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Determination of pH and Conductivity of Soil Samples for Different Location of Sam Global University

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ABSTRACT

This study investigates the physical and chemical properties of soil samples from various locations to determine their suitability for pepper cultivation. 3 soil samples were collected from diverse locations and analyzed for pH, electrical conductivity, organic matter, nitrogen, phosphorus, and potassium content. Results showed significant variations in soil properties across locations. Correlation analysis revealed strong relationships between soil pH, organic matter, and nutrient content. Cluster analysis grouped locations into three categories based on soil properties. Findings provide valuable insights for pepper farmers and soil managers to optimize soil conditions and improve crop yields. The soil pH property used to describe the degree of acidity or basicity which affect nutrient availability and ultimately plant growth. Here the soil pH is determined by the help of using digital image processing. pH of 7.0 is neutral, and soils above or below this value are either alkaline or acidic, respectively.

Key words - soil analysis, pepper cultivation, soil properties, fertility.

Introduction

The assessment of soil pH is a crucial aspect that aids in understanding plant growth and the availability of nutrients essential for this growth. By determining the soil's pH, one can swiftly ascertain its suitability for supporting plant life and identify which nutrients may be in short supply [9]. This technology facilitates the measurement of both acidity and alkalinity. The pH scale ranges from 0 to 14, with a value of 7.0 indicating neutral soil. Values below 7.0 signify acidic conditions, while those above indicate alkalinity. Notably, a soil pH of 6.0 is ten times more acidic than neutral soil [8]. The overall development of crops is significantly influenced by soil pH, which is measured using a pH meter. While most plants can tolerate a range of soil pH levels, increased acidity can hinder their adaptability. The pH scale, extending from 1 to 14, categorizes values below 7 as acidic and those above as alkaline. The optimal pH range for many plants lies between 5.5 and 7.0. Below a pH of 6.0, the availability of nutrients such as nitrogen, phosphorus, and potassium diminishes, whereas above a pH of 7.5, the availability of iron, manganese, and phosphorus decreases. Most essential nutrients for plant growth are most accessible when the soil pH is maintained between 6.0 and 7.5. Additionally, soil color serves as a visual indicator, where digital values of red, green, and blue (RGB) can provide insights into the spectral signatures associated with varying soil pH levels [10].

Materials and Methods :-

Materials - 1. Soil sampling equipment (auger, trowel)

2. pH meter

3. Conductivity meter

4. Distilled water

5. Soil samples from different locations

Method - Calibrate the pH meter, using 3 buffer solutions, one should be the buffer with neutral pH (7.0) and the other should be chosen based on the range of pH in the soil. Take the buffer solution in the beaker. Insert the electrode alternately in the beakers containing 2 buffer solutions and adjust the pH. The instrument indicating pH as per the buffers is ready to test the samples. Weigh 10.0g of soil sample into 50 or beaker; add 25 ml of distilled water. Thoroughly stir for 10 second using a glass rod. Record the pH on the calibrated pH meter.

Table 2.1: Based on soil pH values, following types of

soil reactions are distinguished:

PH Range Soil Reaction Rating

<3.5 Extremely acid

3.5-4.0 Very strongly acid

4.0-5.0 Strongly acid

5.0-6.0 Moderately acid

6.0-6.5 Slightly acid

6.6-7.4 Neutral (comfortable for most crops)

7.5-8.0 Slightly alkaline

8.0-8.5 Moderately alkaline

>8.5 Strongly alkaline

The acidic soils need to be limed before they can be put to normal agricultural production. The alkali soils need to be treated with gypsum to remove the excessive content of sodium.

Location – sam global university

location 1- b block

location 2- f block

location 3 – volleyball ground

Parameters - 1. pH: Measures acidity/alkalinity.

