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Determinationn of Grain Size Distribution (Texture) and Soil Organic Carbon in the Soil of Agricultural Field Of Vijaypur Block, Of Jammu Province

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ABSTRACT
Soil is one of Earth's essential natural resources. Soil is natural unit generated at the interface of lithosphere and atmosphere under mutual process of pedogenetic factors. Soil is the lifeblood of our crop and pasture. It is the bridge of life and the inanimate world. It is referred to as an interface-a common boundary where different parts of a system interact among the different parts of the Earth's system. Although soil is highly variable, there are four main ingredients that are consistent with all types of soil: - mineral, organic matter, water and air. Soils develops as a result of the interplay of five factors:- parent material, climate, organisms, relief and time. Soil is an important factor influencing the productivity of our planet's various ecosystems is the nature of their soils. This important asset supplies nutrients, water and oxygen to plants, supports machinery and animal traffic and provides a medium for the decomposition of crop and pasture residues. Soil itself is very complex. It would be very wrong to think of soils as just a collection of fine mineral particles. The term soil includes entire thickness of the Earth's crust (from ground surface to bed rock), which is assesible and feasible for practical utilization as foundation support or construction material. It is composed of loosely bound mineral particles of various sizes and shapes formed due to weathering of rocks. Texture, or size distribution of mineral particles(or its associated pore volume), is one of the most important measures of a soil because finely divided soil particles have much greater surface area per unit mass or volume than do coarse particles. The present study deals with textural analysis and estimation of total organic carbon in agricultural soil of Vijaypur Block, District Samba of Jammu Province. The study was carried out with the objective to determine the textural properties of the most weathered sediment in the weathering profile in agricultural soil of Vijaypur Block, Distt. Samba of Jammu Province and to study the influence of weathering processes in generating fertile sediments. The soil samples were collected in and around Vijaypur Block of District Samba. With the given latitude- 34.09˚N & longitude- 74.79˚E are the geo- coordinates of the Vijaypur. The soil samples were collected from eight different locations which were analysed for six different parameters i.e. soil organic carbon, soil organic matter, soil pH, soil conductivity, textural analysis. The Grain size distribution pattern of the sediments indicates that the most soil samples are not derived from transportation action only. , texturally the soil samples sediments were classified into gravelly sand deposits and generally sediments are poorly sorted in nature not making rich in fertility status. However, high level of organic activity leading to high biological diversity in the soil. The soil pH indicates the alkaline nature of soil. The study area is classified in a lower rainfall regime which was supported with the results of soil moisture recorded to be less than 20% for all the sampling location.

Key Words: Texture, SOM, Aeolian, Weathering profile.

I. INTRODUCTION

Soil is one of Earth's essential natural resources. Soil is natural unit generated at the interface of lithosphere and atmosphere under mutual process of pedogenetic factors. Soil is the lifeblood of our crop and pasture. Soil is the basis of farming. It is the bridge of life and the inanimate

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world. It is referred to as an interface-a common boundary where different parts of a system interact among the different parts of the Earth's system. Although soil is highly variable, there are four main ingredients that are consistent with all types of soil: - mineral, organic matter, water and air. These four ingredients fall into two categories: - solid (mineral and organic matter) and non solid (water and air). Soils develops as a result of the interplay of five factors:- parent material, climate, organisms, relief and time. Soil is an important factor influencing the productivity of our planet's various ecosystems is the nature of their soils. This important asset supplies nutrients, water and oxygen to plants, supports machinery and animal traffic and provides a medium for the decomposition of crop and pasture residues. Soil itself is very complex. It would be very wrong to think of soils as just a collection of fine mineral particles (www.physicalgeography.net). The term soil includes entire thickness of the Earth's crust (from ground surface to bed rock), which is assesible and feasible for practical utilization as foundation support or construction material. It is composed of loosely bound mineral particles of various sizes and shapes formed due to weathering of rocks.

a) **Soil texture**

Soil texture is the fineness or coarseness of a soil. It describes the proportion of three sizes of soil particles. The relative fraction of these soil particles is important because it can determine factors such as the soil's water holding capacity, aeration, drainage and plant rooting depth. The mineral particles in the soil are divided into the following size classes:-

