Haim Time

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HUMUS: The Soil Organic Fraction and Its Significance

Humus, an integral part of soil organic matter, is usually distinguished by the absence of visible remains of the original plant or animal precursors, though microscopic examination may reveal remains mechanically but not chemically degraded. In effect, humus may be seen as a stable organic matter fraction residual in soil, in a constant process of transformation.

How does this come about. Organic matter that is derived from plant remains is first decomposed by microorganisms into inorganic minerals. Through a process called mineralization, nitrogen and other nutrients are made available for plant absorption. There is, however, a fraction of this organic matter that does not always mineralize, and thus begins humus formation. In this process called humification, this fraction is transformed into various organic polymers resistant to microbial action, and is consequently stable. Humification in soil, however, encompasses a broad range of organic matter dependants, including bacteria, fungi, earthworms, nematodes, protozoa and arthropods. Organic matter available to these populations includes plant remains, both ingested and excreted, and an array of organic compounds, sugars, starches, proteins, carbohydrates, lignins, waxes, resins and organic acids. While sugars, starches and carbohydrates are readily decomposed, fats, waxes and crude proteins are more resistant to attack and remain unchanged for longer periods. Lignin, available to white-rot fungi, but otherwise highly resistant, is one of the primary precursors of humus. In effect, with no definite shape or structure, and defying chemical naming, a complex mixture of compounds and biological chemicals of plant, animal and microbial origin, in a constant state of evolution, has been identified as providing numerous functions and benefits in soil.

While humus may be seen as a nutritional reserve for the soil biota, offering both readily available nutrients and a long term storage supply, chemically stable humus provides soil fertility in a physical sense as well. Soil structure is enhanced by the microbial secretion of mucilages during humifiction. This causes soil particles to adhere and form aggregates, allowing greater aeration and moisture retention. The humus surface is rich in negatively, electrostatically charged anions, which bind to the positively cations released by mineralization, making them available to plant nutrition and preventing loss by leaching. Humus can hold the equivalent of 80-90% of its weight in moisture, thereby increasing a soil's capacity to resist drought. Its biochemical structure allows it to act as a buffer against excess acid or alkaline soil conditions and its dark black or brown color helps warm cold soils in spring

That the richness of the humus story will continue to unfold is borne by the developing consensus that fulvic and humic acids, derived from the long term decomposition of humus, act hormonally on plants rather than by root absorption. Further studies will no doubt continue to refine our knowledge of this critical soil component.

Ref. Humus, WIKIPEDIA

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