



Characteristics of Soil Separate and Its Effect on Plant Growth

(Pramod Kumar Sharma¹, Rinku Jangid², *Mukesh Prajapat³ and Rekha Gurjar⁴)

¹Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh-284003

²Apex University, Jaipur, Rajasthan-302018

³Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh-492012

⁴Sri Karan Narendra Agriculture University, Jobner, Rajasthan-303329

*Corresponding Author's email: mukeshprajapat0743@gmail.com

Soil is natural active complex dynamic body, loose material on the surface of earth and important medium for growth and also source of water and nutrient. It is capable for storing large amounts of carbon, it buffers against pollutants; the protecting groundwater; it filter the rainwater and regulates the discharge of excess water, preventing flooding. Soils vary greatly in their chemical and physical properties. Processes such as leaching, weathering and microbial activity combine to make a whole range of different types. Each type of soil separates has particular strengths & weaknesses for agricultural production/ plant growth.

Nature of soil separates

A. Physical nature of soil separate:

Soil separate consists of sand, silt and clay. Their nature describe briefly. Some physical characteristics of soil can be changed with good management. Physical property of soil primarily dependent on total surface area. In addition to area, the chemical properties of the soil particles and organic matter content also exert influence. Surface area in square centimeter of a soil is called **Specific surface** of the soil.

1. **Sands** (2 - 0.02 mm average particle diameter): Sands may be round or quite irregular depending on the amount of abrasion (rubbing) that they have received.

When sands are not coated with clay or silt particles, do not show, sticky plastic property or any colloidal property due to presence of sand particles in soil mass, the passage of percolating water rapid and there by facilitate drainage & aeration. The water- holding capacity (WHC) of a soil is low due to presence of good amount of sand separates.

Any organic matter will work to build soil structure & its ability to hold onto water. Clay (less than 0.002) Clay consists chiefly of secondary products of chemical weathering, have ultra-microscopic size, possessing large area than that of other fractions like silt & sand.

Clay particle generally are mica like in shape and highly plastic when moist. When clay is wetted it tends to be sticky and is easily molded.

On drying it absorbs considerable heat energy and on wetting amount of heat. This phenomenon is known as "heat of wetting". Clay particles exhibit properties of swelling, plasticity, cohesion and adhesion etc.

B. Mineralogical nature of soil separate:

Sand- Sand is a granular material composed of finely divided mineral particles Sands have various compositions but is defined by its grain size.

The composition of sand varies, depending on the local rock source and conditions, but the most common constituent of sand in inland continental settings and non- tropical coastal settings is Silica (silicon dioxide or SiO₂), usually in the form of Quartz.

Silt - Foremost is the weathering- resistant mineral quartz (SiO₂).

Other minerals often present, though in smaller amounts are mica, feldspar, zircon, hematite and limonite. If the soil is not strongly leached, the sand and silt fractions may also contain fragments of calcite and dolomite.

Clay- Coarse clay particles are composed of minerals like quartz and hydrous oxides of iron and aluminum and other aluminum-silicate mineral.

C. Chemical nature of soil separate (90.3% sand, 9.7% silt clay):

Sand- Its nature is Calcareous soil (12.0% CaCO₃) so, its pH 7.4 and EC 2.2 ds/m.

The sandy soil low in organic matter have a very low CEC (less than 3c mol c/kg). So, sands has no capacity to exchange cations because it has no electrical charge but this can be improve by adding organic matter.

Sand content low holding capacity for cations compared to clayey and silt soils. Since, Quartz (SiO₂) is dominated of these fractions they are chemically inactive.

Sometimes these fractions especially sands, contain different insoluble nutrient to plants which effect on plant growth.

Silt - Silt soil contain sufficient quantities of nutrients, both organic and inorganic. That is why they are very fertile. Soils rich in silt possess high water holding capacity silts (K-bearing mineral- micas) have been known to release potassium in soils and supply K to the plants.

Clay - This fraction is soils is very active montomorillonite and are aluminum silicates. They carry sodium iron and magnesium. Illite is a hydrous mica, a potassium aluminum silicate. It contains high potassium.

Problems which is affect the activity soil separates in the soil

Healthy soils are essential for healthy plant growth, human nutrition, and water filtration. Soil separates help to regulate earth's climate and stores more carbon than all of the world's forests combined.

1. Salinity & Alkalinity: It is a serious problem in some parts of India.

Method of reclamation-

- Cultural practices
 - Tolerant & sensitive crops
 - Biological method
 - Chemical method
 - Irrigation water management
- 2. Wind erosion & shifting sand dunes:** Poses a constant threat to crop production & also to general public facilities like rail tracks, highways & buildings etc.
- The wind work as a powerful agent for erosion.
 - Its action is twofold- To save the topsoil of arable land from erosion & to prevent the deposition of an agriculturally useless sandy cover.
- 3. Water logging:** With the introduction of canal irrigation of canal irrigation system water table of the area is rising at an average rate of about 0.8m per year. As a result of this large area has become water-logged and this area is increasing every year, it is a serious problem particularly in deep black soils. It is also known as water stagnation.
- 4. Low soil moisture condition:** Sandy soils have low moisture storage. High evaporation & low capacity limit the availability of rain water for plant use.
- 5. Sodality of soil:** Sodality of the soil & high residual sodium carbonate content of irrigation water are the main problem.

Method of reclamation:

- Manure, compost, moist peat moss, composted leaves etc.

- Silt (0.002-0.2) - Silts are intermediate in size and show properties somewhat intermediary between sands and clay and are composed of original mineral fragments.
- Fertile soil have a greater tendency onto nutrients better than sandy soils.
- Better water holding capacity than sandy soils. Easier to work with than clay soils.
- Silt soil have a greater tendency than other types to form a crust. Water filtration can be poor.
- Avoid working with silt soils when wet to reduce our risk of compaction. Increase the soil organic matter by utilizing compost and soil microbe-rich products.

Conclusion

Soil separates are composed of various particles and nutrients. It helps to plant grow. The soil is classified into segregate “Soil separate”. Each soil type with different characteristics that give limitation and benefits for growing crop. The physical, chemical and mineral properties of soil are classified into sand, silt and clay. The soil is created up essentially of organic and mineral particles where all type of soil interact slowly yet constantly. In India, “soil separate” reflect different features based on the physical, chemical, mineral and climate factors. Supplying the important nutrients, root support, oxygen and water.

References

1. Soil Science Glossary Terms Committee, & Soil Science Society of America. (2008). *Glossary of soil science terms 2008*. ASA-CSSA-SSSA.
2. Kumari, N., & Mohan, C. (2021). Basics of clay minerals and their characteristic properties. *Clay Clay Miner*, 24, 1-29.
3. Glaser, B., Lehmann, J., & Zech, W. (2002). Ameliorating physical and chemical properties of highly weathered soils in the tropics with charcoal—a review. *Biology and fertility of soils*, 35, 219-230.