1. Coarse fragments larger than 2 mm (gravel, cobbles, stones)
2. Sand .05 to 2 mm
3. Silt .002 to .05 mm
4. Clay smaller than .002 mm

The texture describes how a soil feels and is determined by the amounts of sand, silt, and clay particles present in the soil sample. Soil texture is simply defined as the relative proportion of sand, silt, and clay separates found in the soil .The texture triangle gives names associated with various combinations of sand, silt and clay.

b) **Sand:-**It consists of particles ranging in size from 0.05 and 2mm.They have coarse texture. They hold water and mineral poorly. Water and air penetrate easily that's why, they warm readily in spring and cool quickly in autumn. Soil in the sand texture class is made up of 85% or more sand, 10% or less clay and 15% or less silt.

c) **Loamy Sand:-**When dry, loamy sand is loose and single grained. When wet it is gritty, it does not ribbon and stick together. The soils in this texture class contain 70-85% sand, 10-15% clay, and 30% or less silt.

Sandy loam:- In this soil texture class, the soils contain soil separates within these ranges;

(a) 40% or less silt, 20% or less clay, and 53-85% sand.

(b) 50-40% silt, less than 7% clay, and between 43% and 53% sand.

d) **Loam:-** These are a balance between sand, silt and clay particles and considered as the most desirable soils for agricultural. Loam soils generally contain more nutrients, moisture and humus than sandy soils. Soils in this class contain 7-27% clay, 28-50% silt, and a sand content of 53-23%.

e) **Silt Loam:-**Soils in this texture class have their separates within these ranges;

(a) 50-88% silt, 12 to 27% clay and 38% or less sand.

f) **Silt:-**It is composed of tiny particles ranging from 0.002 to 0.05mm.It is slippery when wet and soft when dry. It has high capillarity, no plasticity and very low dry strength. This soil texture class is made up of soils that contain 80% or more silt, 20% or less sand, and less than 12% clay.

g) **Sandy clay Loam:-**The soils in this texture class have the following make up: 20-35% clay, less than 28% silt and 45-80% sand. It is sticky and plastic; it stains fingers and it turns water cloudy.

h) **Silty Clay Loam:-**In this soil texture class, the soils are made up of 27-40% clay, 60-73% silt and less than 20% sand.

i) **Sandy Clay:-**The soil in this texture class comprises of 35-55% clay, 20% or less silt and 45-65% sand.

j) **Silty Clay:** - This soil texture class is consists of soils that contain 40-60% clay, 40-60% silt and 20% or less sand.

k) **Clay:-**It is composed of very fine particles. In moist condition, clay becomes sticky and can be rolled into threads. It has high dry strength, low erosion, low permeability, good workability under moist condition, and can be readily compacted. This textural class of soil contains 40% or more of clay, 40% or less silt and 20-45% sand.(www.macaulay.ac.uk/soilposters/5.pdf)

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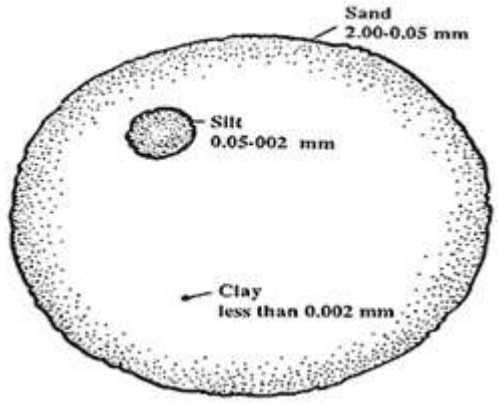

Figure 1. Size of sand, silt, clay, particles relative to each other.

It is with this backdrop present study analysis the grain size distribution and soil organic carbon in soil of agricultural field of Vijaypur block, district Samba of Jammu and Kashmir. The rest of the paper is summarized as follows: Section 2 describes methodology; Section 3 makes the results and discussion; and Section 4 concludes the paper.

1.1. Grain Size Analysis

A grain size analysis is performed to determine the percentage of different grain sizes contained within a soil. The mechanical or sieve analysis is used to determine the distribution of the coarser, larger-sized particles, and the hydrometer method is performed to determine the distribution of the finer particles.

