



CHARACTERISTICS OF SOIL & CONTAMINATION OF HEAVY METALS FROM THE CATCHMENT AREA MANJARA RIVER IN BILOLI TALUKA, NANDED, MAHARASHTRA

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ABSTRACT

Soil is the most vital and precious natural resource that sustains life on the earth. Soil is one of the most significant ecological factors, on which plants depend for their nutrients, water and mineral supply. The work has been carried out to evaluate the status of soil from villages near Manjara River basin in Biloli Taluka, District Nanded in the year 2012. The principal and objective of the study was to find out the status of various physiochemical properties like Temperature, water holding capacity, soil moisture, Organic Matter, chloride, Calcium, Magnesium, potassium, phosphorus and some heavy metals also studied from soil, these parameters have been analyzed with the help of standard analytical methods and procedures presented systematically.

Key words: Soil sample, Physico-chemical parameters, Heavy metals.

INTRODUCTION

Soil is one of the most significant ecological factors, which derived from the transformation of surface rock. It is nothing but soil but soil on which plant depends for their nutrients, water and mineral supply without fertile soil and the microbial fauna that inhabit it, food would not grow, dead things would not decay and nutrients would not be recycled. Most soil area used for agriculture either lack water or have physical and chemical constraints like steep slopes, easily eroded or poorly drained soils, alkalinity, salinity and other conditions toxic to plants. Organic matter is obtained from death of lichens, large trees and mixing of their parts such as roots, leaves and dried twigs. It also includes remains of animals and their excreta. This organic matter provides suitable medium for the growth or microorganisms it also increases the water holding capacity of soil. Metals contaminants in soil due to metalliferous mining and smelting activities, industrial emission, vehicle emissions, dumped waste materials, sewage sludge, composted town refuse, fertilizers, pesticides and urban development, B.K. Sharma (1997).

The movement of air and water will also affect how soil contaminants mover throughout a site. Chemicals may carried by winds and deposited on the surface of soils, tilling can them mix these surface deposits into the soil, the movement of groundwater or surface water may also affect how contaminants spread from the source (Hannah Shayler et.al 2009). Soil is made up of many things

like weathered rock particles and decayed plant and animal matter with varying ratios of minerals, air, water and organic material. Soil fertility is an important factor, which determines the growth of plant. Soil fertility is determined by the presence or absence of nutrients i.e. macro and micronutrients. Out of the 16 plants nutrients, Zn, Cu, I, Mg, Mo, Cl and B are referred as micronutrients. These elements are required in minute quantities for plant growth, but have the same agronomic importance as macronutrients have and play a vital role in the growth of plants, A Cholarajan and R Vijayakumar (2013)

The presence of any element in a fatal concentration in the soil could be due to both natural and anthropogenic factors; therefore it is often quite difficult to discriminate among the different causes. The effects of these processes are strictly time-dependent and exposed in a quite complex structure of soils, Vandana Parth et.al 2011)

