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The future of organic farming in the light of the development of new biological fertilizers

The adoption of a biological method of plant nutrition has proved to be extremely efficient. The method does not involve the use of chemical salts and the innovative approach to soil health and plant growth uses natural crushed zeolite rock and organic waste, either animal or plant. Zeolite minerals are well known to adsorb ammonia, which in this case, is produced by the decomposition of the organic waste. The slow release of the ammonia provides a gradual supply of nitrate ions that can be accepted by the growing plant. In this way, there is very little access to nitrate to diffuse into the soil. With phosphorus obtained from the organic waste by the activity of other micro-organisms and potassium, being available from the waste and soil, the three major elements (NPK) are present in ionized form which can be taken up by the growing plant. The ammonium ions, held by the zeolite are oxidized to nitrate by the activity of soil micro-organisms; not bacteria, as previously thought but Crenarchaeota (Archaea). This was confirmed by molecular biological studies conducted at the Department of Biotechnology, University of Cambridge. This way of providing nitrogen by biological oxidation of ammonia to nitrate (nitrification) involves enzymes which also produce hydrogen in a form which is very reactive. The reactivity of the hydrogen releases a range of ionized elements from the soil which provide minor elements in trace quantities required for strong plant growth. Organic material is essential to supply the carbon demand of soil micro-organisms. Due to the carbon demand of proliferating soil microbes, occurring from the use of chemical fertilizers, carbon is lost in the long-term. This loss leads to a change in soil structure and water holding capacity, resulting in a fragile soil which is prone to wind erosion. The dust bowls of the Midwest of the USA are a spectacular example of this effect. It is thought that the adoption of the more scientific organo-zeolitic-soil system, will be a step forward in plant nutrition.

Biography

Peter J Leggo graduated from the University of St. Andrews, Scotland after a four-year Honours Geology degree course in 1959. He then gained his PhD degree from University of Bristol graduating in Geology and Mineralogy in 1963. Then, he joined Australia National University to work on Isotope Geochronology, 1963-65. He continued this work during a Post-Doctoral Fellowship at the University of Leeds, 1965-68. He held an accepted Professorship at the Department of Geology, University of Florida, USA and later at the Department of Environmental Studies, University of Virginia, USA. On return to the UK in 1995, he became interested in Natural Zeolites which led to current work on biological plant fertilizers at the Department of Earth Sciences, University of Cambridge.

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