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PHYSICO CHEMICAL ANALYSIS OF SOIL IN THE DIFFERENT REGION OF AMRAVATI DISTRICT

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ABSTRACT:
Soil test commonly refers to the analysis of a soil sample to determine nutrients content, composition & other characteristics such as the acidity or pH level. A soil test can determine fertility or the expected growth potential of the soil which indicates nutrients deficiencies, potential toxicities for excessive fertility and inhabitations from the presence of non-essential trace minerals. The test is used to the function of roots to assimilate minerals. The expected rate of growth is modeled by the law of maximum. Composite sampling can be performed by combining soil from several locations prior to analysis. This is a common procedure, but should be used judiciously to avoid skewing results. This procedure must be done so that government sampling requirements are met. A reference map should be created to record the location and quantity of field samples in order to properly interpret test results. Soil testing is often performed by commercial labs that offer a variety of tests, targeting groups of compounds and minerals. The advantage associated with local lab is that they are familiar with the chemistry of the soil in the area where the sample is taken. This enables technicians to recommend the test that are most likely to reveal useful information.

Key words: Analysis, Physio-Chemical, Soil and Amaravati.

INTRODUCTION:
Environmental chemistry was the scientific study of the chemical and biochemical phenomena that occurs in natural places. It should not be confused with green chemistry, which seeks to reduce potential pollution at its source. It can be defined as the study of sources, reactions, transport, effects and fates of chemical species in the air, soil and water environment (Joel OF, Amajuyoyi CA.).

The soil was not a mass of dead debris, merely resulting from the physical, chemical and biological weathering of rocks; it was a more or less homogeneous system which has resulted from the decomposition of plant and animal remains. Soil was used to grow most of the world's food and much of its fiber (AnuUpadhyaya S K, BajpaiAvinash.). The world's mushroom human population imposes increasing and increasing pressure on farmer to produce more food each year. The quality of human diet was determined by the hectares of soil available per person and the quality and management of various soils to produce food. Soil quality was a measure of the ability of a soil to carry out particular ecological function. Soil quality reflects a combination of chemical, physical and biological properties (Osakwe S. A.). Anthropogenic activities such as indiscriminate use of pesticides and fertilizers, disposal of industrial and domestic effluents, municipal sewage sludge and soil waste because undesirable changes in the physical, chemical and biological parameters of soil[l].

Soil acts as thin layer of earth's crust which serves as a natural medium for the growth of plants and it was the unconsolidated mineral matter influenced by genetic and environmental factors. Soil differs from the parent material in the morphological, physical, chemical and biological properties (Kiran G. Chaudhari).

Wetlands can be distinguished from uplands and other ecosystems by examining certain characteristics that relate to features such as water, soils, and biota and to function such as hydrology, biogeochemical cycling, habitat and food webs. These characteristics and features were displayed in the layers (horizons) of the soil profile and it develop as a result of the interaction between the five soil forming factors are the nature of the parent material, climate, organisms, topography and time. Wet land soils are formed as the result of the periodic to continuous inundation and soil saturation leads to anaerobic soil conditions and reduced decomposition, which results in the buildup of organic matter (Joel O F, Amajuyoyi C A.). As organic matter content in soil increases, bulk density decreases due to reduced particle density of the organic material compared to mineral compared to mineral soil (Craft 2000). The growth and abundance of different aquatic flora and fauna are greatly dependent upon the presence of essential nutrients in water body in adequate and balanced quantities. The capacity of soil to retain water for aquatic flora and fauna and the ability of soil to provide various nutrients for biological production are assessed through the analysis of important soil constituents such as pH, specific-conductivity, total alkalinity, calcium, magnesium chloride, nitrate nitrogen, phosphate phosphorous, soil pH was widely accepted as a dominant factor that regulates soil nutrient bioavailability, vegetation community structure, plant primary productivity and a range of soil processes including soil microbial community structure and activity.[2] (Abdul majeed Mlitan)

All the soil properties and the value of the soil pH can widely differ in reliance on soil type, topography, climate, vegetation and anthropogenic activity, because all these factors influence the spatial variability of the observed soil type (Song et The value of soil pH was directly influenced by all five soil forming factors (parent rock, climatic conditions, organisms, topography and time) and further the value of soil pH was dependent on the season influence, way of management, tested soil horizon, soil water contents and time limit of sampling for analysis (Troech & Thompson 2005). The combined application of manure and mineral fertilizers has major effects on soil physical, chemical and biological properties and it increases crop yields. Application of fertilizers was one of the causes of soil acidification. The acidification of soil by N fertilizers was caused by transformation of nitrogen in soil. The uptake of N as ammonium in the crop also contributes to soil acidification.

