

Respiration rates of soil invertebrates from the temperate zone and from the tropics measured by infra-red gas analysis

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Release of CO₂ and other nutrients during mineralisation of plant litter in temperate and tropical ecosystems is mainly attributed to the activity of the soil microflora. It is also known that soil fauna feeding activity influences the microbial decomposition process. Measurements of the amount of CO₂ that is respired directly by soil invertebrates have been reported rarely so far.

To assess the direct contribution of the soil fauna to the carbon cycling a commercially available photosynthesis measuring system, based on infra-red gas analysis, was modified to measure the amount of carbon that is directly respired by small soil invertebrates.

Various soil invertebrates (e.g. millipedes, woodlice, earthworms) from the temperate zone (Germany), and from a tropical forest near Manaus, Amazonia, Brazil, were chosen for measurements and either collected in the field or taken from breeding cultures. Single animals or groups of 5-10 specimens were weighted and placed in a measuring cuvette that was continuously flushed with air in a closed circuit. During respiration measurements the relative humidity of the air in the closed system was in the range of 55 – 75% for termites and 80 – 95% for the other taxa. The temperature inside the cuvette was adjusted to 20 °C for temperate to 28 °C and 31°C for the tropical taxa.

Respiration rates of the tropical fauna were in the range of 26.8 – 994.6 µL CO₂ h⁻¹ g⁻¹ biomass fresh weight and were comparable to respiration rates of soil invertebrates from the temperate zone. The results indicate that biomass and respiration were not correlated and that the direct contribution of the soil fauna to the carbon flux via respiration is small as compared to the CO₂ released by soil micro-organisms.

The work reported here was performed at the laboratories of ECT Oekotoxikologie in Flörsheim, Germany and at the research station of the Empresa Brasileira de Pesquisa Agropecuária, Embrapa, located in the state of Amazonas (Brazil). It was part of the project "Soil Fauna and Litter Decomposition in Primary and Secondary Forest and a Mixed Culture System in Amazonia" carried out within the German-Brazilian scientific co-operation programme "Studies on Human Impact on Floodplains and Forests in the Tropics, SHIFT" (Höfer et al. 2001). The work was partly supported by the Brazilian (CNPq) and German (BMBF) government.

References:

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