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A Review :

Soil enzyme : concepts and relevance in soil health and productivity

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ABSTRACT

Soil is an important natural resource that needs to be preserved and , if possible its quality and productive capacity improved. Because of the conflicting pressure increasingly applied to the soil, it is clear that relevant indicators are urgently needed to assess and monitor soil health. Biological indicators of soil health offer certain advantage over physico chemical methods. Among the various biological indicators to monitor soil health, soil enzyme activities have great potential to provide a unique integrative biological assessment of soils and the possibility of assessing the health of the soil biota. Some enzyme activities could be used as a sensitive indicator of fertility status and soil pollution by heavy metals and other trace elements. Besides, soil enzyme activities provide an easy, relatively rapid and low cost procedure to monitor soil health. Nevertheless, soil enzyme activities also present some limitations and must always be considered in conjunction with other biological and physicochemical measurements of we are to diagnose soil health correctly.

Key words : Soil enzyme, Soil health, Productivity

Environmental degradation poses a significant threat to the global ecosystem due to rising world populations, acceleration of industrial activities, and technological developments over the last 100 years. Soils play a central role in the function and long term sustainability of ecosystems, but because changes can be slow and difficult to quantify, measuring its 'health' or developing 'soil quality standards' has been largely ignored compared to air or water quality standards. Because of the conflicting pressure increasingly applied to the soil, it is clear that relevant indicators are urgently needed to assess and monitor 'soil health.

Biological indicators of soil health offer certain advantages over physico-chemical methods. Among the various biological indicators that have been proposed to monitor soil health, "soil enzyme activities" have great potential to provide a unique integrative biological assessment of soils and the possibility of assessing the health of the soil biota. Hence, it is necessary to study soil enzymes and their relationships to soil health and soil productivity.

Soil enzyme concept:

Nutrient cycling in soils involves biochemical, chemical and physico-chemical reactions, with biochemical processes being mediated by micro-organisms, plant roots and soil animals. It is well known that all biochemical reactions are catalyzed by enzymes, which are protein with catalytic properties owing to their power of specific activation. Soil enzymes may originate from plants, animals, fungi and bacteria. It is generally agreed that the microbial component is the main source of enzymes in soils. Enzymes are organic protein catalysts that transform inorganic and organic substances without themselves being changed.

Soil enzyme properties:

The most enzymes studied in soils have a significant portion of the enzymatic activity associated with abiontic enzymes. These enzymes enter the soil matrix as extracellular enzymes excreted into the soil solution or are release upon cell lysis or as a part of cell debris. It seems likely that the vast majority of extracellular enzymes released into soil, survive for only short periods and are readily decomposed or denatured. However, some of these enzymes are stabilized in the soil matrix and remain catalytic (Skujins, 1978). Abiontic enzymes can exist as stabilized enzymes in two locations : (i) adsorbed to internal or external clay surfaces and (ii) complexed with humic colloids through adsorption, entrapment or co-polymerization during humic matter genesis (Boyd and Mortland, 1990). A more important form of enzyme bonding in soils is by covalent bonding to humic components (Gosewinkel and Broadbent, 1986).

Enzymatic activity associated with cytoplasmic functions plays a critical role in the life processes of soil organisms. Enzymes excreted by microorganisms into the soil solution could be important (i) in hydrolyzing substrates that are too large or insoluble to be taken up directly by cells; (ii) in detoxifying the surrounding environment ; or