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Study of Physico-Chemical Parameter of Soil Analysis in Buldana District

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Abstract: *Soil is the system which supplies plant with available nutrients through the root. Physical and Chemical analysis of the soil are carried out to indicate the efficiency of soil for supplying plants with nutrients in available forms as well as identification of the factors affecting this efficiency in the soil. Therefore, besides perfect sampling in the field, soil samples must be properly prepared and analyzed in order to reach the correct evaluation of the soil nutritional status. Soil is the mixture of minerals, organic matter, gases and countless organisms that together support plant life. Soil is considered to be the "skin of the earth" with interfaces between the lithosphere, hydrosphere, atmosphere of Earth, and biosphere. Soil consists of a solid phase (minerals and organic matter) as well as a porous phase that holds gases and water. Accordingly, soils are often treated as a three-state system Soil is the end product of the influence of the climate, relief (elevation, orientation, and slope of terrain), organisms, and parent materials (original minerals) interacting over time. Soil continually undergoes development by way of numerous physical, chemical and biological processes, which include weathering with associated erosion. Most soils have a density between 1 and 2 gram per cubic centimeter.*

Keywords: Soil Analysis

I. Introduction

Soil is the end product of the influence of the climate, relief (elevation, orientation, and slope of terrain), organisms, and parent materials (original minerals) interacting over time.6 Soil continually undergoes development by way of numerous physical, chemical and biological processes, which include weathering with associated erosion. Most soils have a density between 1 and 2 gram per cubic centimeter[1-3].

Soil science has two basic branches of study: edaphology and pedology. Pedology is focused on the formation, description (morphology), and classification of soils in their natural environment, whereas edaphology is concerned with the influence of soils on organisms. In engineering terms, soil is referred to as regolith, or loose rock material that lies above the 'solid geology'. Soil is commonly referred to as "earth" or "dirt"; technically, the term "dirt" should be restricted to displaced soil. Soil is a major component of the Earth's ecosystem[4]. The world's ecosystems are impacted in far-reaching ways by the processes carried out in the soil, from ozone depletion and global warming, to rain forest destruction and water pollution.

Ammonia generated by the production of coke was recovered and used as fertilizer Finally, the chemical basis of nutrients delivered to the soil in manure was understood and in the mid-19th century chemical fertilizers were applied. However the dynamic interaction of soil and its life forms still awaited discovery[5].

It was known that certain legumes could take up nitrogen from the air and fix it to the soil but it took the development of bacteriology towards the end of the 19th century to lead to an understanding of the role played in nitrogen fixation by bacteria. The symbiosis of bacteria and leguminous roots, and the fixation of nitrogen by the bacteria, were simultaneously discovered by the German agronomist Hermann Hellriegel and the Dutch microbiologist Martinus Beijerinck Crop rotation, mechanisation, chemical and natural fertilizers led to a doubling of wheat yields in western Europe between 1800 and 1900.

1.1 Some Important Physical Properties of Soil

All crops practically slow down their growth below the temperature of about 90C and above the temperature of about 500 C and physical properties as Texture, Structure, Density, Porosity, Consistence, Colour

II. Objective

1. To provide a basis for fertilizer recommendations for a given crop.
2. To evaluate the fertility status of the soil and plan a nutrient management program.
3. To provide and index of nutrient availability or supply in given Soil.
4. To predict the probability of obtaining a profitable response to fertilizer application.

