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

Dr. Sheetal Patel, M. Mahajan
Prof. Brijmohan Mishra Institute of Medical and Technical Sciences. Burhanpur,Madhypradesh,India

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" It consist of a solid phase as well as porous phase that holds gases and water. Soil sample collected from different field of Farmers from 5 different places of field. The present research work the pH of the soil sample was found to be between range of 7.9-8.3, So, soil is not uptake nutrient properly. Nitrogen and zinc is low in all sample area. Soil of Viroda village is blackish in nature which posses good water holding property and moisture. But soil of Viroda village has necessary nitrogen and sulfer and good fertility for Banana, Cotton, Haldi and Maize.

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I. Introduction –

Soil is the region on the earth crust where geology and biology meet the land surface that provides home to plant, animal and microbial life (Pelzar et al.,1993,Ogunmwonyi et al.,2008) Soil testing commonly refers to the analysis of a soil sample to determine nutrient content composition and 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 from excessive fertility and inhibition from the presence of non essential trace minerals. Frequent soil testing helps farmer to decide whether their current management is robbing future productivity and profits. Soil testing involves collecting the soil samples preparation for analysis. chemical and physical analysis interpretation of analysis and finally making fertilizer recommendations for the crops(Claire et al.,2019,Singare et al.,2020) The basic objectives of the soil testing programme is to give farmers a service leading to better and more economic use of fertilizer and better soil management practices for increasing agricultural production. High crop yields can not be obtained without applying sufficient fertilizers to overcome existing deficiencies (Das et al., 2014)

Soil testing is essential and is the first step in obtaining high yield and maximum returns from the money invested in fertilizers. Ammonia generated by the production of coke was recovered and used as fertilizer. Finally, the chemical basis of nutrient delivered to the soil in manure was understood and in the mid 19^{th} century chemical fertilizers were applied. However the dynamic interaction of soil and its life forms still awaited discovery (De eyan et al., 2005) It was known that certain legumes could take up nitrogen from the air and fix it to the soil but it took development of bacteriology towards the end of the 19^{th}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 Germen 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(Wagh P.B.,et al.,2021)

Some important physical and chemical parameter of soil are pH,EC, Moiture content, Organic Carbon, Nitrogen, Phosphorus, Potassium and Chloride.

Sample collection

Sample collected from Viroda is a town in Burhanpur district of India state of Madhyapradesh. Mostly agricultural crops is found in Viroda village is as follows Banana, Cotton, Maize, Wheat, Jawar, and Haldi. Banana is one of the most important crops in Viroda village. Black soil is present in Viroda. The soil sample collected from 5 different field of Farmers.

- Do not sample unusual area. Avoid areas recently fertilized, old bunds, and marshy spots, near tress, compost piles, and other non- representative locations.
- Take a uniform thick sample from the surface to plough depth. Dig a v- shaped hole with a spade then cut out a uniform thick slice of soil from bottom to top of the exposed soil face, collect the sample and place it in the bucket.
- Pour the soil from the bucket on a piece of clean cloth or paper and mix thoroughly, discard, by quartering.
- Quarterly may be done by mixing sample well, dividing it in to four equal parts, then rejecting two opposite quarters, mixing the remaining two portions, again dividing in to four parts and rejecting two opposite quarters, and so on. The sample should be air dried in the shade for an hour or two before packing.
- Each cloth bag should be large enough to hold 500g soil sample and should be properly marked to identify the sample. Fill out the soil sample information sheet for each sample and enclose it with the soil sample. Submit the samples to Soil testing laboratory.

Table No: - 1 Eight soil samples is collected from the field of following Farmers.

S.No.	Name of Farmer	Sample code
1.	Manoj Mahajan	S_1
2.	Gyaneshwar Mahajan	S_2
3.	Ravindra Choudhary	S_3
4.	Devidas Choudhary	S_4
5.	Eaknath Choudhary	S_5

Experimental Procedure

pH

Procedure: Add 25ml distilled water to 10g air-dried sample in a beaker 50ml. 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.

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.

Reagent: 1- Potassium chloride solution 0.01N: 2- Calcium sulphate dehydrates saturated solution.

Procedures: Take 10g air-dry soil in 100ml beaker, add 25ml 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.

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:

Weight 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 distilled water.

Distillation: Put20ml H_3BO_3 in Erlenmeyer flask and 4 drops of the indicator.