Amravati was located in Vidarbha region of Maharashtra state, farmers from this region are suffering from infertility of soil and low crop yield. Vidarbha region was also known in India for large number of farmer's suicide. So by checking the soil nutrients (N, P, K) pH, and E.C. we can find out the nutrient value of soil and necessary action can be taken to increase the soil fertility and it also helps to select the crops suitable for that soil. We can also check the microbial flora in the soil such as nitrogen fixing bacteria, phosphate solubulizing bacteria, etc to decrease the use of chemical fertilizers.

Soil pH was an indication of acidity or alkalinity of soil and is measured in pH units. The pH scale goes from 0-14 with pH 7 as the neutral point. As the amount of hydrogen ions in the soil increases, the soil pH decreases, thus becoming more acidic. From pH 7 to 0, the soil was increasingly more acidic, from pH 7 to 14; the soil was increasingly more alkaline or basic. Some states like Andhra Pradesh, Gujrat, Haryana, Karnataka and Uttar Pradesh have made commendable progress in soil testing programme by different ways such as expansion of soil testing facilities, popularization of the programme in campaign mode, development of soil fertility maps and use of information technology in delivering soil nutrient status and appropriate recommendation to farmers (Sanjoli Mobar). Some elements like potassium, magnesium, calcium, and phosphorous are likely to be unavailable to plants in acidic soil and in basic soil elements like copper, zinc, boron, manganese and iron are not easily absorbed by plants. Thus by maintaining proper pH of soil, you can create an ideal environment for plants. pH also affects the activity of microorganisms responsible for breaking down organic matter and most chemical transformation in the soil. Soil E.C. was also one of the simplest and least expensive soil measurements available to check soil quality. Soil EC was a measurement that integrates many soil properties affecting crop productivity. These include water content, soil texture, salinity and exchangeable calcium (Ca) and magnesium (Mg). Measuring of pH and electrical conductivity (EC) parameters will provide valuable information for assessing soil condition for plant growth, nutrient cycling and biological activity. In mineral soils, pH was a general indicator of soil nutrient availability, presence of free lime (calcium carbonate), presence of excess sodium and excess hydrogen.et al Olsen [3]

Soil and crop management practices have a significant effect on pH and EC and are considered good indicators of change. EC indicates how much dissolved salt is in a given sample. The quality of soil was controlled by physical, chemical and biological components of a soil and their interactions (Prakash L Patel). The acidity or alkalinities in soils have several different sources. In natural systems, the pH was affected by separately.

MATERIAL AND METHODS

Collection of soil sample & soil collecting tools.

Collection of soil sample: Purpose of Collection soil sample:-

- Soil sample are collected from the filed
- To study the soil type.
- To evaluate the fertility of the soil.
- To know the genesis of soil.

Sample Technique: - The method of sampling depends largely on the purpose for which, it was to be collected. In the case of manures & crops experiments sampling technique is quite different. When general fertility was to be found out, numbers of sample to be collected vary according to size of plot. However 15-20 sample/ha-l are advice for such experimental Purpose. For field crops viz, jower, wheat, rice, vegetable crops sample up to depth 15cm for cotton, sugarcane 30cm layer wise.

- First divide the field according to the slope, color, depth, texture, management &cropping patter. After demarcation of field into uniform portion each of this must be sampled
- Then divide each unit in two parts. Draw the zigzag line having about 8 to 10 corner on both the sides of middle line so that it will cover the whole area.
- Where the crops have been planted, collect the soil sample between the lines.
- Do not sample unusual area. Avoid area recently fertilized, old bund, marshy spots, near trees, compost heaps or the non-representative location.
- Use proper sampling tools like auger, soil tube, phawada (spade) or khurpi (trowel).
- Before taking the sample, scrape away surface; litter or any stone etc. collect the soil samples from 10 to 20 spots in the field depending upon the area. At each corner of the zigzag line take the sample by augur at the depth of 15-20cms or with the help of trowel & spend by digging "v" shaped hole up to plow/plough depth. Then cut out uniform thick 2cms slice of soil from bottom to top of exposed soil surface, collect the sample on the blade or in your hand & place it in clean bucket.
- Collect the sample from the uniform area into this same bucket.
- Pour the soil from the bucket on a piece of clean paper or cloth & mix thoroughly.
- Discard by quartering, excess of soil and collect approximately h kg. Of soil.
- To quarter the sample, mix well divide into four equal parts & Reject opposite quarter.
- Mix the remaining two portions & repeat the procedure as many time a necessary to arrive at the desired size sample.
- If the sample was wet or moist, dry it in the shade before putting into plastic bags.