The hydrometer measures the specific gravity of the soil suspension at the centre of its bulb. With the help of hydrometer temperature is controlled and specific gravity must be maintained throughout the analysis.

1.2. Using the soil texture triangle

The textural triangle is a diagram which shows how each of these 12 textures is classified based on the percentage of sand, silt and clay in each. A coarse- textured or sandy soil is composed of medium to large size sand particles. A fine-textured or clayey soil is composed of tiny clay particles. Soils with as little as 20 % clay particles behave like a sticky clayey soil. The loamy soil is a combination of sand, silt and clay sized particles. (www.cmg.colostate.edu.)

Based on the relative amounts of sand, clay and silt as a percentage, examples are:-

A) 20-45% sand, 27-40% clay and 60-73% silt.

The grid on the triangle allows you to move to the left or the right of your position running parallel with either side of the triangle. It is best to start at the base with the sand. Position your finger along the base line at the 50% mark. Move your finger up the line running parallel with the right side of the triangle. Simultaneously use another finger to trace a line from the 30% silt mark until the two meet. Your two fingers will always meet at clay for the remaining percentage, in this case 20%. This is always the case that the first two sizes chosen will lead you to the third.

B—Sand 80% Silt 5% Clay 15% = SANDY LOAM

Trace your finger along the 80% sand line while simultaneously tracing another finger along the 5% silt line until the two meet. This should be where clay is 15%.

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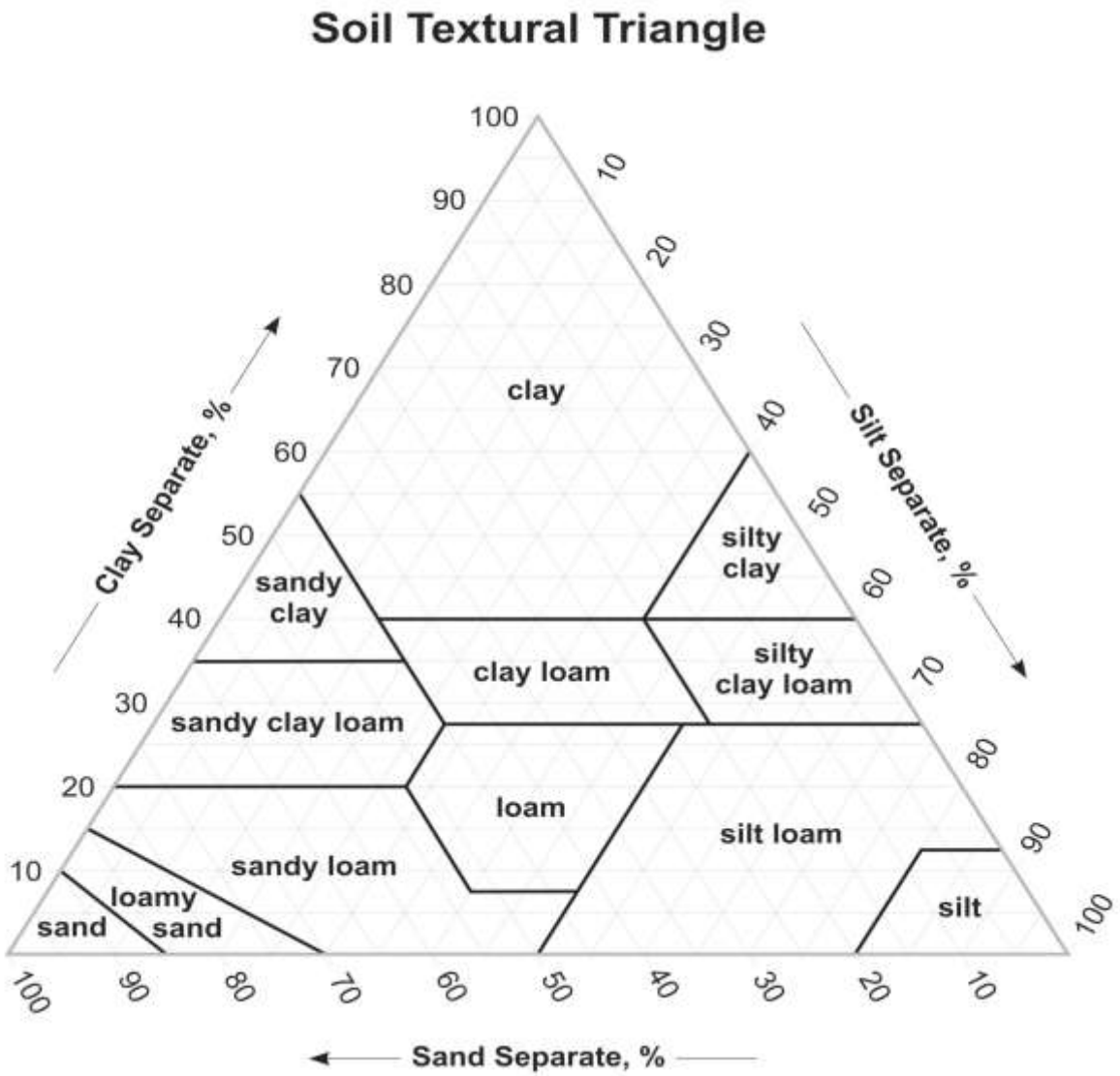

