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Study of pH and electrical Conductivity of Soil in Deulgaon Raja Taluka, Maharashtra

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Abstract- The aim of this paper is to study the pH and electrical conductivity of soil and find out its nutrient value in region of Deulgaon raja taluka Maharashtra. Soil pH is important as it affects the growth of plants. pH of soil affects the ability of plant roots to absorb nutrients. Soil EC is a measurement that correlates to soil properties affecting crop productivity, including soil texture, cation exchange capacity, drainage conditions, organic matter level and subsoil characteristics This study helps farmer to understand nature of their soil and also soluble salts present in their soil. Thus by observing the results they can take necessary action to increase their soil fertility or can select the proper crops.
Keywords: Quality of soil, pH, Electrical Conductance.

I. INTRODUCTION

Deulgaon raja is located in Vidharba region of Maharashtra state, farmers from this region are suffering from infertility of soil and low crop yield. Vidharba region is also known in India for large number of farmer's suicide. So by checking the soil 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. Soil pH is an indication of the acidity or alkalinity of soil and is measured in pH units. The pH scale goes from 0 to 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 is increasingly more acidic, and from pH 7 to 14, the soil is increasingly more alkaline or basic. Some States like Andhra Pradesh, Gujarat, 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. Some elements like potassium, magnesium Calcium and phosphorus 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 micro-organisms responsible for breaking down organic matter and most chemical transformations in the soil. Soil EC is also one of the simplest and least expensive soil measurements available to check soil quality. Soil EC is 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 is a general indicator of soil nutrient availability, presence of free lime (calcium carbonate), presence of excess sodium, and excess hydrogen. 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 is controlled by physical, chemical and biological components of a soil and their interactions [8]. The acidity or alkalinities in soils have several different sources. In natural systems, the pH is affected by the mineralogy, climate, and weathering. Management of soils often alters the natural pH because of acid-forming nitrogen fertilizers, or removal of bases (potassium, calcium, and magnesium). Soils that have sulfur-forming minerals can produce very acid soil conditions when they are exposed to air. Perveen S. et al. [2] have studied micronutrient status of soils and their relationship with various physico-chemical properties. Chhabra G. et al. [13] have shown that available manganese decreased with soil pH and available copper increased with clay and organic carbon content.

By getting information about pH and EC of soil farmers can easily decide the amount of fertilizers to be added to soil and fertility value of their soil to make the production economic.

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II. MATERIALS AND METHODS

The soil pH and EC test are best source available to known the nature of soil and soluble salts status. Eighteen villages from Deulgaon Raja taluka covering North, South, East and West, were selected for this study. A representative soil sample was collected from each village which represents soils of 4 to 10 farm's depending upon area of village. Representative soil samples were collected following standard quadric procedure and taken in polythene bags. In laboratory these samples were analyzed for pH and EC following standard methods. AR grade reagents and double distilled water were used for soil analysis. Results were compared with standard values [1, 6, 14] to find out the nature of soil weather it is acidic, neutral, alkaline or alkali and the presence of soluble salts through electrical conductance measurement.

The pH of Soil Is Measured using Digital pH Meter which consist of electrode and digital meter. The electrode that does the most important job, which is called the glass electrode, has a silver based electrical wire suspended in a solution of potassium chloride, contained inside a thin bulb (or membrane) made from a special glass containing metal salts (typically compounds of sodium and calcium). The other electrode is called the reference electrode and has a potassium chloride wire suspended in a solution of potassium chloride.

A. Procedure for measuring pH.

1) Take 20 gm of soil in 100 ml beaker.
2) Add 40 mL of pure water to it using an pipette or suitable volumetric container. Stir with a glass rod and let the sample stand for 30 min.
3) Standardize the pH meter.
4) Stir the sample again immediately before measuring the soil pH. Do not place the electrode(s) directly in the sand layer at the bottom of the container. The electrodes should be positioned in the solution just above the sand layer.
5) Record pH to the nearest 0.1 pH unit.

B. Procedure for measuring Electrical conductivity.

1) Take 20 gm of soil in 100 ml beaker.
2) Add 40 mL of pure water to it using a pipette or suitable volumetric container. Stir with a glass rod and let the sample stand for 30 min.
3) Standardize the Conductivity meter.
4) Stir the sample again immediately before measuring EC of the soil. Do not place the electrode(s) directly in the sand layer at the bottom of the container. The electrode should be positioned in the solution just above the sand layer.
5) Record EC in dS m^{-} unit.

