A Project report on

WATER and SOIL ANALYSIS of DIFFERENT LOCATIONS of JORHAT

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CONTENTS

Importance of pH :

- pH determination is an indispensable means for characterizing soil from the standard point of nutrient availability and physical condition, structure, permeability, etc.
- It provides information on the potency of toxic substances present in the soil.

- It is indicative of the status of microbial communities and its net effect on the neutralization of organic residue and the Immobilization of available nutrients.
- Ascertaining the soil pH provides the most rational basis for managing soil for selected agricultural crops value, but
- The aim in managing soil pH Is not to achieve a particular pH to adjust the acidity to the point where there are no toxic metals in solution and the availability of nutrients is at Its maximum.

Importance of electrical conductivity:

- Soil electrical conductivity affects yields, crop suitability, plant nutrient availability as well as soil microbial activities such as emission of greenhouse gases and respiration.

- Excess salt hinders plant growth by affecting the balance of soil-water.

SOILS OF ASSAM

- The soils of Assam are very rich in content of nitrogen and organic matter.

- The alluvial soils of the Brahmaputra and the Barak valley are highly fert.ile and are very much suitable for the raising of varieties of crops round the year such as cereals, pulses, oilseeds, plantation crops etc.

- The well drained, deep, acidic alluvial soils of upper Assam with good proportion of phosphoric content are mostly suitable for the plantation.

- New alluvial soils occurring in the cha rlands of the Brahmaputra are most suitable for growing oilseeds, pulses and rabi crops.

- The atluvium of the plains offers excellent opportunity for cultivating rice and vegetable. The soils occurring in the upper reaches of the hill slopes are very suitable for horticulture and plantation crops.

AIM OF THE EXPERIMENT – Determination of pH of soil.

REQUIREMENTS -

1) Glass rod
2) pH meter with glass electrode
3) Glass ware for preparing soil water slurry
4) Analytical balance.

THEORY -

Determination of pH of soll In water suspension by electrometry is a satisfactory method.This method is based on the principle that the soil acts as an electrolyte and pH can be measured by glass electrode and a reference calomel electrode In a moisture saturation percentage soil and pH can be measured using pH meter.

PROCEDURE -

a) Calibration of pH meter-The pH met.er is calibrated using buffer of pH 7 .0 and pH 9.12

b) Determination of pH of oil sample-

1) Approx. 25g soil sample is taken In a 50ml beaker

2) Distilled water is added in a small amount and the addition of water is examined until it just wet the entire mass.

3) The soil is stirred with a glass rod and then a few drops of water is added to make a paste of soil. This is checked by ensuring that the paste barely flows together to close a hole left by the rod. if not, a little more water Is added. The soil is now at "moisture saturation percentage" and this is an equipotential moisture content for the soil. The soil is also said to be at the flow point or liquid limit.

4) The electrode Is removed from the buffer solution used for cailbration of pH, rinsed thoroughly with distilled water and blot dried. The electrodes are Inserted carefully in this paste. The pH is measured when reading is almost constant.

5) The electrode Is removed from the buffer solution used for calibration of pH, rinsed thoroughly with distilled water and blot dried. The electrodes are inserted carefully in this paste. The pH is measured when reading is almost constant.

6) The electrode is taken out and rinsed thoroughly with di!ttllled water, blot dried and again lowered into the soil, The pH Is measured when the reading Is constant.

7) The measurement is repeated 2 or 3 times to get consistent readings.

OBSERVATIONS -

Room Temperature: 25° C

pH reading of soil sample :

Sl. No.	SAMPLE	No. of Obs.	pH reading	Final Value
1	Tarajan	i	7.7	7.7
		ii	7.7	
		iii	7.6	
2	Kenduguri	i	3.8	3.81
		ii	3.81	
		iii	3.81	
3	Teok	i	4.52	4.51
		ii	4.51	
		iii	4.51	
4	Sotai	i	4.86	4.85
		ii	4.85	
		iii	4.85	

RESULTS –

The pH of the soil samples are-
(Tarajan) 7 .7
(Sotai) 4.85
(Kenduguri) 3.81
(Teok) 4.51

PRECAUTIONS -

1. Stir the soil suspension well whenever a reading Is taken.

2. Never touch the membrane of the glass electrode with anything else except soft tissue paper

3. The calibration of the pH meter should be done by buffer solution whose pH Is dose to that of the soil sample.

AIM OF THE EXPERIMENT -

To determine the conductivity of a given soil sample.