(Fig. 2 Diagram of soil textural triangle referred from www.nrcs.usda.gov/wps/portal/nrc)

1.3 Soil organic carbon

Soil organic carbon is the amount of carbon stored in the soil. It is a component of soil organic matter. Soil organic carbon is the basis of soil fertility. Organic material in the soil consists of the remains of living organisms in various stages of decomposition as well as living micro-organisms under the influence of temperature, moisture and ambient soil conditions. Soil organic matter serves as a reservoir of nutrients for crops, provides soil aggregation, increases nutrient exchange, retains moisture, reduces compaction, reduces surface crusting and increases water infiltration into soil. There are two types of factors that influence inherent organic matter content: natural factors (climate, land cover and/or vegetation and topography), and human-induced factors (land use and degradation). (www.eusoils.jrc.ec.europa.eu/...DB-Archive/octop/octop)

II. METHODOLOGY

2.1 STUDY AREA

- Village : Vijaypur
- District : Samba
- Block : Vijaypur
- Latitude- 34.09˚N
- Longitude-74.79˚E
- State- J&K

2.2 LOCATION

The study area (Vijaypur Block) falls in the district Samba in state of Jammu and Kashmir. From this block, total 8 number of soil samples

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were collected from this area for textural analysis and estimation of total organic carbon in agricultural soil. Vijaypur is a block located in Samba district in Jammu and Kashmir. It is one among the four blocks of samba district. The block has 130 villages and there are 18188 houses in this block. It is located 10 km toward west from district headquarters Samba. It is block headquarter. Vijaypur is surrounded by Samba block toward east, Purmandal block towards west, Bishnah block towards west, Ghagwal block towards east

LOCATION	PLACE	LATITUDE	LONGITUDE
Location 1	Rara	$32^0$33′14.06″N	$74^0$57′57.45″E
Location 2	Rarian	$32^0$33′08.58″N	$74^0$58′14.30″E
Location 3	Rarian	$32^0$33′48.31″N	$74^0$58′58.05″E
Location 4	Ghurwal	$32^0$33′59.07″N	$74^0$59′29.37″E
Location 5	Kulian	$32^0$34′09.52″N	$74^0$59′55.90″E
Location 6	Main Vijaypur	$32^0$33′49.10″N	$75^0$01′14.40″E
Location 7	Shivnagar	$32^0$33′43.89″N	$75^0$01′11.26″E
Location 8	Shivnagar	$32^0$33′40.24″N	$75^0$01′21.03″E

2.3 SOIL ORGANIC CARBON METHOD: WALKLEY DIGESTION METHOD

A weighed amount (0.50 gm) of the soil samples with of a variable quantity of organic carbon was treated with 10 ml of 0.25 N potassium dichromate solution (K2Cr2O7) followed by addition of 30 ml of concentrated sulfuric acid. The mixture was gently swirled and left at room temperature for 3-4 hours and then, 100 ml of distilled water was added to the mixture. The excess of dichromate was back-titrated potentiometrically with the standard 0.25 N ferrous ammonium sulfate (Fe (NH4)2(SO4)2*6H2O) solution. Blank titration of the acidic dichromate with ferrous ammonium sulfate solution was performed.