III. RESULTS AND DISCUSSION

Table 1 represents pH values of soils measured on pH meter, it is classified into three categories Acidic, Normal, and Alkaline. Table 2 represents Electrical Conductivity observed which is classified into four categories as Normal, Critical for salt sensitive crops, Critical for salt tolerant crops and Injurious to most crops. Further we classified for number of samples lies in the category low, Medium and high for pH and EC. Soil samples from various villages are categorized as low, medium and high for pH and EC are presented in the Table 3. This table represents the number of samples lies in Low, Medium and High pH range. The same table represents the Electrical Conductivity of the soil for all these villages. Data presented in Table 3 shows that soils of few villages contain low pH value and some soil sample of villages have high range of pH. Average all samples have lower Electrical Conductivity.

All this results suggest good quality of soil of Deulgaon Raja taluka territory and is discussed on the following bases, 92.64 % soil samples found to be with normal pH, 1.37 % samples with low pH i.e. greater the acidity of the soil, it is essential for determining the lime requirement, some samples are also found alkaline 5.97 % . Values may sometime vary significantly from season to season, and are influenced by lime, fertilizer added and climatic conditions. At very low pH, solubility of Al, Mn and Zn increase, and can become toxic to sensitive plants. At high pH values, the solubility of Mn, and to a lesser extent Zn and Cu, can become so low that plants are unable to obtain adequate supplies from the soil. Few soil samples found acidic nature in our research.

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Table 1: Soil Samples are categorized as Follow Depending on pH Value

Category	Range of pH value	Suggestion for remedy
Acidic (Low pH)	<6.5	Requires liming for reclamation
Normal (Medium pH)	6.5- 7.8	Optimum for most crops
Alkaline (High pH)	>7.8	Requires application of organic manures

Table 2: Soil samples are categorized as Follow Depending on EC Value

Range of EC value	Category of Soil
<0.8 dS m^{-1}	Normal
0.8 – 1.6 dS m^{-1}	Critical for salt sensitive crops
1.6 –2.5 dS m^{-1}	Critical to salt tolerant crops
>2.5 dS m^{-1}	Injurious to most crops

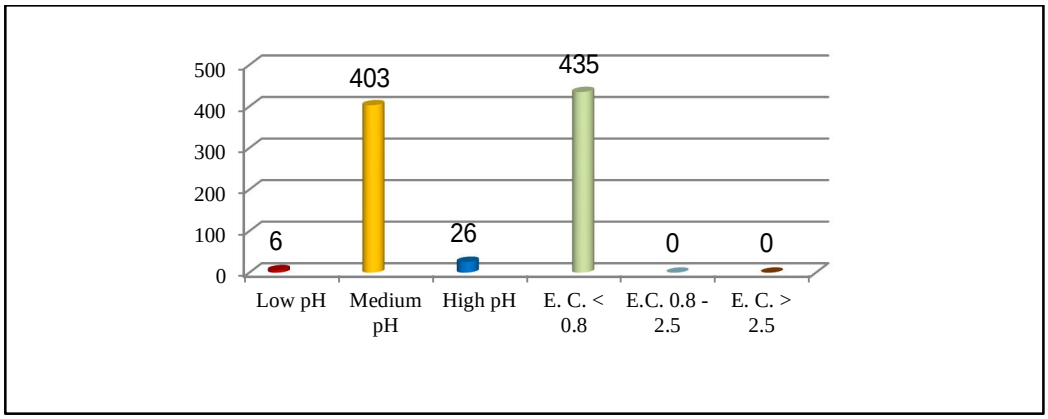
Table 3: pH and Electrical Conductance Study of the Soil of Deulgaon Raja Taluka Territory District: Buldana

Sr. No.	Village Name	Number of samples	No of samples in LOW pH	No of samples in MEDIUM pH	No of samples in HIGH pH	No of samples with EC <0.8 dS m^{-1}	No of samples with EC 0.8 – 2.5 dS m^{-1}	No of samples with EC >2.5 dS m^{-1}
1	Pimpalgaon Chilamkha	25	1	22	2	25	0	0
2	Singaon	28	0	25	3	28	0	0
3	Mehunaraja	22	1	21	0	22	0	0
4	Gargundi	22	0	20	2	22	0	0
5	Aland	24	0	24	0	24	0	0
6	Asola	25	0	22	3	25	0	0
7	Doifodewadi	26	1	22	3	26	0	0
8	Pangri Wagh	25	0	24	1	25	0	0
9	Pimpalgaon	25	0	25	0	25	0	0
10	Umberkhed	26	1	22	3	26	0	0
11	Kumbhari	23	1	22	0	23	0	0
12	Borakhedi Bawra	20	0	20	0	20	0	0
13	Saokhed Bhoi	26	0	24	2	26	0	0
14	Kinhi Pawar	25	0	22	3	25	0	0
15	Bhivgaon	22	0	22	0	22	0	0
16	Chincholi Burkul	24	1	22	1	24	0	0
17	Rohna	22	0	20	2	22	0	0
18	Takarkhed Bhagile	25	0	24	1	25	0	0
	Total	435	6	403	26	435	0	0