REQUIREMENTS -

1) Beaker
2) Magnetic stirrer/glass rod
3) Conductivity meter

THEORY -

Electrical conductivity Is the reciprocal of resistance of a conductor, 1cm long and lcm2 in cross sectional area and Is expressed In S/m. In case of soils, the electrical conductivity of a wave extract is proportional to its salt concentration. Therefore the electrical conductivity measurements are used in soil testing to estimate salinity. Since most soil solutions have a conductivity much less than unity, the measurements are expressed in terms of mS/m.

PROCEDURE -

1. 50 gm of soil Is weighted and 100 ml of distilled water is added to it. 2 The suspension stirred continuously stirring for 20 min.
3. The solution is then filtered using filter paper.
4. Connect the Instrument and calibrate the cell constant of the cell and with 0.01M KCI. Put the temperature probe also In KCI solution.
5. After calibration, the conductivity cell is dipped in the filtered solution.
6. The knob is turned towards the manual read and the conductivity value of the solution Is noted.

INTERPRETATION -

The following approximate values can be used as a guide when using a 1.2 soil water extract for conductivity measurement.

TABLE - Guidelines for the use of soil water extract conductivity :

Sl. No.	Conductivity (mhos/cc)	Relative level of salt	Plant Response
1	0-0.2	Low	No injury to any plants. May indicate lack of nutrients.
2	0.2-0.8	Medium	Optimum level for most plants. Usually indicate well fertilized solis. Very sensitive plants may be injured.
3	0.8-1.5	High	Injury to salt sensitive plants. Germination seeds or seedings likely to be injured.
4	1.0-5.0	Excessive	Definitely injurious to most plants of any age.

OBSERVATIONS -

Sl. No.	Sample	No. of Obs.	Conductance (x2mS)	Final values (mS)
1	Tarajan	i	0.48	0.50
		ii	0.50	
		iii	0.50	
2	Kenduguri	i	0.44	0.44
		ii	0.42	
		iii	0.44	
3	Teok	i	0.52	0.54
		ii	0.54	
		iii	0.54	
4	ssotai	i	0.60	0.58
		ii	0.58	
		iii	0.58	

RESULT –

The conductance of the samples are –
(Tarajan) 0.50 Ms
(Sotai) 0.58 ms
(Kenduguri) 0.44 ms
(Teok) 0.54 ms

PRECAUTIONS -

1. Immediately after testing, the electrodes should be washed off with a gentle stream of distilled water.

2. For storage, after cleaning the electrodes are suspended in distilled water and

WATER ANALYSIS

INTRODUCTION -

water plays an important role In the world economy as It functions as a solvent for a wide variety of chemical substances-often referred to as the universal solvent. Water is required In large quantities in many Industrial processes like paper and pulp industry, textile Industry, pharmaceuticals, fertilizers, chemical industry, fermentation Industry, petrochemicals, etc. Pure water rarely occurs in nature. Surface and groundwater is normally used for industrial and domestic purposes. Each Industry has its own specifications for the quality of water and so the treatment of water depends on the purposes used for. Some of the major parameters generally checked for assessing the water quality are: hardness, acidity, alkalinity, dissolved oxygen, residual chlorine, etc. Analysis of water tells us how dean or polluted it Is. Water used for different purposes has its own requirements for the composition and purity, and each body of water has to be analyzed on a regular basis to assess its suitability. Water fit for human consumption is called drinking water or potable water. It may be made potable by filtration.

