

## Effect of environmental factors, especially temperature, on fungal and bacterial growth in soil.

Fungi and bacteria comprise more than 90% of the soil microbial biomass and are the main agents for decomposition of organic matter in soil. Until recently it was thought that these two organism groups could be lumped in this respect and often total microbial biomass or total activity (respiration) are the only variables included in soil microbiological studies of decomposition and soil organic matter turn-over. However, there is increasing evidence that if decomposition is performed by bacteria or fungi, and thus energy is channeled through the bacterial or fungal food web, this can have profound effects on the ecosystem. Such effects can be direct, like affecting higher trophic levels in the food web, but also indirect, like affecting nutrient mineralization rates and nutrient transfer in soil, and even determine the extent of carbon sequestration in soil. The fungal/bacterial ratio has also been suggested to indicate sustainable soils with low nitrate leaching.

One of the most important environmental factors affecting the function of the decomposer organisms is temperature. To what extent and how rapid soil microorganisms adapt to an altered temperature will not only be of basic interest in soil microbiology, but also be of importance in predicting effects on soil carbon sequestration within a future increased global temperature scenario.

The temperature sensitivity of soil microbial activity has been a topic of considerable interest and debate, especially soil respiration due to its potential feedback effects on climate change. Part of the debate probably owes to temperature having both direct and indirect effects on multiple processes affecting respiration, for example effects on the water content of the soil and on the substrate supply for the microorganisms. One way to improve understanding of these different effects is to subject them to separate studies under controlled conditions.

This can partly be solved by measuring bacterial and fungal growth in natural habitats using the leucine (Leu) incorporation technique (1) and the acetate-in-ergosterol (ac-in-erg) incorporation technique (2). Applying the Leu incorporation in combination with the ac-in-erg incorporation allow us to assess the growth of bacterial and fungal growth separately, thereby allowing us to determine their contributions to the decomposition process (3). We are at the moment one of the few laboratories in the world that can use these techniques in soil.

In my research project I attempt to utilize these methods to explore the effects of environmental factors, especially temperature, on fungal and bacterial growth in soil.

The four main questions we try to answer in my project are:

(I) How will temperature affect the balance between fungal and bacterial decomposition?

(II) What will the effect of increasing temperature be on the bacterial activity and their temperature adaptation in soil?

(III) Is the effect of temperature on fungal growth and temperature adaptation different from that of bacteria?

(IV) How are fungi and bacteria affected by natural, recurring perturbations?

## References

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