2. Electrical Conductivity (EC): Measures ionic content.

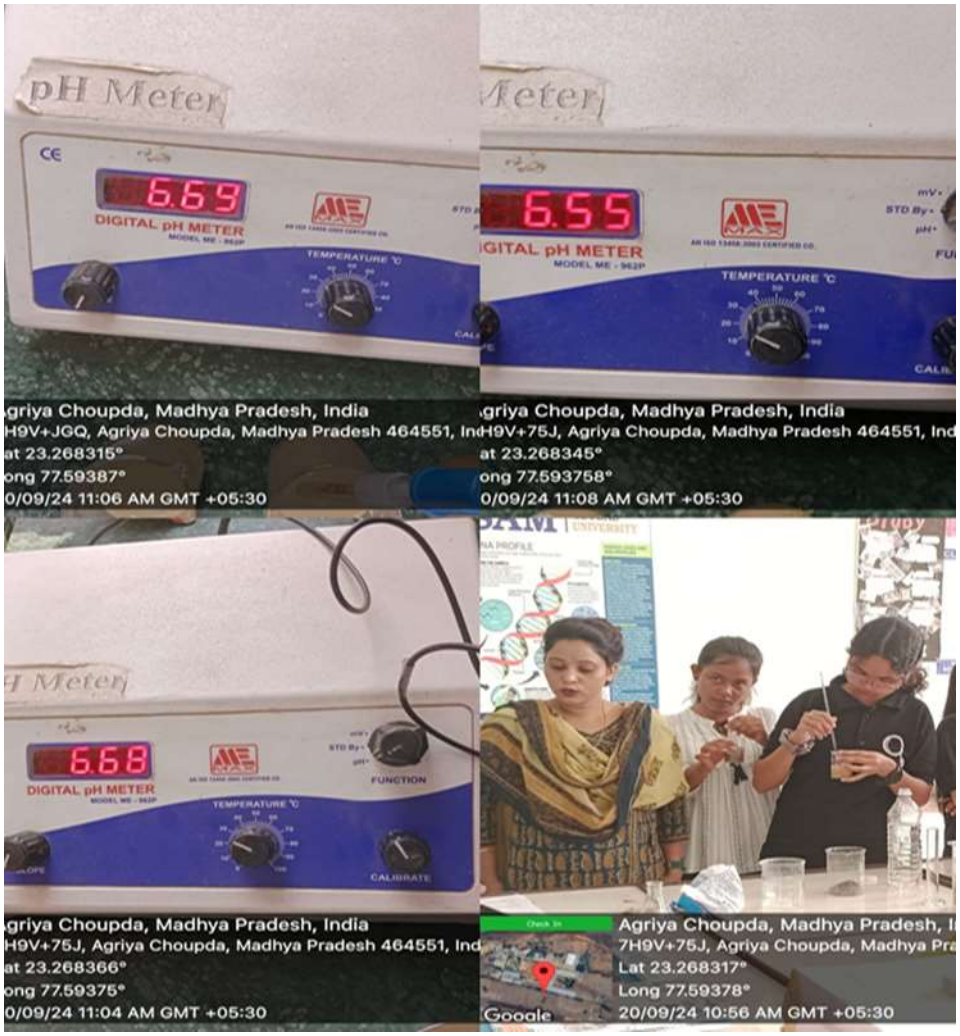
Procedure – 1. Collect the soil sample from different locations .

2. place different samples in different beakersw with labeling.

3. add distilled water in each beaker with constant stirring for making solution of it .

4. after calibrating ph meter , measure the ph of each sample .

5. record the ph of each sample .



Observation –

Location 1 – b block – ph value -6.69

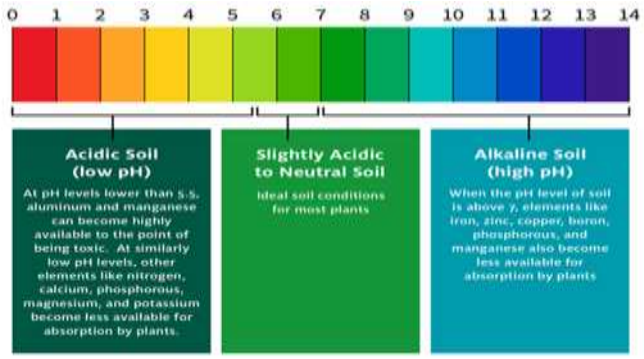
Location 2 – f block – ph range – 6.55

Location 3 – volleyball ground – 6.68

Image during collection of soil sample :-

Result

When light interacts with objects, the material composition determines the absorption and reflection of various wavelengths. By utilizing digital photography, images of soil can be captured, which correspond to the wavelengths associated with red, green, and blue colors, as illustrated in Fig 1. The pH of the soil is then calculated through digital image processing. This process involves separating the color bands to provide information regarding the intensity of light within the red, green, and blue (RGB) wavelength regions. Fig 2 displays the distinct color bands. The colors of the soil samples, captured by the digital camera, vary significantly, ranging from deep brown to light yellowish or greenish hues. The results yield a qualitative assessment of the soil's pH level.



Ultimately, an approximate pH value is obtained and compared with pre-existing values stored in a database. Following this comparison, the soil pH factor is returned, allowing for an accurate determination of the soil's pH. If the obtained value matches the database entry, the pH of the soil is accurately

represented, as shown in Fig 3. Based on the pH level, recommendations for suitable crops can be made. Fig 4 illustrates the flowchart of the entire system.

Conclusion –

The soil pH is a property that indicates the level of acidity or basicity, which influences nutrient availability and, consequently, plant growth. In this context, the determination of soil pH is facilitated through digital image processing techniques. A pH level of 7.0 is considered neutral, while soils with pH values above or below this threshold are classified as alkaline or acidic, respectively.

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