

Course: Rhizosphere Fauna (selective course)

Level one – Program Biotechnology

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Introduction to soil macrofauna (2)

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DIRECT AND INDIRECT CHEMICAL EFFECTS OF SOIL MACROFAUNA

The most important chemical effect of macrofauna on soil is the modification of food quality through its passage in the gut and particularly the mineralization of organic matter and the release of nutrients. Soil macrofauna also influences soil chemical composition through the deposition of excrement.

The main indirect chemical effect is the mineralization of N, P and S through the activation of microflora. Soil microorganisms represent an important proportion of the soil living component (60–80 percent).

The rest of the time, soil microorganisms are “in dormancy” and they are able to survive “hard times” in this way. The contrast between the potential of soil microorganisms for an extremely fast turnover of organic matter and the field reality has been called the “Sleeping Beauty Paradox”. Macrofauna that has the ability to move the soil and change environmental conditions at the scale of microorganisms can interrupt this dormancy (acting as “Prince Charming”), providing assimilable substrates (root exudates, earthworm mucus and other materials) that initiate the metabolic capabilities of microorganisms.

Hence, they appear to be major regulators of microbial activities.

Interactions between microorganisms (with a high capacity to digest almost all organic substrates) and macrofauna (with the potential for mechanical activities) are the basis of the biological systems of regulation that determine soil function (Lavelle and Spain, 2001).

BIOLOGICAL EFFECTS OF SOIL MACROFAUNA

In a natural soil, a complex and dynamic balance exists between the different groups of organisms with different feeding habits. Predation and competition are the main factors controlling this equilibrium. Predation has an important role because it establishes a balance between the number of individuals and the quantity of available resources. Competition is another way to maintain soil fauna populations in balance with soil resources.

Another biological effect of soil macrofauna is the disappearance of dead animal material. This work is realized by necrophagous (which feed on dead and/or decaying animals) and coprophagous organisms (feeding on dung or excrement) such as Diptera larvae, Coleoptera and Lepidoptera larvae and adults. They clean the soil surface and incorporate organic matter into soil. In addition, soil macrofauna disseminates bacteria and spores through excrement dispersion in soils or by on-body transport. Earthworms determine the vertical repartition depth in soil.

The importance of the functions performed in soils by macrofauna and the physical, chemical and biological changes induced in a soil environment as a consequence of its activity make it a vital part of all ecosystems, including agro-ecosystems.

Soil macrofauna is involved in:

- degrading organic matter and mineralizing nutrients;**
- controlling pathogen populations;**
- improving and maintaining soil structure;**
- mixing organic matter through the soil.**

The reduction of aboveground biodiversity is normally associated with the alteration of several environmental parameters including the carbon supply to the soil, which provides the basis for a more or less diversified soil population.