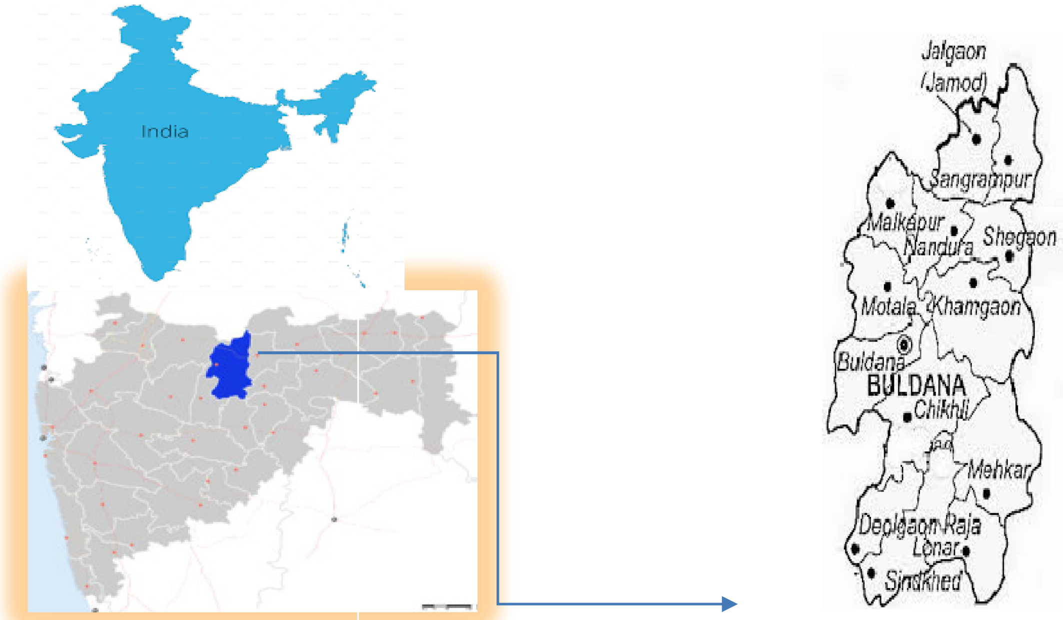
2.1 Sample Collection

Sample collected fromLonar is a town and municipal council in Buldana district of vidarbha region of the India state of Maharashtra.. Mostly Agriculture crop is found in lonar village is as follows cotton, soyabean, chilli, jawar, wheat and cotton is one of the most important crops in lonar village. Various type of soil is present in lonar Red soil, lime soil, black cotton soil etcthe collected soil samples have been analyzed in Laboratory Systematic collection of soil samples is an important step in soil analysis. These centers are manned by trained and experienced agriculture graduates who help the farmer in systematic collection of soil samples.

Appropriate method of collection of soil sample is as important as the chemical analysis of the soil because all the recommendation regarding the soil is based on the analysis of these samples. The samples collected for the analysis should be truly representing the field. 0.5 to 2 Kg sample is collected for soil analysis and out of this sample only 2 to 5 grams soil is used for analysis. Ten Soil sample is collected from the fields of following farmer

Sr. No.	Name of Farmer	Sample Code
1.	Shashikant Sarkate	S1
2.	Bhaskar Padghan	S2
3.	Vijay Sarkate	S3
4.	Ambadas Pophale	S4
5.	Anna Padghan	S5
6.	Gopal Avachar	S6
7.	Madhav Narvade	S7
8.	Satish Sarkate	S8
9.	Bhagwat Gavali	S9
10.	Ravindra Deshmukh	S10

Location of study area is shown in following maps



III. Experimental Procedure

3.1 pH

Procedure: Add 25 ml distilled water to 10 g air-dried sample in a beaker 50 ml. Read the suspension temperature by thermometer. Stir at regular intervals for 20-30 minutes. Wash the pH meter electrode with distilled water. Open the contact switch, wait 5 minutes, adjust temperature knob to room temperature. Rinse the electrode with distilled water, then with the soil suspension after stirring. Read the pH value of the soil suspension.

3.2 Electrical Conductivity (EC)

Electrical conductivity is commonly used for measuring the electrical resistance in the solution which indicates the total concentration of ionized constituents in solutions. It is closely related to the sum of the cations and anions in the suspension. Accordingly, it can be used for indicating the salinity in soil extracts. Electric conductivity can be expressed as milliohms/cm in 11:215 soil/water extract.

Reagents: 1- Potassium chloride solution 0.01N: 2- Calcium sulfate dehydrates saturated solution.

