CHAPTER-I

INTRODUCTION

Soil is a mixture of broken rocks and minerals, living organisms, and decaying organic matter called humus. Humus is dark, soft and rich in nutrients. Soil also includes air and water. All the living things in the soil, plus essential materials that these organisms use to survive, form the soil ecosystem.[11]

The top layer of the earth's surface in which plants can grow, consisting of rock and mineral particles mixed with decayed organic matter and having the capability of retaining water. The soil is the part of the earth's surface which includes disintegrated rock, humus, inorganic and other organic materials that provides the medium for plants growth. For the formation of soil, it takes around hundreds to thousands of years. The soil is usually generated when rocks break up into their constituent parts. When a range of different forces acts on the rocks, they break into smaller parts to form the soil. These forces also include the impact of wind, water and the reaction from salts.[11]

The soil basically classified into four sandy soil, slit soil, clay soil and loamy soil.

Soil analysis is a set of various chemical processes that determine the amount of available plant nutrients in the soil, but also the chemical, physical and biological soil properties important for plant nutrition, or "soil health". Chemical soil analysis determines the content of basic plant nutrients; nitrogen (N), phosphorus (P_2O_5), potassium (K_2O), pH, humus content, total $CaCO_3$, available lime, organic matter, total sulphur (S), trace elements, and other physical characteristics (capacity, permeability, density, pH – value).[12]

Forensic Soil Analysis is the use of soil sciences and other disciplines to aid in criminal investigation. Soils are like fingerprints because every type of soil that exists has unique properties that act as identification markers. This means that the origin of the soil sample can be identified. For example, clay embedded in the sneaker of a criminal can be traced back to a specific clay type found along a lake where a murder victim was discovered. The majority of soil cases involves footprints or tire marks that have been left in the soil.[12]

The unique properties of soil are as follows:

Sediment– the original solid particles that were weathered and transported. This could be in the form of a grain of rock that breaks off of the larger parent material (larger version of rock). Soils can develop on these sediments due to physical and chemical alteration.

Colour– indicates its history as well as the compounds present in the soil. For example, white or grey soil could mean that the soil contains lime or has been leeched ((a chemical, a metal, etc.) from a substance by the action of a liquid passing through the substance. Grey soil can also mean that the organic material or moisture is present, black soil suggests the same. Soil that is red, brown or yellow generally suggests that there is iron present.

Structure-indicates whether a soil is composed of a single grain particle or not. This is determined by the presence of peds (clumps). These peds are formed due to cementing agents such as calcium carbonate attracting the soil particles so that they adhere to each other to form either bulky peds which are small conglomerates (masses) or platy peds which are flat and sheet like.[11]

Physical characteristics of soils:-

- Texture
- Structure
- Bulk Density
- Organic Matter
- Colour
- Soil Depth
- Soil Temperature
- Odour

CHAPTER-II

LITERATURE REVIEW

Karle et.al,(1997) studied soil is an important habitat for both producers (green plants) and decomposers (bacteria and fungi). While air and water are both self-purifying systems with regard to most inorganic contaminants, soil is a sink - receiving fall-out from the atmosphere which it absorbs or filters, and could retain materials from infiltrating natural waters. Soil also serves as nature's recycling system, it provides habitat for a myriad of living organisms and in human built ecosystems, and it serves as engineering medium.

McBride et.al (1997) studied the mobility and solubility of toxic metals and nutrient in soil fifteen years after sludge application. Base on the elemental deficits calculated using soil chromium concentration as an indicator of the original sludge concentration in the soil, it is estimated that most of the sludge –applied Na, S, Ca and Sr, about 40% of the Zn and Cu and less than 305 of the Cd and P have been lost from the top soil surface by physical –chemical or biological processes and there is potential for groundwater and surface water contamination.

Singh et.al (1997) it deals with a survey along two national highways near Lucknow. The pattern of lead deposition as reflected by soil Pb burdens, showed that decrease in concentration with increasing distance and soil depth. Some plants contained high concentration of Pb with more accumulation in the underground portions of the plants. The cattle grazed near the roadside pastures, naturally milk sample contained lead at an elevated concentration.