Hardness of water-

Hardness of water is the property which restricts the father formation with soaps. The hardness in water Is derived largely from contact with the soil and rock formation and is caused by the presence ofsoluble salts of calcium and magnesium in ground and surface water. The soaps, sodium or potassium salts of higher fatty acids, will not be forming lather with hard water till the Ca^{2+} and Mg^{2+} ions are precipitated out In the form of their sparingly soluble salts of higher fatty acids.

Acidity of water -

Acidic water are corrosive and can not be used in boilers to generate steam. Hence, measurement of acidity and its removel or control is of utmost importance. Excessively acidic water is also unfit for consumption and agricultural purposes.

acidity of water is may be due to presence of mineral acids, organic acids and dissolved carbondioxide.

Alkalinity of water -

Determination of alkalinity of water is important particularly in conditioning the boiler feed water and calculating the amounts of Na2CO3 and lime required for water softening. High alkalinity in water leads to caustic embrittlement in the boilers and deposition of sludge and scales.

Residual chlorine in potable water -

Surface drainage water such as that of rivers, ponds, springs, etc. contains disease causing bacteria, microorganisms, fungus, etc. It is unfit for human consumption. The process of destroying these pathogenic organisms, called disinfection is effected by various methods such as-boiling, adding bleaching powder, chloramines, potassium permanganate, copper sulphate, exposure to U.V radiation, sterilization by ozone, etc. Chlorine, being a powerful oxidizing agent and cheaply available, is widely used for the disinfection of potable and municipal water supplied for domestic purpose.

Excess of free chlorine, however, is injurious to human metabolism and causes unpleasant taste too. tt is, therefore, necessary to estimate the free chlorine in municipal water supplies and regulate up to permissible amounts.

Dissolved oxygen in water-

Oxygen is slightly soluble In water and Its solubility decrease with increase in concentration of impurities, particularly those of salts. The solubility of oxygen of the air in pure water is 14.S x 10"1gdm·3 at temperature o0c, which decreases to 7.5 x $10^{-3}gdm^{-3}$ at 30°C, pressure being one atmosphere. Determination of dissolved oxygen in water is important for Industrial purposes, e.g., it has to be checked in boiler feed water as it plays an important role in corrosion. Dissolved oxygen is needed for living organisms In water to maintain their biological processes.

AIM OF THE EXPERIMENT –

To determine the total hardness of water

REQUIREMENTS-

1. Burette
2. Pipette
3. Conical Rask
4. volumetric Rask
5. Disodium salt of EDTA
6. Water samples
7. NH_4OH-NH_4Cl buffer solution, pH 10-It Is prepared by dissolving 64 g of NH_4Cl in distilled water, adding 570 cm3of ammonia solution and diluting to 1 dm^3 with distilled water.

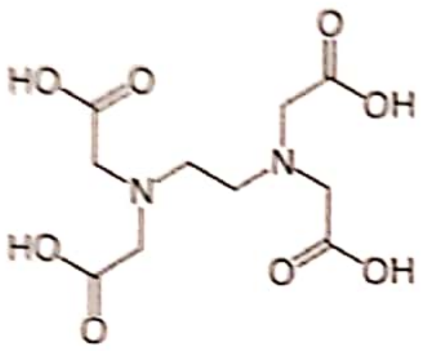
s. Eriochrome black T 0.50g Indicator Is weighed and dissolved In 100 cm^3 ethanol.

9. Mg -EDTA complex (O.OO5 M) solution - It Is prepared by adding stoichiometric amounts of 0.001 M disodium salt of EDTA and 0.001M $MgCl_2$. A portion mg EDTA solution when treated with a few drops of eriochrome black Tat pH 10 should change to a wine red colour, which should change to a pure blue on the addition of one drop of 0.001M EDTA solution and wine red on addition of a single drop of 0.001M $MgCl_2$ solution.

