

Impact of Waste on Characteristics of Soil -A Case Study of Mysore Sugar Industrial Area, Mandya City, Karnataka, India

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Abstract: *The soils on the earth's surface are undergoing change, which escapes casual study of the soil. Each type of soil has a life cycle in terms of geologic time. This dynamic and evolutionary nature is embodied in a definition of soil as a natural body of the earth surface having "properties due to the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time." The main objective of our study was to analyze contaminated soil samples around sugar industrial area and to compare them with a soil sample collected near residential area i.e., near state bank of India. Samples were collected from identified points and analyzed whether they are contaminated or not*

Keywords: Electrical Conductivity, Nitrogen, Organic carbon, Phosphorous, Potash, Press mud, Compost, Soil.

I. INTRODUCTION

Soil is the key to plant life, containing nutrients and stored water. Soil also influences our livelihood in many ways. It is important for lawns, as a foundation material for engineering structures, for sewage disposal and for recreation[1]. Mandya city is the district head quarter, is situated at a distance of 98Kms from Bangalore. It is sufficiently developed in fields of industry, commerce and education. There are many industries like:

- Large scale- Mysore Sugar Company limited (My sugar Co Ltd.)
- Small scale - granites, chemicals, colors and dyes production etc.

The Mysore sugar company ltd., is established in 1933, which aims to bring a new outlook in the life and prosperity of farmers, with agricultural development as well as for the social uplift of the villagers of the area. The factory supplies the required quantity of manure for sugar cane crops, which is produced in compost yards located near sugar factory and acetate town. Manure is produced with the combination of press mud from sugar factory and spent wash from distilleries. The factory has its own treatment plant for the treatment of combined waste from sugar plant and distillery unit. Solid waste is called as press mud from sugar industry is used to produce compost[4]. Treated waste water is discharged to nearby Hebbal stream. During treatment of wastewater and solid waste, there may be an overflow, seepage, leakage of wastewater into soil. There has been a serious concern about possible contamination of soils, ground and surface water during handling of liquid and solid waste.

Therefore, in the present study, I have taken up a task to predict pollution of soil around the sugar industrial area and the compost yard and to compare with a soil sample collected near residential area.

II. MATERIALS AND METHODOLOGY

The main objective of this study is to know whether the liquid and solid waste discharged from My sugar Co. Ltd., alter the quality of soil or not. So soil sampling stations include the waste disposal locations. During the study period, samples were collected from the following areas (Table 1).

TABLE 1: SAMPLING LOCATIONS

Sample no.	Area
1	NEAR STATE BANK OF INDIA
2	NEAR HEBBAL STREAM

3	NEAR TREATMENT PLANT
4	NEAR COMPOST YARD
5	NEAR COMPOST YARD

Samples were collected during pre monsoon season and were analyzed using standard methods[3].

III. RESULTS AND DISCUSSIONS

The study was conducted on soil quality around sugar industrial area and near residential area. Samples were collected and analyzed in the Soil Health Centre, Mandya according to the methods depicted in the manual on soil analysis published by government of Karnataka. Six parameters such as pH, electrical conductivity, nitrogen, phosphorous, potash and organic carbon were analyzed related to plant growth and results of each set of samples are presented in table 2.

TABLE-2: RESULTS OF ANALYSIS OF SOIL QUALITY

Sample no	pH	E.C m mho/cm	N Kg/acre	P Kg /P ₂ O ₅ /acre	K Kg K ₂ O/acre	O.C %	Texture
1	7.2	0.30	65.84	42	156	0.72	Red sandy loam
2	9.9	1.75	38.16	34	110	0.52	Clay
3	7.8	1.03	89.04	>91	329	> 1.20	Moderately clay
4	7.9	0.85	89.04	>91	201	> 1.20	Moderately clay
5	7.3	0.70	83.10	>91	352	>1.12	Moderately clay

(E.C : Electrical conductivity N : Nitrogen P: Phosphorous K: Potash O.C: Organic Carbon)

3.1 Discussions

The results of the soil quality analysis are discussed below:

- Soil sample collected near Sate Bank f India shows normal characteristics i.e sample collected is neutral having pH of 7.2 (normal pH: 6.3-8.3), Electrical conductivity of 0.3 (Normal E.C: < 1.0) and high values of nitrogen, phosphorus, potash indicates high fertility of soil.
- Soil sample collected near Hebbal stream, where treated wastewater is discharged by sugar factory is alkaline, has pH of 9.9 (Alkali pH > 8.3) and high electrical conductivity of 1.75 (critical E.C: 1.0 -2.0) and all other parameters are within the limit.
- Soil sample collected near Effluent treatment plant of sugar factory, has high electrical conductivity of 1.03 and also high nitrogen, phosphorous, potash and organic carbon concentration.
- Soil sample collected near compost yard has electrical conductivity f 0.85 and high nitrogen, phosphorous, potash and organic carbon concentration.
- Soil sample collected near compost yard has electrical conductivity of 0.70and high nitrogen, phosphorous, potash and organic carbon concentration.

IV. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

- It may be concluded that, except soil samples collected near state bank of India and Hebbal stream, all other samples have high concentrations of nitrogen, phosphorous, potash and organic carbon. This may be due to the infiltration of the wastewater or due to fly ash or due press mud from factory. This will increase the fertility f soil
- Soil samples collected near Hebbal stream is alkaline, indicated by high pH. This indicates high concentrations of salts in soil near to Hebbal stream.
- Soil sample collected near Hebbal stream and effluent treatment plant of sugar factory have high electrical conductivity. This indicates that increased concentration of sodium salts which lessens the soil permeability and also porosity.

- The other parameter, which is main concern is organic carbon. Except soil sample collected near Hebbal stream, all other samples have more organic carbon. This will increase the soil permeability and also fertility. Soil which has less concentration of organic carbon near Hebbal Stream will subject to erosion[2].
- All soil samples except Hebbal stream have high concentration of nitrogen, phosphorous, potash and organic carbon when compared with the soil sample collected near state bank of India i.e., near residential area. This is due to the discharge of waste from the sugar factory.

4.2 Recommendations

Based on the investigations of characteristics of soil around Sugar Industrial area of Mandya city, the following recommendations are suggested:

- It is suggested to add gypsum to the soil near Hebbal stream to reduce the alkalinity of soil and also reduce the concentration of sodium salts thereby improve the soil permeability and porosity.
- It is recommended to provide drainage to soil and allow good quality of water through it to reduce the electrical conductivity of soil collected near Hebbal stream.
- Care must be taken for soil near compost yards to reduce the electrical conductivity by providing drainage, otherwise it will become unfit for plant growth, if it is irrigated.
- It is recommended to control the high concentrations of nitrogen, phosphorous and potash i.e, sufficient for plant growth otherwise crop yield will become stagnant and later it will decrease[5].
- It is recommended that care must be taken to prevent erosion of soil near Hebbal stream by plantation.

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