Procedures: Extraction: Take 10 g air-dry soil in 100 ml beaker, add 25 ml distilled water Stir for 10 minutes, and repeat stirring 4 times on 30 minutes intervals Measure the suspension temperature by thermometer Read out the electrical conductivity of soil solution

3.3 Total Nitrogen

Reagents:

1. Digestion mixture: Mixture of Potassium sulphate K_2SO_4 and Copper sulphate $CuSO_4 . 5H_2O$. with Selenium. Mixed with proportion of 10: 1: 0.5 respectively.
2. H_2SO_4 conc.
3. NaOH solution (40%).
4. H_3BO_3 solution (4%).
5. 0.01 N HCl
6. Indicator

Procedure:

Weigh 5 g soil into digestion flask add 5 g digestion mixture and 20 ml H_2SO_4 conc.put the flask on digestion board with electric heaters. Heat gradually; low at 10-30 minutes, then raise heating degree. After the end of fuming, the digestion is continued for 1 hour after the solution had cleared with white colour of digestion mixture. Transfer the sample to 250 ml volumetric flask; complete the volume with dist. Water.

Distillation: Put 20 ml H_3BO_3 in Erlenmeyer flask and 4 drops of the indicator.

Put the flask so that the lower tip of the glass receiver tube is below the boric acid surface. Start running the cooling water in condenser boils the water in the boilers. Put 25 ml of the sample in the funnel with dist. Water. Released ammonia is trapped in boric acid.

Titration: Ammonia is titrated with HCl or H_2SO_4. At end point the green colour just disappears.

Calculation

$$\text{N \% in soil} = \frac{(\text{sample titration} - \text{blank}) \times \text{normality} \times 14 \times \text{dilution}}{\text{sample weight}}$$

3.4 Soil Organic Matter

Reagents: H_3PO_4 85%, H_2SO_4 concentrated (96%), NaF, Standard 1N $K_2Cr_2O_7$, 0.5 N Fe^{++} solution The Fe^{++} in this solution oxidizes slowly on exposure to air so it must be standardized against the dichromate daily. Ferroin indicator:

Procedure: Weigh out 1 to 2g dried soil (< 60 mesh) and transfer to a 500 ml Erlenmeyer flask. The sample should contain 10 to 25 mg of organic C (17 to 43 mg organic matter). For a 1 g sample, this would be 1.2 to 4.3% organic matter. Use up to 2.0 g of sample for light colored soils and 0.1 g for organic soils.

2- Add 10 ml of 1 N $K_2Cr_2O_7$ by means of a pipette. Add 200 ml of concentrated H_2SO_4 by means of dispenser and swirl gently to mix. Allow to stand 30 minutes. The flasks should be placed on an asbestos sheet during this time to avoid rapid loss of heat. Dilute the suspension with about 200 ml of water to provide a clearer suspension for viewing the endpoint.

3- Add 10 ml of 85% H_3PO_4, using a suitable dispenser, and 0.2 g of NaF, using the spatula The H_3PO_4 and NaF are added to complex Fe^{3+}, which would interfere with the titration endpoint. Add 10 drops of ferroin indicator.

4- Titrate with 0.5 N Fe^{++} to a burgundy endpoint. The color of the solution at the beginning is yellow-orange to dark green, The reagent blank is used to standardize the Fe^{++} solution daily. Calculate % C and % organic matter

% easily oxidizable organic C

$$C = \frac{(B-s) \times n \times Fe{++}}{gmofsoil} \times \frac{12}{4000} \times 100$$

Where: B = ml of Fe^{++} solution used to titrate blank,

S = ml of Fe^{++} solution used to titrate sample, and 12/ 4000 = mill equivalent

3.5 Moisture Content

Procedure: Weigh 5.00 g of air-dry soil < 2 mm into a previously dried (at 105°C) and weighed weighing dish with lid (a labeled aluminum dish) fit lid, cool in a desiccators for at least 30 minutes and reweigh. All Weighing should be recorded to 3 decimal places.

