GOLD NUGGET

Distribution Patterns – Soil Biodiversity At The Extremes Part 2

Biodiversity in the subsurface

Most studies of the interactions between life aboveground and life belowground have concentrated primarily on connections between vegetation, soil and the uppermost layer of weathered rocks, rarely investigating more than a metre below the surface. Although the processes taking place in deeper zones may profoundly influence life at the surface, important questions remain about the links between the deep biosphere and surface environments, including the soil: how does land use or disturbance at the surface impact the subsurface? How are signals, if any, transported from the surface to the deep biosphere? How long does this take and how long does it last?

Deep life, defined here as beginning below the rooting zone, often extends far below the pedosphere, down through the subsurface to caves and groundwater contained within shallow and deep aquifers. Of course, prokaryotic population densities decrease with depth from the soil surface to the subsurface, but levels of 104 to 108 cells per gramme can still be found in unsaturated bedrock or 103 to 108 cells per ml groundwater in saturated bedrock. The lower boundary of the deep biosphere, marking the limits of the influence of life on the rock environment, is still not defined. Molecular methods have provided evidence that the biosphere can reach deep into the bedrock.

Assuming an upper temperature limit of 130 °C for bacteria, life could exist down to a depth of 5.2 km in continental crusts. Although the constraints of temperature, energy, oxygen and space should preclude life of multicellular organisms at these depths, nematodes feeding on subsurface bacteria have been detected in 3.6 km-deep fracture water in the deep mines of South Africa. Often flagellates, ciliates and amoeba are present, suggesting that protists can make an important contribution to the control of microbial populations by grazing bacteria on rock surfaces. But still less is known about the role and distribution of deep biodiversity, in particular, what controls its spatial distribution, its role in shaping water and nutrient cycles, and the consequences for ecosystem services.

Studies of the first few metres of soil demonstrate large differences in the microbial community structure between surface soil communities and those living deeper than one metre. Probing even deeper into the subsurface raises a number of basic questions: What biota live there? How do they interact with and reflect their environment? And how do they reflect surface properties? Microbial communities living in the subsurface appear to be composed of many bacteria and archaea belonging to classes and orders that had not been previously sampled or even recognised. Some might belong to mostly uncharted branches of the tree of life, the ‘microbial dark matter’ that represents a major unexplored portion of microbial diversity.

Farming Secrets says: ***Deep Rooted Plants Are Important To Bring Nutrients To Upper Soil Layers***

Ref: **A Global Atlas of Soil Biodiversity p73**