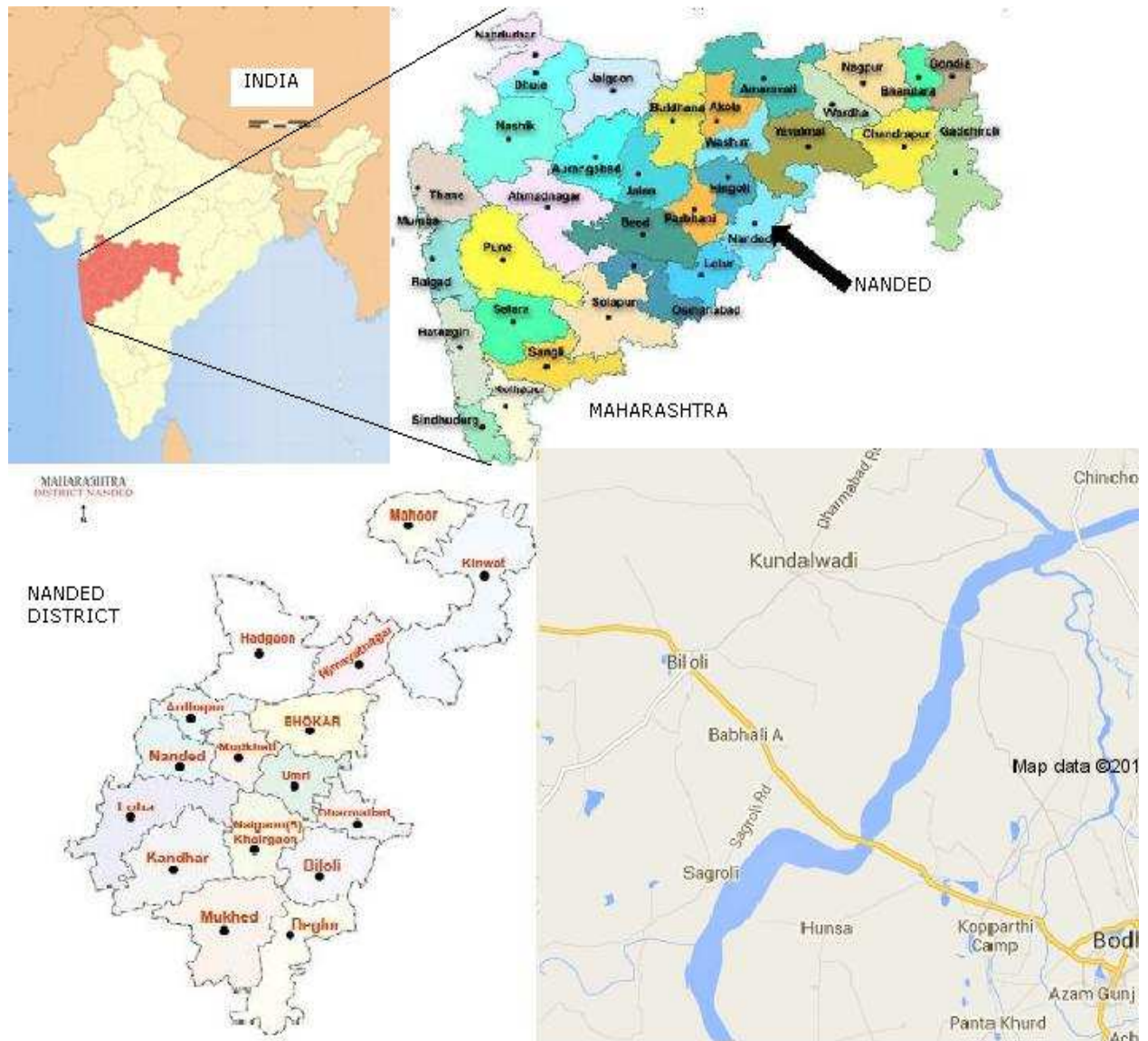
The availability of micronutrients is particularly sensitive to changes in soil environment. The factors that affect the contents of such micronutrients are organic matter, soil pH, E.C, sand, silt, and clay contents revealed from different research experiments. There is also correlation among the micronutrients contents and above-mentioned properties (Anil B Nawale & Rajeshwari Saraswat, 2013). The soil pH defined as the negative logarithm of hydroxide ions in the soil. The pH can affect the availability of nutrients in the soil. The soil organic carbon refers to the amount of carbon stored in the soil. It improves the physical properties of soil. It increases the cation exchange capacity (CEC) and water holding capacity of sandy soil and it contributes to the structural stability of clay soils by helping to bind particles into aggregates. The organic matter in soil derives from plants and animals. (Sheikh parveen R & bhosle A.B., 2013).

Reason of the present study has been undertaken which could be helpful in assessing the present status of the soils in the study area.

MATERIALS AND METHODS

Study Area

Biloli is located at 18°46'N 77°44'E 18.77°N 77.73°E. It has an average elevation of 347 metres. It is located 71 KM towards East from District head quarters Nanded and just near to the boundary of Maharashtra and Andhra Pradesh states and separated from Andhra Pradesh by Manjara River, which is flowing through the border both states. The present studies of the soil were collected from different location of nearby villages of Biloli such as Sagroli, Yesgi and Ganjgaon is of Biloli Taluka of Nanded district Maharashtra state.



Material and Methodology:

For the present study the sub surface soil samples were collected from different location of nearby villages of Manjara River were Sagroli, Yesgi, and Ganjgaon of Biloli Taluka, i.e. mention Site I, Site II and Site III respectively. These soil samples has been collected in the plastic pouches and carried out in a laboratory and determined the pH of the soil and take out the other physico-chemical analysis of the soil i.e. Temperature, water holding capacity, soil moisture, Organic Carbon, Organic Matter, chloride Alkalinity, Calcium, Magnesium, potassium, phosphorus, Iron, Zinc, Manganese Copper etc using the standard analytical methods prescribed by Trivedy and Goal, and APHA and compared to standards.

