GOLD NUGGET

Distribution Patterns – Soil Biodiversity Over Time – Part 2

Soil biodiversity also changes over hundreds or thousands of years, through processes of primary succession, which is the gradual and natural development of an ecosystem over a longer period of time. Studies have revealed a number of general patterns that occur in soil communities over these long timescales. Most data come from glacier forelands and lava fields, and sand dune systems that undergo primary succession. These kinds of landscapes are unique observatories of soil formation because they contain soil chronosequences. As succession proceeds from its initial stages toward the 'maximal biomass', or climax phase, soil microbial communities become increasingly abundant, active and diverse, and they also become increasingly fungal dominated in nature. Mycorrhizal communities also change as succession proceeds: during early succession, ruderal plants are generally non-mycorrhizal, whereas in mid-succession, the dominant herbaceous plants tend to have a facultative requirement for arbuscular mycorrhizal fungi. Finally, in climax communities, the trees and shrubs, which dominate the vegetation, often have an obligate need for ectomycorrhizae.

Similar changes in microbial community composition appear to occur during secondary succession. This process of succession occurs after land has suffered a major disturbance, such as fires or hurricanes, or following the abandonment of agricultural land. Such events commonly lead, over time, to a shift in the make-up of the microbial community toward fungal dominance over bacteria. These changes can take decades to occur and they are most likely related to a build-up in the amount and complexity of organic matter, and changes in the quality of resource inputs to soil resulting from vegetation change. They may also be related to changes in the physical-chemical nature of soils; for example, a decline in soil pH that commonly occurs during succession.

Soil animal communities also change during succession, but patterns appear to be less clear, at least when considering temporal changes in different trophic groups. For example, during secondary succession in abandoned agricultural land, soil invertebrates of different trophic groups appear to respond differently, and some faunal groups do not recover at all. Also, on glacier forelands, the first colonisers of recently exposed glacial debris can be predators, with herbivores and decomposers coming later.

Similarly, the first colonisers of newly exposed glacial moraine in the Arctic have been shown to be spiders, whose densities are related to inputs of potential prey items, predominantly midges. In these harsh environments, large inputs of insects could be an important source of nutrients for the developing ecosystem, even before a cyanobacterial crust forms, Insects are often the first colonisers of newly exposed soils in extreme environments.

Many factors cause soil communities to change over successional timescales, but of most importance is the build-up in the amount of complexity of soil organic matter, which provides resources for the developing soil food web. This is largely driven by changes in vegetation as succession proceeds, which alter both the amount and quality of organic matter entering the soil, and also soil weathering processes, which contribute to the formation of mature soils from early stages. In particular, processes of soil weathering determine the depth of soil, its pH and the availability of key nutrients, such as phosphorus.

Farming Secrets says: It Is Important To Know The Complexities Of The Soil

***Ref:* A Global Atlas of Soil Biodiversity p75**