THEORY-

Hardness of water is determined most conveniently and accurately by EDTA method In which a glllen sample of water is titrated with a standard EOTA solution, using Eriochrome black T dye as an Indicator. At pH 10 the Indicator forms a wine red coloured unstable complex with divalent metal ions (Ca^{2+} and Mg^{2+} present in hard water. At the end of the titration the colour of the complex Titrant changes from wine blue to original blue colour. This is due to the fact that Ca^{2+} and Mg^{2+} ions from more stable complex with EDTA than with indicator.

EDTA having formula -



can be represented by $Na_2H_2Y_2H_20$. It forms complex with practically all the metal ions except those of alkali metals.

$H_2Y^{2-} + Ca^{2+} \rightarrow CaY^{2-} + 2H^+$

$H_2Y^{2-} + Mg^{2+} \rightarrow Mg_2Y^{2-} + 2H^+$

$Ca^{2+}.Mg^{2+}$ eriochrome black T → [Ca^{2+}·Mg^{2+}.Eriochrome black T complex] wine red → [Ca^{2+}-Mg^{2+}-EDTA] complex + eriochrome black T

During the major part of the titration the indicator exists entirely in the form of metal complex, only the metal ions reacts with EDTA. At equivalence point, EDTA removes the metal ions from the metal dye complex with a resulting colour change. Since the dye stuff tends to polymerize in acidic solutions to a red brown product, the pH > 7 of the solution must be maintained during the titration with EDTA. The optimum pH for the determination of hardness of water is 10+0.1, which can be maintained using NH_3-NH_4Cl buffer.

PROCEDURE-

The experimental procedure involves the following steps:

1. <u>Preparation of standard 0.001 M EDTA solution:</u>

EDTA is available as its disodium dihydrate salt. First take already dried sodium salt of EDTA from the counselor. Then take rough mass of a glass weighing bottle and transfer about 0.95g of the salt to the weighing bottle and weigh accurately transfer the salt to a clean and dry volumetric flask of 250cm³ capacity through a glass funnel. Find out the accurate mass of the weighing bottle after transferring the salt. The difference between two masses gives the actual amount of EDTA salt taken. Dissolve the salt in distilled water. Make up to the mark with distilled water and shake thoroughly to make a homogeneous solution.

2. Titration of water sample:

1. Fill the burette with the EDTA solution after rinsing it with this solution and mount the burette.
2. Pipette out 60 cm of the water sample using a 20 cm^3 pipette In a 250 cm^3 conical flask, add 2 cm^3 of the buffer solution, 0.5 cm1of Mg-EDTA complex so1unon, and five drops of Eriochrome black T indicator. Colour of the mixture at this stage must be wine red.
3. Titrate with 0.01M EDTA from the burette with constant swirling. End point is detected by the colour change from wine red through purple to a dear blue. This solution should be stirred thoroughly and the titrant added slowly near the end point.

OBSERVATION-

Sl. No.	No. of Obs.	Volume of water sample in cm^3	Burette reading		Volume of EDTA solutions in cm^3	Concordent reading
1	i	60	0	1	1	
	ii	60	1	1.9	0.9	1
	iii	60	1.9	2.9	1	
2	i	60	0	1.7	1.7	
	ii	60	1.7	3.3	1.6	1.7
	iii	60	3.3	5	1.7	
3	i	60	5	0.7	0.7	
	ii	60	0.7	0.8	0.8	0.7

	iii	60	1.5	2.2	0.7	
4	i	60	0	0.9	0.9	
	ii	60	0.9	0.9	0.9	0.9
	iii	60	1.8	0.8	0.8	

CALCULATION -

SAMPLES	TOTAL HARDNESS (ppm)
Tarajan	(1 x 1000) ÷ 60 = 16.6
Sotai	(1.7 x 1000) ÷ 60 = 28.3
Kenduguri	(0.7 x 1000) ÷ 60 = 11.6
Teok	(0.9 x 1000) ÷ 60 = 15

RESULT –

Permanent hardness of the given water samples are -

(Tarajan) 16.6 ppm of $CaCO_3$

(Sotai) 28.3 ppm of $CaCO_3$

(Teok) 11.6 ppm of $CaCO_3$

Kenduguri)15 ppm of $CaCO_3$