GOLD NUGGET

Distribution Patterns – Soil Biodiversity At Aggregate Scale Part 2

Functions at aggregate scale

In addition to microbial diversity and distribution, variation in soil aggregates also affects the functions carried out by microorganisms. For example, the composition of free-living bacteria that fix atmospheric nitrogen into soils, differs with the size of soil aggregates.

Macroaggregates have a greater diversity and activity of diazotrophs, yet microaggregates can carry between 30 % and 90 % of the diazotrophic population. These different diazotroph communities exploit specific anaerobic niches within the different sizes of aggregates, creating the conditions required for the fixation of nitrogen.

Similarly, denitrifiers, which reduce nitrate by releasing it back into the atmosphere (in a process called denitrification), are not present and active in all sizes of soil aggregates, but occur mainly in microaggregates, where nearly 90 % of the potential denitrification activity can occur. Furthermore, microbial diversity and functions can differ in relation to the location of microorganisms in the exterior or interior parts of aggregates. The process of nitrification (i.e. conversion of ammonium into nitrate) can be 50 % higher on the exterior of the aggregates (first mm) than in the interior, due to the aerobic conditions which are required for this process. Conversely, the interior of soil aggregates can provide anaerobic conditions favourable for processes that require low levels of oxygen, such as nitrogen fixation, denitrification or methane production. The interior of aggregates can also protect bacteria against pollutants, such as heavy metals, whereas the bacteria on the exterior of aggregates generally show more resistance to pollutants.

Earthworms and aggregates

In most soils, earthworms play a key role in the formation of aggregates. These biogenic aggregates (earthworm-accumulated casts) may represent more than 50 % of the soil volume, and earthworms are considered as fundamental agents of aggregation in soil. Different organisms living within the soil are influenced by soil aggregates, and vice versa. This close interaction between soil biodiversity and soil aggregates is dynamic and can change over a short period of time. Therefore, soil management (e.g. conventional field tillage v no till) can greatly affect the soil aggregates and organisms, meaning that better soil management is required to sustain the organisms and their microhabitats, in order to deliver valuable ecosystem services.

Farming Secrets says: ***A Visual Soil Assessment To Assess Your Soil Aggregation Is Vital***

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

Glossary:

Diazotrophs A microorganism capable of assimilating and fixing atmospheric nitrogen

Denitrifiers Denitrification is a microbially facilitated process where nitrate (NO_3) is reduced and ultimately produces molecular nitrogen (N_2) through a series of intermediate gaseous nitrogen oxide products. Facultative anaerobic bacteria perform denitrification as a type of respiration that reduces oxidized forms of nitrogen in response to the oxidation of an electron donor such as organic matter.