

SOIL and AGRICULTURAL ENVIRONMENTAL CHEMISTRY

SOIL

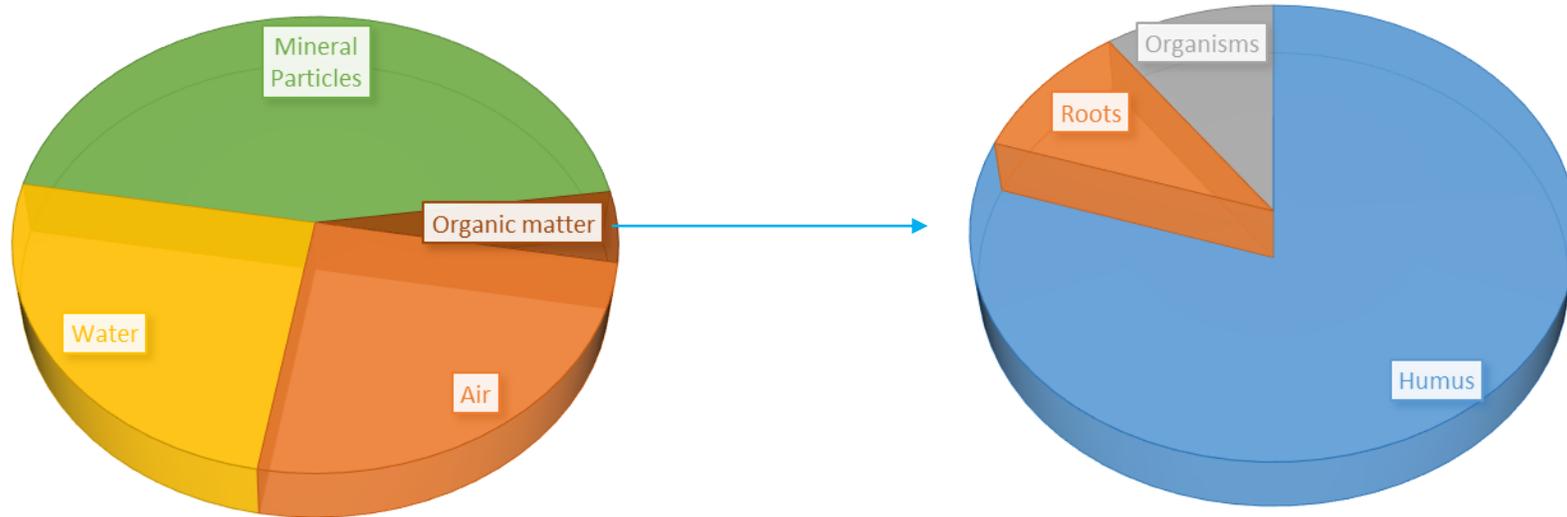
- Soil is defined as a three-dimensional, dynamic natural body occurring on the surface, consisting of rock and mineral particles mixed with decayed organic matter.
- It is capable of retaining water, providing nutrients and medium for plant growth and supporting a wide range of biotic communities and a modifier of the atmosphere.
- Soil is formed by a combination of physical, chemical and biological processes and plays an important role in the **carbon, nitrogen and hydrological cycle**.

Soil Formation

- Soil formation is the consequence of a combination of biological, physical, and chemical processes. Soil should ideally contain 50 percent solid material and 50 percent pore space.
- There are 5 factors on which the formation of soil depends:
 - i. Climate
 - ii. Organisms
 - iii. Parent material
 - iv. Time
 - v. Topography

Soil Composition

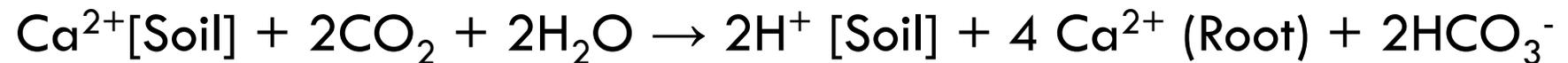
Most soils contain the four basic components: mineral particles, water, air, and organic matter. Organic matter can be further sub-divided into humus, roots, and living organisms.



Soil Reactions

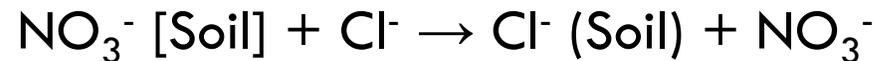
Cation Exchange Reactions

- One of the most important chemical functions of soils is the cation exchange reactions that take place at the surface of the clay minerals, humus particles and to some extent ferric hydroxide because of the presence of negatively charged sites.

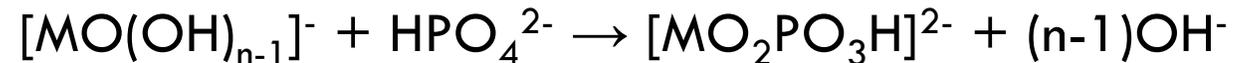


Anion Exchange Reactions

- Anion exchange reactions also follow the same principle and are reversible as the cation exchange reactions:



Iron and aluminum hydroxide clays undergo exchange of hydroxide anions (OH^-) with other anions. The metal oxide has a net negative charge and under such condition anions, such as phosphates and sulphates, can be exchanged:



Essential Elements: Macro and Micronutrients in Soil

- There are certain elements that are essential for plant growth and reproduction. The nutrients required by plants organisms in high concentration are called macronutrients and those required in lesser concentration are called micronutrients.
 - i. **Macronutrients:** The essential macronutrients are carbon, hydrogen, oxygen, nitrogen, phosphorous, potassium, calcium, magnesium, and sulfur.
 - ii. **Micronutrients:** The essential micronutrients are iron, manganese, zinc, copper, boron, chlorine, molybdenum, aluminum, bromine, iodine, and vanadium for plant growth.