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ASSESSMENT OF HEAVY METAL CONTAMINATION IN SOIL SAMPLE NEAR INDUSTRIAL AREA OF MORBI, GUJARAT

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ABSTRACT

The quantities of toxic trace metals in soil have a significant impact on soil quality and its usage in food production, particularly in an industrial Area. Toxic elements such as copper, zinc, and iron, as well as Manganese, are investigated in representative soil samples from Morbi, Gujarat's industrial sector. Sample were taken from five different location near industrial area it were compared to the Gujarat government's test range, most of the industrial region is significantly contaminated bycopper, and zinc, with partial contamination by manganese and iron.

Keywords: *Soil, Heavy metal, Contamination, Industry, Morbi*

INTRODUCTION

Soils are complex ecosystems made up of both living and non-living elements that interact in a variety of ways. Even though agricultural systems are not totally natural systems, soil is one of the aspects of natural capital that contribute to agricultural production. Natural capital, such as soil, is combined with manufactured capital, such as farm equipment, and human capital, such as farmer experience, in farming. Importance of Assessment of Soil Fertility Status.Soil fertility, or the amount of crop nutrients stored in the soil, is often confused with soil quality and health. Soil health refers to a soil's ability to function as a vital living system within ecological and land-use boundaries, sustaining plant and animal productivity, preserving, or improving water and air quality, and promoting plant and animal health**.**Soil types vary greatly around the world, depending on geography, climate, and vegetation, with corresponding differences in physical, chemical, and biological properties**.** Plants require macronutrients in greater quantities than micronutrients. It's critical to strike a balance between the two because too few macronutrients can result in poor plant growth and disease risk, while too many micronutrients can cause color loss and stunted growth.In recent years, there has been a lot of concern about heavy metal contamination of soil as a result of rapid industrialization and urbanisation. These elements can build up in plants and animals, eventually reaching humans through the food chain. (Frink 1996; Abrahams 2002) Many industries in the area manufacture chemicals, pharmaceuticals, batteries, metal alloys, metal plating, and plastic products. Most of these enterprises directly discharge their effluent into adjacent ditches and streams, while the solid trash is dumped on open land, along roads, and in lakes.Heavy metals are dispersed on land and into streams and lakes as a result of this type of disposal. These heavy metals can leach into the soil and pollute groundwater. The objective of the study is to establish the quantitative extent and magnitude of contamination in the natural upper surface soil due to heavy metals and propose a plan of action for remediating the site.

Material and Methodology:

Study Area: Morbi district is a newly formed district of the state of Gujarat, India on August 15, 2013, along with several other new districts on the 67th Independence Day of India. The district has 5 talukas – Morbi, Maliya, Tankara, Wankaner (previously in Rajkot district) and Halvad (previously in Surendranagar district). The town of Morbi is situated on the Machchhu River, 35 km from the sea and 60 km from Rajkot. Morbi city is the administrative headquarters of the district. This district is surrounded by Kutch district in north, Surendranagar district in east, Rajkot district in south and Jamnagar district in the west.Prior to the last ten years, Morbi was regarded as a rural Gujarati town with minimal resources. It now supplies a significant portion of the world's ceramic needs. This ceramic city's main products include wall tiles, floor tiles, polished porcelain tiles, sanitary ware, and mosaic tiles.

Preparation of Sample:

5 samples were taken from different location near industrial area of Morbi region in which the micronutrients like Zinc, Iron, Copper and Manganese were analysed. All the samples were dried, ground with mottle and passed through 2mm sieve. For the Laboratory studies all the samples were packed in polythene bags.

Sample digestion:

Exact 10 grams of air-dried soil was weighed out using an electronic balance and transferred into a 50 ml conical flask. To this flask, 20 ml of the Diethyl triamine penta-acetic acid (DTPA) extracting solution was added. The suspension was mixed thoroughly using a mechanical shaker for 2 hours with a speed of 120 cycles per minute. The suspension was then filtered with Whatman Paper No. 41 (Tandon, 1993).

- **Instrument:** AAS (Atomic absorption spectrophotometer) & Mechanical shaker
- **Reagent:** Dilute HCL: AR Grade HCL diluted 5 times with double distilled water

DTPA extractant: Dissolve 1.967gm of AR Grade diethyline-triaminepentaacitic acid (DTPA) and 1.470gm of Cacl2.2H2O (AR Grade) in about 25ml of double distilled water (DDW) by adding 13.3ml of triethanol amine (TEA), Followed by 100ml more of DDW. Transfer the solution to one litre volumetric flask. This reagent has 0.005M DTPA, 0.1M TEA and 0.01M CaCl2.2H2O.