Chen et.al (2000) studied about Soil environmental quality and the distribution of trace metals in surface soils of Hong Kong were assessed. The results showed that treatment of calcium carbonate, steel sludge and furnace slag (FS) decreased Cd uptake by wetland rice, Chinese cabbage and wheat by 23- 95% compared with the unamended control. Among the three amendments, FS was the most efficient at suppressing Cd uptake by the plants, probably due to its higher content of available silicon.

Galiulin et.al (2002) research results relating to contamination of soils by heavy metals and its ecological consequences in several regions of Russia and Poland, characteristics of air borne soil 2 of 28 contamination, preventive and remediation measures for pollutes soils were analysed. It is shown that the elaboration of maximum permissible concentrations of heavy metals in soil is the most important requirement for the correct assessment of soil contamination and the application of various preventive and remediation measures.

Fischerova et.al (2006) experimented remediation possibilities of As, Cd, Pb, and Zn on medium contaminated soil. On Seven plant species with a different trace element accumulation capacity and remediation potential they found good accumulation capabilities and remediation effectiveness of Salix dasyclados similar to studied hyper l2accumulators.

Ololade and Ologundudu (2007) Cadmium in food comes to a large extent from atmospheric cadmium as a result of foliar absorption or root uptake of cadmium deposited on soils. The transfer of cadmium from soil to the food chain depends on a number of additional factors, such as the type of plant, the type and pH of the soil, and the zinc and organic matter content of the soil.

Ayari et.al (2010) Compared to untreated soils, compost-amended soils showed significant increases in the content of all measured metals: cadmium, chromium, copper, nickel, lead and zinc. Plant/soil transfer coefficients for compost-amended treatments were higher than threshold range indicating that there was an important load/transfer of metal ions from soils to wheat plants (Ayari et al., 2010).

Seifie et.al (2010) studied Soil Electrical Conductivity (EC) is one of the soil physical properties which have a good relationship with the other soil characteristics. As measuring soil electrical conductivity is easier, less expensive and faster than other soil properties measurements, using a detector that can do on the go soil EC measurements is a good tool for obtaining useful information about soil pollution condition.

Dasaram et.al (2011) assessed the soil contamination in Patancheru industrial area, Hyderabad, Andhra Pradesh, India. Toxic trace metals concentrations in soil exert a decisive 8 of 28 impact on soil quality

and its use in food production particularly in an industrial area. The agricultural area, although were invariably enriched in these toxic metals, showed comparatively less contamination possibly due to uptake by plants.

CHAPTER-III
AIMS AND OBJECTIVES

AIM:-

To analyse and compare the types of soils based on macronutrient content and pH.

OBJECTIVES

- To determine the difference in pH level.
- To determine the difference in the Nitrogen, Phosphorus and Potassium content.

CHAPTER: - IV

MATERIALS AND METHODOLOGY

Materials Required

Apparatus

1. Soil Samples
2. Test Tube
3. Beaker
4. Weighing Machine
5. Gloves
6. Measuring Jar

Reagents Required

1. Distilled Water
2. Ammonium Acetate
3. Bray's Reagent
4. Boric Acid
5. Reagent A
6. Reagent B
7. Potassium Dichromate

Instruments

1. Stirring machine
2. pH meter reader
3. Flame photo meter reader
4. Colouring meter

Figure 1: Stirring Machine

Figure 2: Flame Photo Meter Reader

Figure 3: Colouring Meter

Figure 4: P^h Meter Reader

METHODOLOGY:-

Reagent Preparation

- Preparation of Bray's solution :-To make up 10 litre solution, dissolve 11.1 g NH_4F (Ammonium Fluoride) in 100 ml distilled water and add this solution into 9 litre distilled water acidified with 20 ml of concentrated HCL and make up to 10 litre.

- Reagent A:-Dissolve 12 g of Ammonium Molybdate in 250 ml distilled water and 0.2908 g Antimony Potassium Tartarate in 100 ml distilled water separately. Add both solution in 1000 ml 5N H_2SO_4 (138ml

Sample Collection

Based on the colour the soil is mainly divided as Black soil and Red soil. The red soil and black soils samples were collected from 8 different place named as Mavelikara, Vazhuvady, Chenithala,, Thonakadu ,Chenganoor, Kandiyoor, Kaviyoor, Kodumon using a long narrow bladed shovel. Mixed the collected samples in a container; then pour the soil on a plastic sheet. Divide the lot into four and discard the soil from appropriate quarters. Repeat the procedure until the desired volume of soil(1-2kg) was attained.