CALCULATION

Organic carbon content in the sample was calculated as:

Organic carbon (%) = (Blank – Soil sample) x 0.25×1.33×0.3) × 100

Weight of soil

Soil organic matter = Total organic carbon ×1.7

2.4TEXTURAL ANALYSIS

Grain size is studied for variety of reasons. It is fundamental property and descriptive measure of sediments and sedimentary rock (Lindholm, 1987). It is also important in understanding the mechanism operative during transportation and deposition, as well as the distance of sediment transport.

METHOD: SIEVING METHOD

Sieving is commonly used in the determining the grain size distribution of the coarse-grain sediments. In Sieving method, 50 grams of sample was placed in the uppermost sieve in a set of stacked sieves (size ranging from 2mm to 0.063mm). The stack of sieves was arranged in an order so that the coarsest sieve is at the top with the finer below (with pan at the bottom to catch any sediment that passes through the lowest and finest sieve). The stacks of sieve were shaked continuously for 30-35 minutes. Sediments of different sizes that had collected on each sieve and the pan was removed and weighed. Before placing the next sample the sieve was cleaned properly with the water and ethyl alcohol. (Gradistat software version 4.0 for sample statistics to study grain size distribution).

III. RESULTS & DISCUSSIONS

SOIL ORGANIC CARBON & SOIL ORGANIC MATTER

The level of Soil organic carbon in the Soil sample varies between 1590mg/kg to 5980mg/kg. However the level of Soil organic matter varies between 2740mg/kg to 10280mg/kg. The sample of location 4 (Ghurwal) showed the lowest value of organic carbon and organic matter. However, the sample of location 3 (Rarian 2) showed the highest value of both Soil organic carbon and Soil organic matter.

GRAIN SIZE :

The grain size distributions for samples are calculated using different statistical methods (Boggs, 1987) which are shown in figure 2A-2H. Generally the samples are poorly sorted .However; the mean sizes of the sample are gravelly sand.

The sample nature at location 1 pertains very fine gravelly sand in nature with 62.7 % sand and 37.3 % gravel.

The sample nature at location 2 pertains very fine gravelly sand in nature with 28% sand and 72% gravel.

The sample nature at location 3 pertains very fine gravelly fine sand in nature with 81.9% sand and 18.1 % gravel.

The sample nature at location 4 pertains very fine gravelly fine sand in nature with 80.9% sand and 19.1 % gravel.The sample nature at location 5 pertains very fine gravelly medium sand in nature with 93.6% sand and 6.4 % gravel.

The sample nature at location 6 pertains slightly very fine gravelly fine sand in nature with 95.5% sand and 4.5 % gravel.The sample nature at location 7 pertains very fine gravelly fine sand in nature with 94.3% sand and 5.7 % gravel.

The sample nature at location 8 pertains very fine gravelly sand in nature with 68.7% sand and 31.3 % gravel.Polymodal distribution of all the samples indicates more than one source of origin of soil samples.50 % samples are platykurtic in nature.

IV. CONCLUSION

Soil is one of Earth's essential natural resources. Soil is natural unit generated at the interface of lithosphere and atmosphere under mutual process of pedogenetic factors. Soil is the lifeblood of our crop and pasture. present study analysis the grain size distribution and soil organic carbon in soil of agricultural field of Vijaypur block, district Samba of Jammu and Kashmir. It has been found in the study that Texturally the soil samples sediments were classified into gravelly sand deposits and generally sediments are poorly sorted in nature.Grain size distribution pattern of the sediments indicates that the most soil samples are not derived from transportation action only. Polymodal distribution indicates more than one source for the origin of the soil samples.The moderate to low level of soil organic carbon indicates low level of organic activity. The low to moderate level of soil organic carbon and soil organic matter leads to cater biological diversity in the soil. Highest value of Soil organic carbon at the level of 598mg/kg was reported from the location 3 of the study area.

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