Method Name: Atomic Absorption Spectrophotometric (Lindsay and Norvell, 1978)

Result and Discussion:

Code Given	Village Name
WS-1	Rangpar
WS-2	Jetpar
WS-3	Kalikanagar
WS-4	Jambudiya
WS-5	Unchi Mandal

Element Name	Range	Class
Cu	>0.4	High
Zn	>1	High
Mn	>10	High
Fe	>10	High

Table 1: Shows code with Village Name Table 2: Range of Element
(WS-Winter season)

Village Name	Cu(ppm)	Zn(ppm)	Mn(ppm)	Fe(ppm)
WS-1	0.56	0.92	2.14	0.52
WS-2	1.26	3.8	8.0	6.08
WS-3	3.58	1.48	2.08	1.64
WS-4	2.22	0.72	7.38	9.0
WS-5	2.74	1.4	2.88	5.62

Table 3: Shows amount of heavy metal in taken Soil sample which were collected from Agricultural land located near Industrial area.

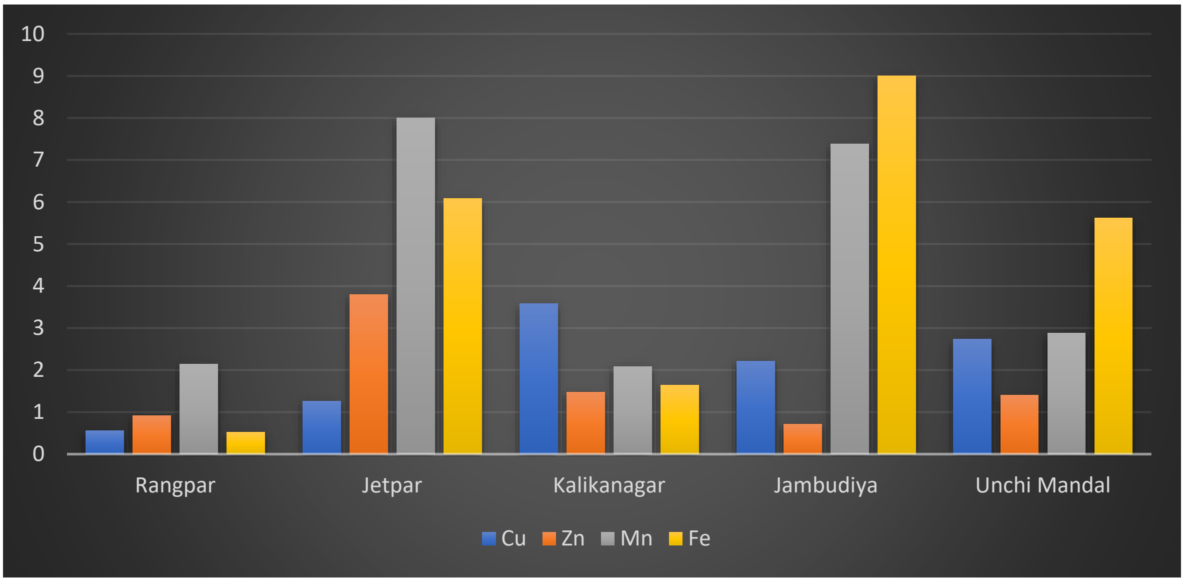

Figure 1: Shows Results of contaminated soil obtained from analysis

Table 3 and figure 1 shows five different villages collected near Industrial area from Morbi district. Soil analysis has been done by analyzing amount of Cu, Zn, Mn and Fe in taken soil samples from Rangpar, Jetpar, Kalikanagar, Jambudiya and Unchi Mandal. Readings of all sample were compared to the ranges given by Gujarat Government. Samples were showing contamination due to Industrial area. It demonstrates that the Cu and Zn concentrations in the soil sample are greater. Mn and Fe are present at lower concentrations than Cu and Zn. This is since the study area is contaminated by the industrial area effluent from the nearby industries and vehicular emissions.

CONCLUSION

The study indicates that soils in the Morbi industrial area aresignificantly contaminated with metals such as Cu, Zn, Fe, and Mn at levels above the concentration in soil, which may pose a number of health risks. A provision should be made to measure hazardous metals in industrial settings. Before discharging effluents on open land, they must be treated. In general, the findings support the source of contamination. likely be anthropogenic due to industrial activity in neighboring Morbi soils, which has resulted in soil contamination in the studied region. In addition, frequent monitoring of heavy metal pollution and certain procedures (such as phyto-remediation by growing some plants in the region) should be implemented as soon as feasible in the study area to reduce the pace and amount of future pollution.

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