Calculation:

$$\% \text{ moisture} = \frac{\text{wet soil (g)} - \text{Dry soil}\backslash \text{ (g)}}{\text{dry soil}} \times 100$$

3.6 Chloride: - Reagents

A. Potassium Chromate, Silver Nitrate Solution ($AgNO_3$) 0.01N NaCl, 0.01 N

Procedure: Pipette 5-10 ml soil saturation extract into a wide-mouth porcelain

Crucible or a 150-ml Erlenmeyer flask. Add 4 drops potassium chromate solution.

Titrate against silver nitrate solution until a permanent reddish-brown color appears. Always run two blanks containing all reagents but no soil, and treat them in exactly the same way as for the samples. Subtract the blank titration reading from the readings for all samples.

Calculation

$$Cl\ (meq/L) = \frac{(V - B) \times N \times R \times 1000}{Wt}$$

3.7 Water Holding Capacity

Procedure:

Weight accurately 20 gm of soil sample on the balance transfer this soil on the whatmann's filter paper and kept this soil in funnel then on the measuring cylinderpour 40 ml of water into the soil sample Keep this experiment stay for one night Then observe how much of water is come down from soil sample in measuring cylinder accurately weight the wet soil with filter paper and subtract weight of filter paper from wet soil Then calculate the water holding capacity by the using below formula

WHC = weight of wet soil – weight of taken soil

IV. Result and Discussion

1. Temperature of Soil sample was found to be 28.9 to 34.7
2. Colour of Soil sample found to be Black, Lime and Red.
3. The amount of pH present in the Soil sample was found to be in between range of 6.2 to 8.32
4. The amount of chloride ion present in the Soil sample was found to be in between 0.047 to 0.093 meq/L.

Sr. No	Name of Parameters / Name of Farmers	Water Holding Capacity (ml/20gm)	Moisture Content (%)	Chloride (mg/L)
1	Shashikant Sarkate	7.2	4.1	0.063
2	Bhaskar Padghan	5.6	5.2	0.065
3	Vijay Sarkate	11.4	3.0	0.089
4	Ambadas Pofale	3.2	6.3	0.047
5	Anna Padghan	9.9	3.8	0.068
6	Gopal Avachar	8.9	8.6	0.071
7	Madhav Narvade	10.8	3.0	0.088
8	Satish Sarkate	7.4	7.5	0.070
9	Bhagwat Gavali	13.2	6.3	0.093
10	Ravindra Deshmukh	6.5	7.5	0.059

Sr. No.	Name of Parameters / Name of Farmars	E.C. (ms)	Nitrogen (%)	PH	Organic carbon (%)
1	Shashikant Sarkate	0.361	2.88	7.20 at 23^0C	3.62
2	Bhaskar Padghan	0.374	3.39	6.45 at 23^0C	2.7
3	Vijay Sarkate	0.938	2.33	7.46 at 23^0C	3.38
4	Ambadas Pofale	0.376	2.28	6.82 at 23^0C	2.99
5	Anna Padghan	0.382	3.80	7.33 at 20^0C	4.0
6	Gopal Avachar	0.420	4.03	8.32 at 29^0C	2.47
7	Madhav Narvade	0.461	2.03	8.07 at 28^0C	3.29
8	Satish Sarkate	0.377	3.25	6.2 at 23^0C	3.1
9	BhagwatGavali	0.936m	2.75	7.98 at 20^0C	2.89
10	RavindraDeshmukh	0.376	4.02	8.08 at 23^0C	3.09

V. Conclusion

The study of soil is mostly based on the following parameter of soil which is as follows

A) Texture B) Fertility C) Colour D) Moisture E) Water holding capacity

Soil analysis of Lonar village I found that soil of Lonar village is blackish & red in nature which posses good water holding property & moisture as well as organic carbon Beyond that I also found soil of Lonar village has necessary Nitrogen From the above point we can assume that the soil of Lonar village has good fertility for the following crops Soyabean, Wheat, Blackgram, Greengram, Cotton

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