Put the flask so that the lower top 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 25ml 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

N% in soil = $\frac{\text{(Sample titration – blank) x 14x dilution}}{\text{Sample weight}}$

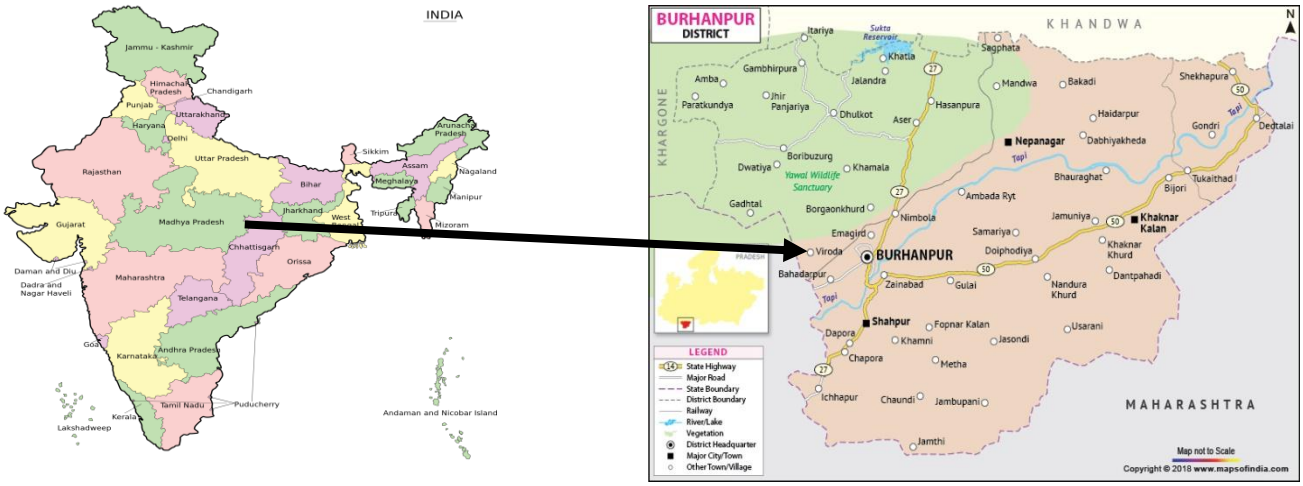
Moisture Content

Procedure: Weight 5.00g of air dry soil <2 mm into a previously dried (at 105^0C) and weighed weighing dish with lid(a labelled aluminium dish) fit lid, cool in a desiccators for at least 30 minutes and reweight. All Weighing should be recorded to 3 decimal places.

Calculation:

$$\% \text{ Moisture} = \frac{\text{wet soil (g) – Dry soil\(g)}}{\text{Dry soil}} \times 100$$

Location of study area is shown in following maps



Phosphorous:-Reagents

A. Olsen reagent, Sodium bicarbonate,($NaHCO_3$)1N NaOH, Ammonium Molybdate'Ascorbic acid,P-nitro phenol, Sulfuric acid 5N, Activted charcoal.

Procedure: Take 27 gm of soil in 250ml conical flask,add activated charcoal,add 50ml Olsen reagent and shake for 30min.on shaker

Calculation

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

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 cylinder pour 40ml of water in to 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 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.

II. Result and Discussion

In all samples pH show more than normal range, The amount of pH present in the soil sample was found to be in between range of 7.9 to 8.3 .Soil is not uptake nutrients properly. Sample S_1 to S_5 organic carbon in soil is sufficient that is in between 0.51 to 0.75, Nitrogen and Zinc is low in all samples area and Iron, Phosphorus and Potassium is high.

Table No: - 2 Physico- Chemical Analysis of Soil Sample

S.No	Parameters	Unit	S_1	S_2	S_3	S_4	S_5	Status	Range
A) 1.	Physical Parameters pH	--	8.30	7.9	7.9	8.2	8.1	High	6.5- 7.5
2.	EC	ds/m	0.77	0.81	0.99	0.82	0.77	Low	1.0-3.0
3.	Organic Carbon	%	0.90	0.76	0.51	0.57	0.60	Sufficient	0.5-0.75
B) 1.	Major/ Macro Nutrients Nitrogen(N)	Kg/hectare	196.94	200.10	251.51	260.20	257.20	Low	280-560
2.	Phosphorous(P)	Kg/hectare	43.72	51.72	60.73	30.27	29.5	Sufficient	28-56
3.	Potassium(K)	Kg/hectare	344.83	291.51	289.30	300.51	320.51	High	140-280
c) 1.	Minor/Micro Nutrients Sulphur(S)	mg/Kg	33.76	25.23	30.31	25.72	21.5	High	10-20
2.	Zinc(Zn)	mg/Kg	0.24	0.24	0.29	0.40	0.39	Low	0.5-1.0
3.	Iron(Fe)	mg/Kg	12.11	15.11	12.51	13.57	10.71	High	5.0-10.0
4.	Magnease(Mn)	mg/Kg	4.12	4.60	4.95	4.51	4.61	Low	5.0-10.0
5.	Copper(Cu)	mg/Kg	0.81	0.61	0.59	0.67	0.71	High	0.2-0.4

III. 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 Viroda village. I found that soil of Viroda village is blackish in nature which posses good water holding property and moisture as well as organic carbon Beyond that I also found soil of Viroda village has necessary Nitrogen and Sulfer. From the above point we can assume that the soil of Viroda village has good fertility for the following crops Banana, Cotton, Haldi and Maize.

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