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DETERMINATION AND TESTING METHODOLOGY OF PH LEVEL OF A SOIL

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Abstract:

This paper presents the study of identifying the pH level in soil. pH is a measure of the soil's acidity or alkalinity. The determination of pH value in soil is used for plant growth. Soil plays a vital role in the survival of living beings on the earth. Soil is important for soil fertility (agriculture) which supports for plant growth, microbiological growth which supports for cultivation of many bacteria, algae, and fungus which gives medicine like antibiotic and also supports germination of seeds. During the rain .the soil absorbs water which goes into deeper layer of soil and is available for plant growth, forest growth, and drinking water. This study explains types of soils and their pH values, testing methods for pH of a soil.

Keywords: Soil, pH value, alkalinity, acidity, neutral, base.

1. INTRODUCTION

Soil is the combinations of minerals, liquids, gases, organic matter, and uncountable organisms which are together to support life on Earth.. Soil is recognized as one of the most valuable natural resource. The pH level in the soil is considerable for the soil health. pH value is used to measure the degree of acidity or alkalinity. The acidity and alkalinity of the soil deeply affects plants growth. If the soil is too sweet and or too sour, plants could not take the nutrients such as potassium (K), nitrogen (N), and phosphorus (P). Most nutrients like N, K, and P are readily available when the pH value of the soil solution ranges between 6.0 and 7.5. Below a pH value of 6.0 (acid), some nutrients such as N, P, and K less available. Above a pH value of 7.5 (alkaline), phosphorus, Iron, and manganese are less available.

Figure: 1 soil image

Wide range of soil colors will be available such as gray, black, white, yellow, red, and brown are altered by the content of organic matter, and due to the presence of water, magnesium and oxidation state of iron. Red and yellow soil indicates the presence of iron oxides. Dark brown soil black color soil signifies that those soil having very high organic content. Soil will be in dark in color when it's dry. Due to oxidation the soil will turn into red and brown colors and some of specific minerals will affect the soil color. If the soil is black in color due to Manganese oxide, similarly the soil is green in color because of potassium and the soil will be in white with the presence of calcite. These are all because of concentration of organic matters, presence of water and oxidation are

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influenced factors of pH and color association.

2. TYPES OF SOIL

Different sizes of soil particles leads to various soil types. Soil is made up of ground rock particles. Soil components size plays a vital role. The size of the soil determines soil types such as sandy, loam, clay-loam, silt-loam, and so on.

2.1 Sandy

Sandy soil is the largest particles between the different soil types. It is dry and rough to the touch, and because it's having very large spaces between the particles, it couldn't hold on to water.

2.2 Silty

This soil will be small in size when compared to sandy soil. Silty soil is smooth to the touch. When moistened, it's soapy slick. If the soil is roll it between the fingers, dirt is left in the skin. Silty soil retains water longer, but it doesn't hold on to as much nutrients. Because of the moisture quality this soil will be cold and drains poorly.

Figure: 2 various types of soil

2.3 Clay

Clay is the smallest particles between the three so it has very good water storage qualities which sticky to the touch when wet, but it will be smooth when dry. Because of the tiny size of clay particles and its habit to settle together, little air passes through its spaces. Soil is used for better growth of plants.

2.4 Peaty

Peaty soil has black and dark brown in color and which soil is soft and easily compressed due to its high water content, and also contains rich in organic matter.

2.5 Saline Soil

The soil in extremely dry regions is usually briny because of having high salt content. Known as saline soil, it can cause damage to and slow in plant growth, hang up, fertilization or germination, and cause difficulties in flooding. Due to high salt contents this soil prevent water uptake by plants, leading to dearth stress.

3. SOIL ORGANIC MATTER

Organic compounds, plant, animal and microbial material are used to make the soil organic. A soil having a biomass composition as microorganisms with 70%, macro fauna with 22%, and roots with 8%. The living component of a soil consists of earthworms with 900 lb, fungi with 2400 lb, bacteria with 1500 lb, protozoa with 133 lb, arthropods and algae with 890 lb arthropods and algae. The organic matter of a soil contains living cells like bacteria, actinomycetes, and molds which work to

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break down the dead organic matter. The organic matter has been classified as follows:

- *Polysaccharides*
  - cellulose
  - starch
  - pectin
  - hemicelluloses
- *Proteins*
- *Lignins*

4. SOIL REACTION (PH)

pH level is used to estimate the Soil reactivity which is used to measure the acidity or alkalinity of a soil. pH is a measure of concentration of hydrogen ion in which the solution of water pH ranges from 0 to 14 (acidic to alkalinity) but practically the soils having the pH ranges from 3.5 to 9.5. Usually the pH value is measured on the scale of 1-14.