Fill the sample into plastic bag & put the plastic bag into cloth bag.

Determination of calcium by EDTA titration method from soil sample:-

Principalthe extent of sodium hazard in irrigation water was determined in terms of the sodium concentration in relation to the two useful divalent cations namely Ca++. The most common method of calcium and determination in irrigation water is by complex metric titration using sodium salts of ethylene-diamine terra acetic acid. (EDTA).

Ethylene diamine tetra acetic acid (EDTA) form soluble complexes with calcium and ions at an optimum PH of 10.0 and thus removing 'them from solution without precipitation. The reaction is stoichiometric and essentially instantaneous at temperature near 600C and the complex formed are very stable. At the same pH the dye trichrome blue-black B has a turquoise blue color in the absence of calcium and magnesium ions but forms red compounds with them which are less stable than the EDTA-Ca complexes. The formation of Ca complexes at pH 10.0 was achieved by using ammonium hydroxide-ammonium chloride buffer.

Reagents: -

1) Standard calcium chloride solution (0.1N): Dissolved exactly 0.5005 gm of A.R. grade $CaC0_3$ (dried at 150^{0}C) in minimum (about 10 mi) of 0.2N I-ICI (AR). Boil gently to expel the $C0_2$. Then make the volume accurately to Iliter.
2) Eriochrome Black T Indicator: Homogenize 0.2 gm of EBT in 50 gm of Kcl or Nacl. Eriochrome blue black — B, 0.5% in ethanol.

Dissolve 0.5 gm Eriochrome blue-black —B in 100 ml of 95 % of ethanol.

Sodium Hydroxide (10%) : Dissolve 10 gm of NaOH in 100 ml of distilled water

3) Murexide Indicator: Take 0.2 gm of murexide (also known as ammonium purpuate) and mix it with 40gm of powdered potassium sulphate. The indicator was kept in powdered form as it goes oxidation in the solution form.

4) Take 10 ml water sample in 100 ml of conical flask and dilute the content by adding about 25ml of distilled water.

A) **Physical parameters**

Determination of pH soil sample:-

Definition of pH:- It is the negative logarithm of hydrogen ion activity. Soil reaction represent the amount of free or active & not the total quantity of potential or combined acidity.

The pH is usually measured by pH meter, in which the potential of hydrogen ion indicating electrode (glass electrode) was measured potentiometrically against calomel saturated reference electrode which also serves as salt bridge. Now a days, most of the pH meters have single combined electrode. Before measuring the pH of the soil, the instrument has to be calibrated with standard buffer solution of known pH.. Since, the pH was also affected by the temperature, hence, the pH meter should be adjusted to the temperature of the solution by temperature correction knob.

Reagents:

Standard buffer solutions: These may be of pH 4.0, 7.0 or 9.2 and are prepared by dissolving one standard buffer tablet in 100 ml distilled water, it was necessary to prepare fresh buffer solution after few days. In absence of buffer tablet, a 0.05 M potassium hydrogen phthalate solution can be used which gives a pH of

4.0 (Dissolve 10.21 g. of A.R. grade potassium hydrogen phthalate in distilled water and dilute to 1 liter. Add 1 ml of chloroform or a crystal of thymol per liter as a preservative).

Procedure:

1. Take a 1 gm of soil sample & weight, transfer to test tube.
2. Add some distilled water & stirred for 10 min
3. Take pH meter & Deep into the solution by slowly.
4. pH change color& that pH paper metrics with pH meter

RESULT & Disussion :

ELECTRICAL CONDUCTIVITY

The electrical conductivity of soils varies depending on the amount of moisture held by soil particles. Sands have a low conductivity, silts have a medium conductivity, and clays have a high conductivity. Consequently, EC correlates strongly to soil particle size and texture.

EC Effect (ds m-l)

<1- No deleterious effect on crop

1-2	- Critical for salt sensitive crops
2-3	- Critical for salt tolerant crops
>3	- Injurious to most crops

pH

The availability of some plant nutrients was greatly affected by soil pH. The "ideal" soil pH was close to neutral, and neutral soils are considered to fall within a range from a slightly acidic pH of 6.5 to slightly alkaline pH of 7.5. It has been determined that most plant nutrients are optimally available to plants within this 6.5 to 7.5 pH range, plus this range of pH was generally very compatible to plant root growth.