Table No.1 Average Concentrations of various Physico-chemical parameters in soil samples

Sr. No.	Soil Parameters	Average Value of Site I	Average Value of Site II	Average Value of Site III	Average
1	Ph	7.9	7.4	7.8	7.7
2	Temperature	26.0 ⁰ C	26.5 ⁰ C	27.0 ⁰ C	26.5 ⁰ C
3	Water holding capacity (%)	40	41	43	42
4	Soil Moisture (%)	11.50	10.60	11.90	11.33
5	Organic Carbon (%)	0.24	0.14	0.36	0.25
6	Organic matter (%)	0.41	0.24	0.619	0.423
7	Chloride (%)	26.98	34.08	27.52	29.53
8	Calcium (mg/kg)	121	112	134	122.33
9	Magnesium(mg/kg)	172	157	168	165.66
10	Nitrogen (kg/ha)	132	125	148	135
11	Potassium (kg/ha)	486	363	506	451.66
12	Phosphorus (kg/ha)	89.34	48.24	62.68	66.75

Table No.2 Average Concentrations of Heavy metals from soil samples.

Sr. No.	Soil Parameters	Average Value of Site I	Average Value of Site II	Average Value of Site III	Average
01	Iron (ppm)	3.46	4.12	3.92	3.83
02	Manganese (ppm)	21.30	25.20	24.64	23.71
03	Copper (ppm)	6.79	9.09	8.02	7.96
04	Zinc (ppm)	0.85	1.05	1.36	1.08

RESULTS AND DISCUSSION

The study of different physico-chemical characteristic of the soil sample from different location of nearby village sites of Biloli Taluka, Nanded which is mentioned above. The examination results of soil samples are given in the Table No. 1 & presented in Fig. No. 1 the average pH of the soil from selected sites recorded in between 7.4, 7.8 & 7.9 respectively. Balaji Avhad *et al.* recorded to be range from the minimum pH was 6.25 and 8.09 the maximum pH from Kurunda river basin, Maharashtra. The measurement of pH shows the acidity and alkalinity of the soil. Neither a high pH above 8.4 nor a low below 5.0 is favorable for maximum yield of crops. The type of soil controlled by pH value at 6.0-8.2 pH will bacteria predominate (Mezhin)

The recorded average soil temperature from site I, site II & site III were 26.0⁰ C, 26.5⁰ C, 27.0⁰ C soil temperature also depend on the atmospheric temperature. The temperature of soil greatly affects the physical, biological and chemical processes occurring in soils, chemicals and biological rates are

slow. Temperature plays a very important role in soil characteristics and seed germination. Temperature regenerates absorption and transport of water and nutrients ions in higher plants, Swapnil Rai *et al*.

The soil moisture was found in average from 10.60%, 11.50% & 11.90% and the average value of Water holding capacity was from 40% to 43%. The water holding capacity is an index of a number of physical properties of soil. Good water holding capacity shows the good physical condition.

A conversion factor of 1.72 is commonly used to convert organic carbon to organic matter in this study the average values of organic carbon from site I, site II & site III were found from 0.14%, 0.24% & 0.36% and organic matter was found in between 0.24%, 0.41% & 0.619%. Pravin R. Chaudhari *et al* recorded pH was from 5.39 to 8.41, Organic Carbon and Organic Matter Content of soil samples varied as (0.13 – 0.78 %) and (0.22 – 1.33%) respectively, Nitrogen was in the ranges from 88 to 138kg/ha and Phosphorous was 123 to 964kg/ha. A Cholarajan and R Vijayakumar states that the maximum organic matter of the soil was (0.48%) recorded at Ambalappattu, whereas minimum (0.29%) was recorded at Cholankudikkadu soils. The average organic matter content of the soil was as 0.39 %. The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizer.

The average value of Calcium and Magnesium present in soil samples at all sites were calcium was 121mg/kg, 112 mg/kg, & 134 mg/kg and magnesium was 172mg/kg, 157 mg/kg & 168mg/kg. High concentration of Ca and Mg increases pH of the soil. Nitrogen was found 132, 125 and 148kg/ha, Potassium was 486kg/ha, 363kg/ha and 506kg/ha. And Phosphorous was 89.34, 48.24, 62.68kg/ha respectively. Potassium is essential for photosynthesis, for protein synthesis, for starch formation and for the translocation of sugars.

D.V. Ahire reported the pH values ranged between 7.2 - 8.4 Organic Carbon in ranged (0.23-0.70%), Nitrogen (160-238kg/ha), Potassium (412-610 kg/ha) (Ca) (98-200 meq/100 gm) and Magnesium (18 – 49 meq/100 gm) on Physico-Chemical Properties of Black Soils from North Maharashtra Region (India).