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Status of pH and Electrical Conductance in the Soil of Deulgaon Raja Taluka



IV. CONCLUSION

The pH and Electrical Conductivity of soil in Deulgaon Raja taluka is under permissible or acceptable limit about 92.64 % samples with normal pH, so it is good for crop. Study helps to identify the nature of soil i.e. acidic, neutral or alkaline. Some soil samples found to be alkaline (5.97 %) in nature so farmers are ask to use organic manure. Study helps to find out the crops suitable for their soil. By knowing EC levels will help in plant production and monitoring of inputs. Soil EC maps can be used to define management zones reflecting obvious trends in soil properties.

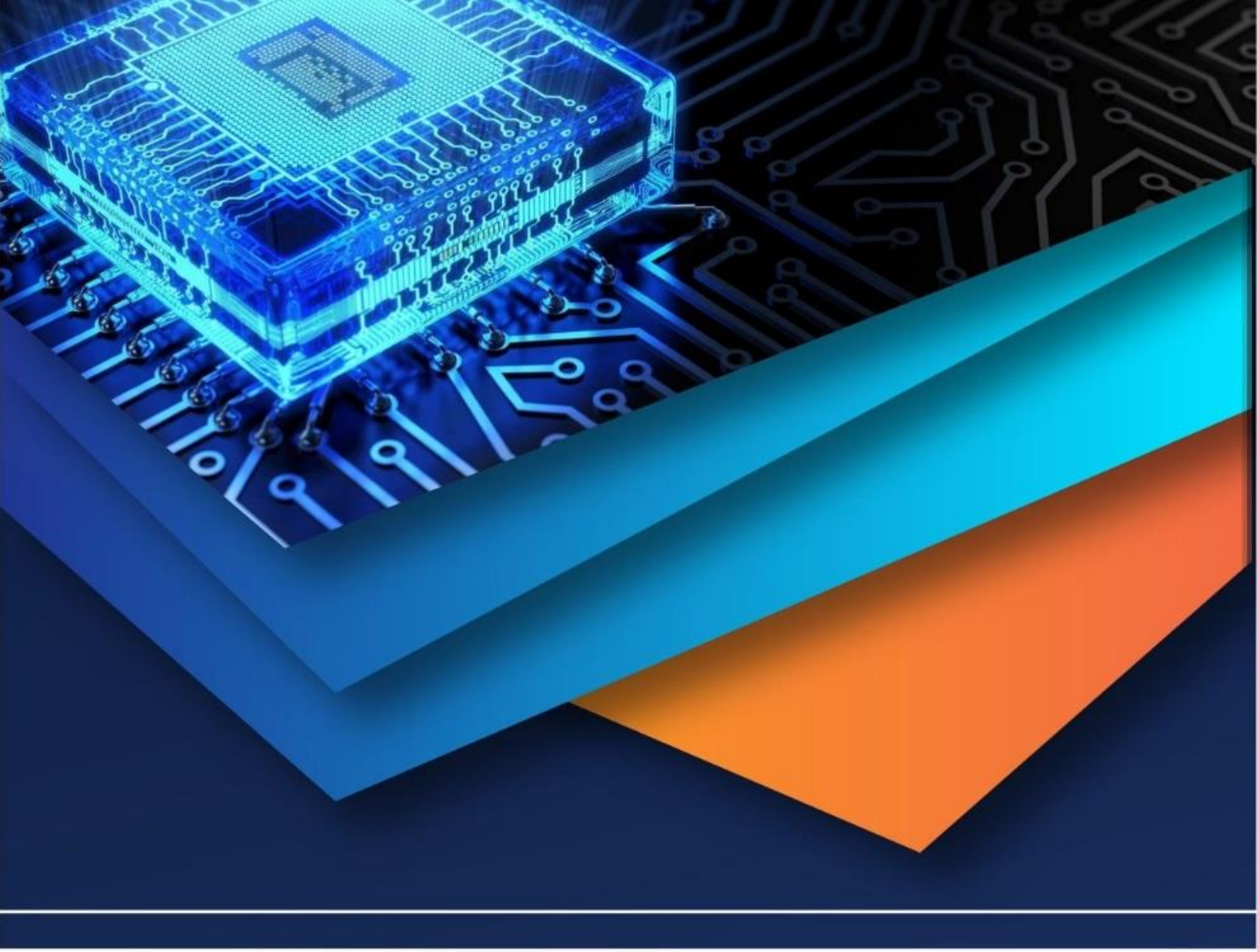
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