Categories of soil pH values:

Soil pH	Interpretation
< 5.0	Strongly Acidic
5.1 - 6-5	Slightly Acidic
6.6-7.5	Neutral
-8.0	Mild Alkaline
> 8.0	Strongly Alkaline

ORGANIC CARBON

Plant productivity was linked closely to organic matter (Bauer and Black, 1994). Consequently, landscapes with variable organic matter usually show variations in productivity. Plants growing in well-aerated soils are less stressed by drought or excess water. In soils with less compaction, plant roots can penetrate and flourish more readily. High organic matter increases productivity and, in turn, high productivity increases organic matter.

Limits:

Low	< 0.5%
Medium	0.5-0.75%
High	> 0.75%

NITROGEN

Nitrogen represents Life. It was an ingredient of proteins and distinguishes them from carbohydrates. Carbohydrates are passive, storing energy or providing physical structure, but proteins control the movement of energy and materials and the growth of the plant. Sugars, starches and cellulose are carbohydrates; chlorophyll, enzymes, and hormones are proteins,

Inasmuch as proteins influence food quality as well as quantity, nitrogen has a predominant role among the soil nutrients. Nevertheless, to the casual observer the obvious effect of nitrogen was on leaf growth and color. Nitrogen fertilizer produces a luxurious growth of lush green leaves, essential for capturing the sun's energy and converting it into sugars. Nitrogen was necessary for the production of sugars and, subsequently, of sweet, ripe fruit. If nitrogen was low, growth was stunted, and all plant functions are disturbed. Nitrogen was mobile and, and when in short supply it will drift from older leaves to younger ones. Deprived of nitrogen, the older leaves will often turn light green, yellow, or in some cases pink. A stunted plant with such discolored leaves was a good sign of a protein deficiency in the plant, and it may indicate a nitrogen deficiency in the soil, but it also may mean that the soil was too cold or too wet or too dry, or that the plant is under attack by an insect or disease.

All soil life requires nitrogen in substantial amounts, and because supplies were usually limited, competition was vigorous. Perhaps for this reason, plants evolved to render the metabolism of nitrogen first in priority among all other processes.

Available N (kg ha-I) Soil rating

<	280	..	Low
2	80-560	..	Medium
>	560	..	High

PHOSPHOROUS:

Phosphorus is essential for the general health and vigor of all plants. Some specific growth factors that have been associated with phosphorus were:

Stimulated root development

Increased stalk and stem strength

Improved flower formation and seed production

More uniform and earlier crop maturity

Increased nitrogen N-fixing capacity of legumes improvements in crop quality, increased resistance to plant diseases

Supports development throughout entire life cycle

Phosphorus deficiencies late in the growing season affect both seed development and normal crop maturity.

Very low	..	Less than 5 P kg ha-1
Low	..	5-10 P kg ha-1
Medium	..	10-20 P kg ha-1
High	..	20-40 P kg ha-1I
Very high	..	More than 40 P kg ha-1

POTASSIUM:-

Potassium has many different roles in plants:

In Photosynthesis, potassium regulates the opening and closing of stomata, and therefore regulates C02 uptake.

Potassium triggers activation of enzymes and was essential for production of Adenosine Triphosphate (ATP). ATP was an important energy source for many chemical processes taking place in plant issues.

Potassium plays a major role in the regulation of water in plants (osmo-regulation). Both uptake of water through plant roots and its loss through the stomata are affected by potassium.

Known to improve drought resistance.

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SOIL TEST REPORT FOR SAMPLE 1:
Tiosa

Soil testing parameter	Rating
pH	7.042
Electrical conductivity	2.325 mho-1
Organic carbon	0.90%
Nitrogen	86.6 kgha-1

SOIL TEST REPORT FOR SAMPLE 2:
Kruha

Soil testing parameter	Rating
pH	7.079
Electrical conductivity	3.076 mho-1
Organic carbon	0.70%
Nitrogen	88.46 kgha-1

SOIL TEST REPORT FOR SAMPLE 3:
Daryapur

Soil testing parameter	Rating
pH	8.85
Electrical conductivity	2.213 mho-1
Organic carbon	0.86%
Nitrogen	89.05 kgha-1

Microbial Activity of Soil:-

Sr. No.	Sample of Soil	Nitrogen Fixing Organism	PSB Bacteria
1	Tiosa	Present	Absent
2	Kurha	Present	Present
3	Trimurti Nagar	Present	Absent