GOLD NUGGET

Distribution Patterns – Soil Biodiversity At Aggregate Scale Part 1

Soil aggregates

Soil is an incredibly complex and diverse organisation of pores and particles, which influence the organisms that live within. These particles, known as 'soil aggregates', consist of mineral and organic materials bound together, and are generally defined by their size and their stability in water. These aggregates are typically classified into three main size fractions: macroaggregates (> 250 µm), microaggregates (50 - 250 µm) and clay- and silt-sized aggregates (< 50 µm). Different soil organisms live in the network of pores between and within aggregates.

The vast variation in the size of aggregates, as well as their physical-chemical properties, results in a huge diversity of microhabitats for organisms living within the soil. For example, small pores found in clay- and silt-sized aggregates will protect microorganisms against predation from larger organisms, which are restricted to larger pores in meso- and macroaggregates or between aggregates, and also restrict the flow of water and air and the input of new nutrients. Therefore, clay- and silt-sized aggregates are more stable habitats, with reduced competition and predation, and less variation in water influx (due to the capacity of small pores to better hold water), and are less sensitive to mechanical breakdown and influx of environmental pollutants.

Microaggregates are intermediate habitats, mainly populated by microfauna. Macroaggregates are considered to be less stable habitats due to greater fluctuations in water and gas flow, increased competition and predation, and their sensitivity to mechanical breakdown. Macroaggregates are mostly populated by ecosystem engineers, such as earthworms and termites.

Microorganisms and soil aggregates

The abundance of microorganisms varies with the size of soil aggregates, and is directly related to the specific environmental conditions of each size. Bacterial biomass is often higher in clay- and silt-sized aggregates, especially in fine soil fractions (< 20 µm), where it can reach levels that are 30 - 80 % higher than in macroaggregates, due to more stable environmental conditions. Aerobic (life in the presence of oxygen) bacteria dominate macroaggregates, as oxygen concentration is higher; clay- and silt-sized aggregates generally contain a mix of aerobic and strict anaerobic (oxygen not needed to live) bacteria. By contrast, fungi are mainly found in macroaggregates where their biomass and hyphae length can be up to 80 % higher than in microaggregates. The small size of pores in microaggregates prevents fungi from growing inside them, limiting the fungal presence to their surface.

The size of soil aggregates plays a role not only in microbial abundance, but also in diversity.

To be continued…

Farming Secrets says:* *Conducting Several Visual Soil Assessments Annually Is A Very Good Start To Monitoring Soil Fertility For Plant Health

***Ref:* A Global Atlas of Soil Biodiversity p72**