

Soil Characterisation

Introduction

Soil is an essential natural resource accessible to us, as a mixture of minerals, liquids, gases, organic matter and microorganisms. Soil is available to us in different proportions of decomposition or transformation of minerals and rocks with pre-mixed organic matter, involving numerous physical, chemical, and biological processes. Soil characteristics or properties may vary with a change in any or all the factor(s), such as geography, climate, plant environment, and living or dead organisms¹. Soils offer nutrients, water, air, physical balancing, temperature control, and defence from contaminants² to plants.

What is soil characterisation?

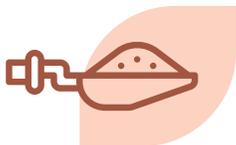
Soil characterisation is a technique involving various chemical processes, which determines, the nature and contamination in soil. It also determines the chemical, physical, and biological properties of soil.

Why soil characterisation is important?

Soil characterisation provides the necessary basic information to generate useful soil classifications in an ecology. It helps in the generation of data for mineralogical, microbiological, chemical, and physical properties. The overall combination of soil mapping, soil classification, and soil characterisation provides a powerful resource for producing data for studies which are dependant on the soil characterisation.

How is soil characterisation performed?⁴⁻⁵

Criteria for the collection, transportation, storage, and several parameters of characterisation that are to be determined are mentioned below:



Collection

- Within a depth of 0 to 25 cm.
- From the pastureland, without any application of crop protection products, mineral fertilisers, or biological materials for at least last one year.
- Neither flooded nor dried.



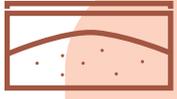
JRF GLOBAL

Pioneering Solutions since 1977 - Responsibly



Transportation

- Transport in containers, maintaining the original temperature conditions at source, enabling to continue the initial soil properties without any significant alteration.



Storage

- Air-dried if required, then manually cleared of large unwanted objects (e.g., stones and other remaining plants parts) after the receipt of the soil in the laboratory.
- Processed by sieving without excess drying, to a particle size less than or equal to 2 mm.
- Store in the refrigerator at 4 ± 2 °C for no longer than three months, to ensure the aerobic condition during its storage.



Characterisation

- Soil is characterised for the below-mentioned parameters during the GLP study⁶⁻⁸.

Parameters to be characterised	Method of analysis/ Instrumentation used
Particle size distribution (sand/silt/clay content)	International Pipette Method
pH (in Distilled Water)	pH meter
Organic Carbon Content	Walkley and Black method/Titrimetric Analysis
Water Holding Capacity	Classical Method
Water Content	Classical Method
Total Nitrogen Content	Dumas Nitrogen Analyser
Initial Nitrate Content	Ion Selective Electrode meter
Cation Exchange Capacity	ICP-OES / Ion Chromatography
Microbial Biomass	CO ₂ Soil Respirometer

JRF has the competencies to characterise the soil, using the parameters mentioned above. Besides, JRF also can do customised characterisation studies as per the various test guidelines requirement like, Soil Microorganisms: Nitrogen Transformation Test (OECD TG 216), Soil Microorganisms: Carbon Transformation Test (OECD TG 217), Adsorption - Desorption Using a Batch Equilibrium Method (OECD TG 106), Aerobic and Anaerobic Transformation in Soil (OECD TG 307), etc.

References

1. http://www.idd.go.th/idd_en/en-US/importance-of-soils/
2. Miller, Raymond W.; Donahue, Roy Luther (1990). Soils: an introduction to soils and plant growth. Upper Saddle River, New Jersey: Prentice Hall. ISBN 978-0-13-820226-2.
3. Morris et al. (2010). Proceedings of the Annual International Conference on Soils, Sediments, Water and Energy, Vol. 15, Art. 28.
4. OECD (2000). The Organization for Economic Co-operation and Development Guidelines for the testing of chemicals, OECD 217, Soil microorganisms: Carbon Transformation Test, adopted by the Council on January 21, 2000.
5. OECD (2000). The Organization for Economic Co-operation and Development Guidelines for the testing of chemicals, OECD 216, Soil Microorganisms: Nitrogen Transformation Test, adopted by the Council on January 21, 2000.
6. Baruah TC, and Barthakur HP (1997). A Textbook of Soil Analysis. Vikas Publishing House Pvt. Ltd., New Delhi, pp 334.
7. Black CA, (1965). Methods of soil analysis (Ed.) Agronomy monograph Number 9. American Society of Agronomy, Madison Wisconsin, USA.
8. Walkley A, Black IA (1934). An examination of the Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Science, 34:29-38.



About the Author:

Jitendra D. Bhosale, Ph.D.

Specialised in organic chemistry, Research Officer in the Environmental Fate and Metabolism (EFM).

He has a good experience of conducting E-Fate studies like Carbon and Nitrogen Transformation Tests, Hydrolysis, Photolysis, Ready Biodegradability, Method development and validation. He is actively involved in research validations. He has professional experience of more than 13 years, including academic research, Synthesis R&D, medicinal plant extraction & isolation, analytical instrumentation, and CRO industry.

Founded in 1977, JRF Global is one of the oldest (41+) and most respected non-clinical Contract Research Organization in Asia. JRF's capabilities spanning from Discovery to Development phase provides integrated services to both innovator and generic.

Salient Features:

- GLP and AAALAC accredited
- 300+ Employees, 700+ Clients across 60+ Countries
- Spread across 6 locations worldwide (USA, Canada, Spain, UK, India, Japan)
- 33500+ GLP Studies across all industries and have been well received by US FDA, EMA, MHRA and other regulatory agencies
- State-of-the-art animal house facility which is among the best in Asia

Experienced in handling small molecules, biologics/biosimilars, vaccines & herbal products JRF's fully integrated chemistry and toxicology services offers an attractive value proposition in terms of efficiency, deliverables and cost.

Services at a glance:

- P-C Chemistry, Analytical/Bioanalytical Chemistry
- Med-Chem & Custom Synthesis
- *In vitro* DMPK
- *In vivo* Pharmacokinetics
- Efficacy models
- Safety Pharmacology
- Genotoxicity
- DART - Segment I, II, III



JRF GLOBAL

Pioneering Solutions since 1977 - Responsibly