Tests

P^H:-10 gm collected soil sample was added in 25ml distilled water. Stirred with stirring machine. For observing the readings the solution was kept under the pH meter reader. Continue the process for each sample.

Potassium:-5gm collected soil sample was taken in a beaker and add 25 ml ammonium acetate and shake well. It was filtered with filter paper. Kept that solution under flame photo meter reader for observation. And repeated the process for each sample.

Phosphorus:-2.5gm collected soil sample was taken in a beaker and to that added Bray's solution and shake well. Filtered the solution using filter paper and a clear solution was obtained. From that cleared solution take 5ml and to it added Boric acid, Reagent-A and Reagent-B and mixed it well. After that the solution was kept under the

colouring meter for readings. Thick blue colour was obtained and the readings was noted. Repeated the procedure for each sample.

Nitrogen:-1gm collected soil sample was taken in a beaker and to it 10 ml potassium dichromate and 10 ml concentrated H_2SO_4 was added. It was kept for half an hour without making any disturbance. After that added 10 ml distilled water. The mixture was kept for one day. After one day the mixture was kept under the colouring meter and noted the readings. Repeated this procedure for each sample.

CHAPTER-V

OBSEVATION TABLES

Table 1:- SAMPLE ONE: - RED SOIL (KODUMON)

SL.NO	PARAMETER	TEST VALUE
1	P^H	6.90
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	26.40 kg/ha
4	POTASSIUM	492.80 kg/ha

Table 2:- SAMPLE TWO:-BLACK SOIL (KAVIYOOR)

SL.NO	PARAMETER	TEST VALUE
1	P^H	4.70
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	8.36 kg/ha
4	POTASSIUM	352.80 kg/ha

Table 3:- SAMPLE THREE:-BLACK SOIL(VAZHUVADY)

SL.NO	PARAMETER	TEST VALUE
1	P^H	5.40
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34kg/ha
4	POTASSIUM	162kg/ha

Table 4:- SAMPLE FOUR:-RED SOIL (MAVELIKARA)

SL.NO	PARAMETER	TEST VALUE
1	P^H	4.70
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34 kg/ha
4	POTASSIUM	400 kg/ha

Table 5:- SAMPLE FIVE:-RED SOIL (CHENITHALA)

SL.NO	PARAMETER	TEST VALUE
1	P^H	5.00
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34 kg/ha
4	POTASSIUM	342 kg/ha

Table 6:- SAMPLE SIX:-BLACK SOIL (THONAKADU)

SL.NO	PARAMETER	TEST VALUE
1	P^H	5.30
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34
4	POTASSIUM	62 kg/ha

Table 7:- SAMPLE SEVEN:-BLACK SOIL (CHENGANOOR)

SL.NO	PARAMETER	TEST VALUE
1	P^H	4.50
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34 kg/ha
4	POTASSIUM	168 kg/ha

Table 8:- SAMPLE EIGHT:-RED SOIL (KANDIYOOR)

SL.NO	PARAMETER	TEST VALUE
1	P^H	5.2
2	NITROGEN	0 kg/ha
3	PHOSPHORUS	34 kg /ha
4	POTASSIUM	84 kg/ha

CHAPTER-VI
RESULTS AND CONCLUSION

RESULTS

Determined the nitrogen, potassium, phosphorus and pH content in the collected sample. The nitrogen content in red soil and black soil samples are zero. pH value for red soil ranges from 4.5 to 6.9 kg/ha and for black soil is 4.7 to 5.40 kg/ha. Phosphorus content for black soil is 8.36 to 34 kg/ha and red soil ranges from 26.4 to 34 kg/ha. Potassium content for red soil 84 to 492.80 kg/ha and for black soil ranges from 62 to 352.80 kg/ha.

CONCLUSION

Soil evidence is most reliable and acceptable in the court of law. The previous studies says that soils are unique like fingerprints so it is useful to solve the crimes by finding its origin. In this study using the soil parameters like p^H, potassium, phosphorus, nitrogen. Nitrogen is not showing any variation. P^H and potassium content is different for each soil samples. Phosphorus content similar in 6 samples.

The findings will be useful for identifying the locations based on macro nutrient and p^H value in red soil and black soil.

In future, analysis of micro nutrients in different types of soil will helps to identify the location.

CHAPTER-VII
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