The soil from sangamner area, Ahmednagar district, Maharashtra, India they have observed pH ranges from 7.8 to 9.7, organic carbon content ranges from 0.16 to 1.57%, the available nitrogen was recorded in the ranges from 88 to 175kg/ha, available Potassium in the soil ranges from 75 to 1176 kg/ha and available Phosphorus ranges from 0.54 to 28.45 kg/ha, K. K. Deshmukh.

Heavy metals from soil:

In the present study the concentration of heavy metals found in the soil from selected sample sites were shown in table No. 2. Ranges of the concentration were Iron from site I -3.46 ppm, at site II- 4.12ppm, and site III-3.92ppm. Manganese at site I-21.30ppm, site II-25.20ppm and site III- 24.64ppm Copper were at Site I-6.79ppm, at site II-9.09ppm and at Site III-8.02ppm and Zinc at Site I-0.85ppm and at site II-1.05ppm and site III-1.36ppm which is shown in Table No 2 & Presented in Fig. No 2

The concentrations of heavy metals Fe, Mn, Cu, and Zn obtained in the soil samples taken from Sangamner Tahsil in Ahemadnagar district of Maharashtra was found ranged in between 0.011 to 3.01ppm, 0.33 to 74.05ppm, 0 to 3.92ppm and 0 to 1.86ppm respectively, reported by Anil B Nawale, Rajeshwari Saraswat.

D.V. Ahire recorded the concentration of heavy metals in the black soil from North Maharashtra has been in the range between Fe (2.1-4.8ppm), Mn (5.6 - 15 ppm), Cu (0.65-2.1 ppm), Zn (0.32-2.1ppm)

The researcher have assessment the comparative study on the soil properties due to the Paper industries wastewater and well water irrigated soil he states mean of pH, OC, Ca, Mg, K, was 8.29 & 7.23, 2.50% & 0.33%, 312 & 320 kg/ha, 95 & 110 kg/ha, 792 & 578 kg/ha and heavy metals were Fe, Mg, Cu, and Zn observed mean 21.50 - 9.00 mg/kg, 2.61 - 0.81 mg/kg, 20.70 - 1.66 mg/kg, and 46.50 - 0.69 mg/kg respectively, Ratna P. Roy *et al*.

In the study of Physico-chemical properties and available nutrients in sandy loam soils of Haridwar, P. R. Chaudhari *et al* has recorded the ranges pH was 6.88 to 8.34, Organic carbon 0.28 to 0.62%, Calcium 116-328 meq/100mg, Magnesium 52-164 meq/100mg, Nitrogen 151-188 kg/ha, Potassium 115.4-290 kg/ha, Phosphorous 2.49-63.76kg/ha and heavy metal concentration were Fe, Mn, Cu & Zn observed in ranges 8.25-45ppm, 6.61-47.91ppm, 0.29-2.39ppm & 1.69-5.06ppm respectively.

Pravin R. Chaudhari *et al* recorded the concentration of heavy metals from Coimbatore soil were Fe, Mn, Cu, and Zn were ranges from 0.12ppm to 5.53ppm, 2.30ppm to 23.16ppm, 0.11ppm to 1.08ppm and 0.47ppm to 2.60ppm respectively.

The copper and Zinc high concentration of heavy metals ranged were 77.1 mg/kg to 137.5 mg/kg, and 91.0 mg/kg to 139 mg/kg respectively in the Industrial area of Surat, Gujarat, Western India by A. K. Krishna, P. K. Govil.

The values of copper permissible limit as assigned by BIS Guideline 35 to 270 mg/Kg for soil. And for Zinc permissible limits for soil i.e. 250 to 500 mg/kg, **Singh *et al* (2012)**

CONCLUSION

In the present study it has a black cotton soil; pH of the soil is suitable for fertility, which is rich in calcium and magnesium level. The organic carbon were low, Phosphorous were found in slightly maximum and Potassium were found maximum in soil, use natural fertilizer for better improvement of soil fertility.

