

Analysis of Soils in the vicinity of Chemical Laboratory of Janata Mahavidyalaya, Chandrapur Maharashtra, India

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Abstract: The aim of work was to analysis soil in the vicinity of the chemistry laboratory. There was a number of fruit plants present. Chemicals used in a laboratory may be exposed in the soil, it may be polluted soil. Some chemicals may contain heavy metals, the soil may be contaminated, so some fruit plants have the tendency to absorb heavy metals from soils. So contaminated fruit may be hazardous to human health. So we analyse soil sample. We collected soil sample from the different area near to the chemistry laboratory where fruit plants were present and performed physicochemical analysis such as pH, electrical conductivity, TC. For Heavy Metals (As, Pb, Hg) we sent the sample to Vidarbha Enviro Power Ltd. It was found that from the pH value soil is found to be slightly alkaline, all other parameters are slightly varied from standard values. Heavy metals are found in range, so the use of fruit from fruit plants in the vicinity of chemistry labs may be safe for human health.

Keywords: soil; heavy metals; pH; fruit plants.

1. INTRODUCTION

Soil is a very important pool of many elements such as C, N and P and because soil retains and releases large amount of water, understanding how soil is influence by trees is necessary for understanding local and global biogeochemical cycles and for understanding water storage and the water cycle¹. Soil holds the roots of plants stand above the ground to collect the light they need to line. This helps plants grow, fungi and bacteria also lone in the soil. They eat the dead plants and animals. The broken down material becomes food for plants². Many animals a turn into the soil and make the soil their home. The large animals use soil to make dens for sleeping of their young baby. The small animals live most of their life in this soil. Earthworms are famous for improving the soil. Many microorganisms living in soil, most of them eat the organic material in the soil. They use oxygen and release carbon dioxide and also release mineral nutrients into the soil³. Soil analysis is a set of various chemical processes that determine the amount of available plant nutrients in the soil, but also the chemical, physical and biological soil properties important for plant nutrition⁴. Many elements are present in the soil, some are primary and some are secondary-

Primary Elements Chart –

- Nitrogen: helps to form amino acids which are the building blocks of proteins.
- Phosphorus: is used in the formation of nucleic acids and other chemicals which help in the development of healthy root systems, early growth, early maturity, and seed production.
- Potassium: is similar to phosphorus for root formation and also appears to promote disease resistance it increases the size and quality of fruits.

Secondary Elements Chart –

- Sulphur: it must be present to form protein.
- Calcium: is utilized in the root system and leaf development and is combined with other elements to form cell walls. It also helps by activating other enzyme systems.
- Magnesium: It is the central atom of the chlorophyll molecule which makes it absolutely necessary for photosynthesis. It also plays a role in phosphate metabolism, plant respiration, and enzyme systems⁵.

Soil may become contaminated by the accumulation of heavy metals and metalloids through emissions from the rapidly expanding industrial areas, mine

tailings, disposal of high metal wastes, leaded gasoline and paints, animal manures, sewage sludge, pesticides, wastewater irrigation, coal combustion residues, spillage of petrochemicals and atmospheric deposition. Heavy metals constitute a group of inorganic chemical hazards and those most commonly found at contaminated sites are Lead (Pb), Chromium (Cr), Arsenic (As), Zinc (Zn), Cadmium (Cd), Copper (Cu) and Mercury (Hg)⁶. Many of the current environmental, social, economic, geologic, and human health issues can be better addressed if soils are considered and paid due attention. The idea that there is a link between soils and human health has been recognized for thousands of years; however, the scientific study of how soils influence human health is a recent undertaking. Examples of common topics investigating how soils benefit human health include the transfer of nutrients from soil to people through plant⁷. There is increasing awareness that heavy metals present in the soil may have the negative effect on human health and on the environment. From the environmental point of view, all heavy metals are important because they cannot be biodegraded and are largely immobile in the soil system, so they tend to accumulate and persisting urban soils for a long time. This results in levels that are dangerous to humans upon both acute and chronic exposure⁸. The aim of soil analysis is to assess the adequacy, surplus or deficiency of available nutrients for fruit plants and to find out heavy metals in the vicinity chemical laboratory, which may be absorbed by fruit plants.

2. MATERIALS AND METHODS

Soil samples are collected from places of fruit plants in the vicinity of chemistry laboratory of Janata Mahavidyalaya Chandrapur. It was then brought to the laboratory for physiochemical analysis. The various experimental procedure used for the analysis of soil. pH is measured by pH meter. Electrical Conductivity (EC) was measured with conductometer. Moisture in the soil, Water Holding Capacity, Practical Density, Porosity determined by the physical method and Organic carbon, Available Phosphorous, Potassium, sodium, Lime, Calcium was estimated by Chemical methods⁹. For heavy metals determination, we sent soil samples to Maharashtra Enviro Power Limited Butibori Nagpur.

