not suitable for agriculture as well as construction purpose. Soils also differ in their susceptibility to erosion (erodibility) based on texture; a soil with a high percentage of silt and clay particles has a greater erodibility than a sandy soil under the same conditions. The moisture content ranges between 1.6 to 6.8%. Moisture content percentage is maximum in agricultural area than industrial area. Soil water dissolves salts and make up the soil solution, which is important as medium for supply of growing.

In the present study, pH ranges between 6.60-7.84 the soil pH is slightly acidic (6.5 & 6.9) in residential and agricultural cum residential soils. The soil from industrial area and agricultural area having pH are near to neutral (7.5 & 7.8). pH values above 7.5 generally have high calcium carbonate and cause iron, manganese, copper, Zinc, and boron ions to be less available to plants (Bradly and Weil, 2002) [14].

Soil EC is an important characteristic that can be used for nutrient availability and the salt content of soils measured in terms of EC ranges from 200 to 254 µS/cm. The electrical conductivity value was slightly more industrial and than agricultural area. Soil temperature greatly influences the rate of biological, physical, chemical, processes in the soil. Soil temperature regulates seed germination, root growth and the availability of nutrients. Soil temperatures also change with depth. The deeper the soil, the more constant the temperature will be. Below 50 cm (20 in), soil temperature seldom changes and can be approximated by adding 2.8°C (2°F) to the mean annual air temperature. Temperature ranges between 26.7°C 27.8°C. The temperature is maximum in industrial area than agricultural area.

The Organic Carbon (%) ranges from 2.38-2.96 g/kg. Soil organic carbon is remarkably high in agricultural area, even in residential area is having good amount of organic carbon build up. This shows the potential of the land for growing different crops is more. The area affected by industries effluent is having more organic carbon may be because of some organic material present in the effluent.

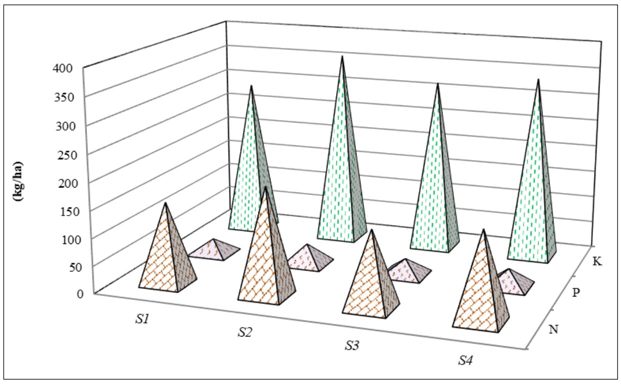


**Fig 2:** Graphics analysis of major nutrients namely nitrogen, phosphorus and potassium at four different zones in Satna.

Poor soil organic carbon (SOC) reduces microbial biomass, activity, and nutrient mineralization due to a shortage of energy sources. Soil organic carbon results in less diversity in soil biota with a risk of the food chain equilibrium being disrupted which can cause disturbance in the soil environment (E.G., plant pest and disease increase, accumulation of toxic substances). The data pertaining to the availability of major nutrients namely nitrogen, phosphorus and potassium are presented (in table 1). Available nitrogen (N) ranges between 140.4-197.3 kg/ha. Available phosphorus (P) ranges between 27.5-37.6 kg/ha. Available potassium is ranged between 290.6-360.8 Kg/ha. Most in all the samples, maximum amount is present in agricultural soil.