- A pH value with 7.0 = Neutral soil
- A pH value above 7.0 = Alkaline soil
- A pH value below 7.0 = Acidic soil

4.1 Various types of pH testing

Test method 1: Commercial Test Probe

1. Dig a small hole in the soil and fill the hole with distilled water.
2. Insert the test probe into the mud and hold it there for 60 seconds and take a reading.
3. Take several measurements in different spots in the garden and then find the average value of pH.

Test method 2: Red cabbage

1. Take a red cabbage and chopped it.
2. Heat pure distilled water until it boiling
3. Add the chopped red cabbage to the boiling distilled water which gives violet hued juice with pH of 7.
4. Pour the cabbage juice into 2 separate cups.
5. Add vinegar (which has acidic characteristics) into one cup with the cabbage juice which turns into the color hot pink, similarly add baking soda (which has alkalinity characteristics) with another cup of cabbage juice and then it turn into the color blue or green.
6. Pour the cabbage juice into the soil and wait for 30 minutes.
7. Test the soil color, if it turns into violet (pH of 7) the soil is neutral, else if it turns into pink (pH from 1 to 7) the soil is acidic, and else if it turns into blue or pink, (pH from 8 to 14) the soil is alkaline.

Test method 3: Vinegar and Baking Soda

1. Take 2 cups of soil from the garden.
2. Add vinegar into one cup of soil and wait for few minutes, if it is fizzes, the soil is alkaline. In that case, stop the testing process.
3. Add baking soda into to another cup of soil and wait for few minutes, if it is fizzes, the soil is acidic.
4. If soil doesn't fizzing, then the soil has pH of 7 which is neutral.

Test method 4: Laboratory Method

1. Take 3 cups of soil sample from wet garden or land.
2. Diffuse the soil on to the baking sheet and allow them to dry for 24 hours.

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3. Remove the rocks, roots and large lumps of organic material from the dried soil.
4. Put one cup of dried the soil into the clear jar and add water to the jar to saturate the soil, Measure the level of a soil.

Depth of sand = ----------inches

5. Add one tease spoon of detergent into the jar and it will act as a surface active substance and it will keep the soil particles from scuffing together.
6. Close the jar with lid and shake the jar for three minutes for mix the soil, soap, and water, and put the jar down on a flat stable surface and start your timer.
7. Measure the depth of the settled material after 1 minute and which material will be sand, because sand will settle the most quickly. Measure the depth of sand.

DoS (Depth of Sand) = ____(inches)

% Sand = (DoS / Depth of Soil) * 100%

% Sand = _____%

8. Allow the jar to stand for 6 hours and measure the new depth of the settled material. The depth of slit is given by difference between the new depth and the depth of the sand layer.

New Depth = _____inches

Depth of Silt = New Depth – Depth of Sand

Depth of Silt = _____inches

%Silt = (Depth of Slit/Depth of Soil)* 100%

% Silt = _____%

9. The depth of the clay is measured as subtracting the new depth from the depth of soil which found in step 4.

Depth of Clay = Depth of Soil – New Depth

Depth of Clay = _____inches

%Clay = (DoS / Depth of Soil)* 100%

% Clay = _____%

4.2 Changing the pH of a soil

Some methods are available to change the pH value of a soil. If the soil is less acidic which has the pH value below 7, add quick lime or dolomite into the soil. It will turn the soil into neutral. If the soil is less alkaline which has pH tested above 7, add organic matters like peat moss, pine needles, sulfur (very effective) and decomposed tree leaves which are all turns the soil into neutral.

These methods are used to Change the soil pH for growth of specific plants. For example, add sulfur to a certain area in the garden to encourage beautiful blue blooms on your hydrangeas, which prefer more acidic soils.

5. CONCLUSION

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This study explains that the pH value of a soil and its importance. Various types of soils and their pH level testing mechanism are explained clearly. This study concludes that the soil with pH value of 7 is very suitable for the plant growth.

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