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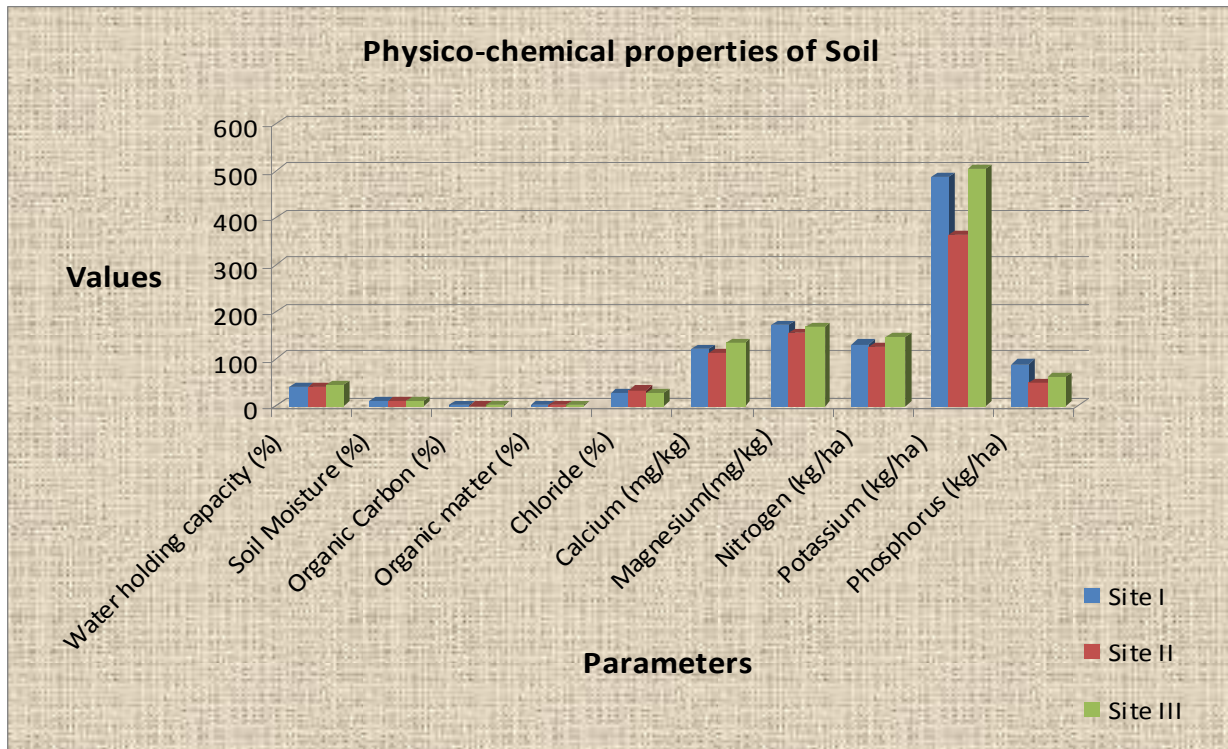


Fig. 1 Physico- chemical parameters of Soils

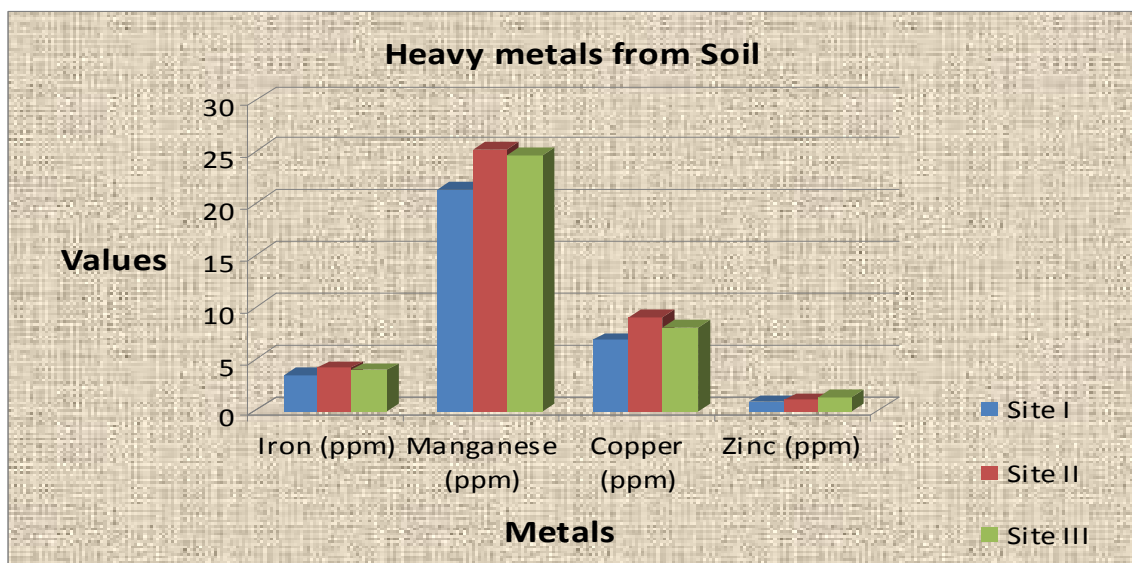


Fig. 2 Heavy metals from soil samples

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