**Table 1:** Primary properties of soils of four different zones in Satna

| Sample | pH | EC | Temp. °C | Soil texture (%) | | | SM (%) | OC g/kg | Available | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sand | Silt | Clay | | | N (kg/ha) | P (kg/ha) | K (kg/ha) |
| S1 | 7.84 | 254 | 27.8 | 44.94 | 19.65 | 20.68 | 1.6 | 2.96 | 150.4 | 27.5 | 290.6 |
| S2 | 7.53 | 228 | 26.7 | 22.82 | 19.85 | 13.32 | 6.8 | 2.38 | 197.3 | 37.6 | 360.8 |
| S3 | 6.60 | 201 | 27.1 | 47.44 | 20.58 | 13.09 | 2.2 | 2.45 | 140.4 | 30.2 | 320.1 |
| S4 | 6.96 | 200 | 27.3 | 30.42 | 10.09 | 7.55 | 3.3 | 2.90 | 160.6 | 32.8 | 340.3 |

**Note:** S1 = Industrial Soil, S2 = Agricultural Soil, S3 = Residential Soil, S4 = Agricultural + Residential Soil, EC=Electrical Conductivity,
SM=Soil Moisture, OC=Organic Carbon, N=Nitrogen, P=Phosphorous and K= Pota sium)

Soil is one of our most fundamental and precious resources. Like clean air and water, life cannot survive without healthy soil. About 95% of our food comes from the land soil, supports organisms that are essential for healthy environment. The ever increasing pollution of the environment has been one of the greatest concerns for science and the general public in the last fifty years. Contamination and poor soil management are causing problems.

Pollutants that have damaged land and soil may enter surface or ground water affecting our ability to meet, water quality standards. They may also affect air quality. The study area i.e. Birla Cement Pant area Ghurdong, Naibasti and Kaima differs in the quality of the soil. Our investigation shows that the soils near Cement plant area has poor quality of soil as it in severely affected by the Industrial activities of the industry and require immediate attention from the people and farmers living in this area. Ghurdong and Naibasti areas are less affected by the industrial activities and the quality is measurable good.

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## 4. References

1. US NRC (United States National Research Council), US NRC (United States National Research Council) (2001). Basic Research Opportunities in the Earth Sciences, National Academies Press, Washington, D.C, 2001.
2. Planet Earth. Soil Earth s living skin. International Year of Planet Earth, Trondheim, Norway, 2005.
3. Madeley, John Food for all, The Need for A New Agriculture, The Book published in, The University Press Ltd. Bangladesh, 2002.
4. Shiva Kumar D, Srikantaswamy S, Shakunthala Bai, Kiran BM. Assessment of Heavy Metals Contamination in the Soil of Industrial Area, JECET. 2013-2014; 3(1):053-064.
5. Swaminatha K, Ravi K. Effect of dying factory effluents on physico chemical and biological properties of soil. Environmental and Ecotoxicology, 1987, 249-253.
6. Monanmani K, Chitraraju G, Swaminathan K. Effect of alcohol and chemical industrial effluents on physical and biological properties of soil. Pollution Research, 1990; 9:79-82.
7. Kannan N, Rajasekharan N, Vallinyagam P. Characterization of match industry effluents. Indian Journal of Environmental Health. 1993; 35:301-307.
8. Parvej S, Panday GS. The progressive formation of sulphate in the textile mill effluents. Indian Journal of Environmental Health. 1994; 36:263-266.
9. Sivakumar S, John de Brito A. Effect of cement pollution on soil fertility. Journal of Ecotoxicology, Environmental Monitoring. 1995; 5:147-149.
10. Narasimha G, Babu GVAK, Rajashekar Reddy B. Physicochemical and biological properties of soil samples collected from soil contaminated with effluents of cotton ginning industry. Journal of Environmental Biology. 1999; 20:235-239.
11. Kansal SK, Manohar S, Dhiraj S. Studies on characterization and degradation of pulp and paper mill effluents. Journal of Industrial Pollution Control. 2005; 21:37-42.
12. Nagaraju M, Narasimha G, Rangaswam V. Impact of effluents of sugarcane industry on Physicochemical and biological properties. Journal of Industrial Pollution Control. 2007; 23:73-76.
13. Carter MR, Gregorich EG. Soil Sampling and Methods of Analysis 2nd Edition. Canadian Society of Soil Science, 2006.
14. Brady N, Weil R. The Nature and Properties of Soils. 13th ed, 2002.