3. RESULT AND DISCUSSION

Quality of soil is characterized by physical and chemical analysis. Various observations obtained

during physicochemical analysis are tabulated in the following table 1. The quality of soil in terms of physiochemical analysis is discussed as follow.

pH: It measures the potency of H⁺ ion in a soil sample. Determination of pH of soil¹⁰ is important because all nutrients are not available at all pH value. The normal range pH of soil sample should be 6.0 to 7.5. Below pH 6.0 nutrient like nitrogen, phosphorus and potassium are not available and pH above 7.5, iron, manganese, and phosphorus are present in fewer amounts. Thus it gives rough ideas about availability medium for absorption of nutrients. It is found by bringing it into saturation stage with distilled water and pH is measured with the help of pH meter. All soil samples show pH values are ranged from 6.10 to 7.80 which are in the normal range.

Electrical conductivity: It shows the presence of ions in soil sample¹¹. The high electrical conductivity of soil indicates a high level of water soluble salts in soil samples and it is desirable for the growth of most of the plants. The normal range of EC is 0.2 to 1.2mmhos/cm. Any soil sample having EC less than 0.2 indicates that there is no enough availability of nutrients for plant growth. If EC of soil is above 1.2 indicates highly saline soil. It may be due to use of high salt fertilizers or lack of drainage of salinity. For good crop growth EC of soil sample should be maintained in the range. The Electrical Conductivity of soil samples was in the range 0.393mmhos/cm to 0.502 mmhos/cm, which shows soil have enough availability of nutrients for plant growth.

Organic Carbon: Carbon is determined in the laboratory directly by treating the soil with a known amount of K₂Cr₂O₇ in presence of conc. H₂SO₄. Oxidation of organic carbon by K₂Cr₂O₇ takes place. Organic matter cannot be measured directly. It not only affect the soil fertility but also influencing the power of holding or leaving CO₂ in the atmosphere¹². All the soil samples show low organic carbon content. The Organic Carbon in samples was found to be in the range from 0.31% to 0.50%.

Phosphorus: For this the soil is shaken with 0.5M Sodium Bicarbonate at the nearly constant pH 8.5 in presence of activated charcoal & extract is treated with ammonium molybdate which results in the formation hetero poly complex known as Phosphomolybdate which is reduced with stannous chloride. Here complex formation takes place, which gives the blue color. The intensity of the blue color is proportional to the amount of phosphorus entering into the reaction yielding a complex known as

Molybdenum Blue. All soil samples have medium phosphorus range the quantity of Phosphorus found to be lower to medium range (11.17ppm-20.16ppm).

Potassium: It is necessary to find out a quantity of potassium in soil¹³ and the readily available tool to ascertain whether potassium fertilizer required or not. Potassium was first extracted from air dried sample by shaking with 0.5 M ammonium acetate/ acetic acid solution for 30 minutes. Availability of potassium in all soil samples was found to be in high amount.

Sodium: The concentration of sodium in all soil samples lies in the lower range than the normal range.

Magnesium: The concentration of Magnesium in all soil samples was found in normal range.

Heavy Metals: It is important to find out the presence of Heavy Metals like Pb, As, Hg in the soil. As samples were collected from in front of chemical laboratory may contaminate with heavy metals due to exposing with chemicals. Heavy metals were found to be in ranged (> 0.1) for Lead, (> 0.1) for mercury, (0.2326 ppm-1.1001 ppm) for Arsenic which is not hazardous.

4. CONCLUSION

Soil analysis is an important tool for evaluating and avoiding problems of nutrient balance. Soil samples tested for physicochemical parameters the result indicating that the most of parameters are in normal range and then some are below the normal range so some remedial measures are required. Heavy metals which is naturally present in the earth crust. Up to the normal range plays important role in human life. Lead, Arsenic mercury is heavy metals which are harmless to human life in large concentration. In regular lab work, it may be exposed to the soil near the lab where the fruit trees present. Some fruit trees have the tendency to absorb heavy metals from soil, so it needed to analyzed. Heavy metals in soil sample were found in normal range, so it will not hazardous to used fruit from trees near to the chemistry laboratory of Janata Mahavidyalaya, Chandrapur.

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Sr.No.	Parameter	Unit	Different Area Janata Mahavidyalaya, Chandrapur			
			Sample 1	Sample 2	Sample 3	Sample 4
1.	pH	-----	7.20	7.80	6.10	6.90
2.	Electrical Conductivity	Millie mhos/cm	0.502	0.423	0.393	0.410
3.	Organic Carbon	%	0.31	0.50	0.50	0.33
4.	Phosphorus	ppm	11.40	14.80	20.16	11.17
5.	Potassium	ppm	259	276	266	299
6.	Sodium	ppm	3.80	4.00	4.80	6.70
7.	Magnesium	ppm	6.25	7.00	7.50	6.66
8.	Lime	ppm	2.87	3.37	4.17	3.20
9.	Moisture	%	2.56	1.01	2.56	1.02
10.	Water Holding Capacity	%	42	60.54	44.51	54.19
11.	Lead	ppm	<0.1	<0.1	<0.1	<0.1
12.	Mercury	ppm	<0.1	<0.1	<0.1	<0.1
13.	Arsenic	ppm	0.23	0.70	1.10	0.49