



BIOLOGY CENTRE CAS

Institute of Soil Biology

address: Na Sádkách 702/7, 370 05 České Budějovice, Czech Republic

Three master thesis projects available in Laboratory of Environmental microbiology

**Department of Soil Microbiology, Institute of Soil Biology
Biology Centre, Czech Academy of Sciences
in České Budějovice, Czech Republic**

**Laboratory of Environmental microbiology
has three available master thesis projects**

Start: February 2018 (Or upon agreement)

Project #1

Title: Plastic biodegradation by soil fungi

As the world's population continues to grow, so does the amount of plastic wastes that people produce. Plastic is composed of major toxic pollutants and thus it has the potential to negatively impact the natural environment and create severe problems for plants, wildlife and even human populations. The accumulation of these products has led to increase the amounts of plastic pollution around the world. Plastic wastes are commonly accumulated in soil due to the very slow rate of degradation. As a consequence, the toxic chemicals that are included in the plastic structure are released in the soil and affect negatively both soil ecosystem and human health.

The present project aims to design a laboratory scale system for plastic biodegradation by fungal isolates recovered from different plastic contaminated soils in order to simulate the biodegradation of plastics under environmental conditions.

The master student will contribute in:

- Design the laboratory scale experiment in collaboration with the supervisor and a Postdoc researcher in the group.
- Take samples in intervals during the experiment and monitoring the bioactivity of organisms through time.
- Investigate the plastic degradation rate and analysing the by-products.
- Study the changes in the microbial cell structure and the plastic sheets by Scanning electron microscopy (SEM).

Project #2

Title: Fungal ecology and bioactivity

Fungi are well known as prolific sources of distinctive biologically active secondary metabolites. Fungal natural products have found utility as important pharmaceuticals, agrochemicals, and commercial enzymes.

Enzymes which decompose complex molecules into smaller units, such as carbohydrates into sugars, are natural substances involved in all biochemical processes. The Fungi kingdom



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produce a great number of extracellular enzymes, many of which are applied in industry and biotechnology.

The present project aims to investigate the enzymatic production capabilities of filamentous fungal isolates (Ascomycetes, Zygomycetes, and Asco- and Basidiomycetes) from various ecosystems in different countries;

- Isolates from soil and sediments in the Czech Republic, Germany, Russia, USA, Egypt, and Macedonia.

- Isolates from air, litter and caves in the Czech Republic, Slovakia, Romania, Spain, and France.

- Isolates from intestines and excrements of soil invertebrates, and vermicomposts.

The master student will contribute in:

- Molecular identification of the fungal isolates.

- Screening for enzymes production by the fungal isolates.

- Extraction and purification of different commercial enzymes from the most efficient fungal isolates.

Project #3

Title: Mineral-microbe interactions and microbial ecology

The interplay between geology and biology has shaped the Earth during billions of years. Microbe-mineral interactions are prime examples of this interplay and underscore the importance of micro-organisms in making Earth a suitable environment for all forms of life. Mineral bioweathering is important for understanding a variety of environmental issues such as nutrient cycling, neutralization of acidic rain and long-term sequestration of atmospheric CO₂. Soil microorganisms play an essential role in releasing the key nutrients from primary minerals that are required for their own and plants' nutrition. The production of biogenic chelators is considered to be one of the most important weathering mechanisms by all soil microorganisms. The most common biogenic chelators produced by microorganisms are siderophores and organic acids.

The present project aims to apply an interdisciplinary approach to obtain an integrated understanding of microbe-mineral interactions in rock samples collected from underground laboratory and iron mine.

The master student will contribute in:

- Analyses of the microbial diversity in rock surfaces using next-generation sequencing.

- Extraction and analyses of biogenic chelators (siderophores and organic acids) using high performance liquid chromatography coupled to electrospray ionization mass spectrometry (HPLC-ESI-MS).

- Analyses of rock surface by Scanning electron microscopy (SEM).



How to apply:

Interested candidates with B.Sc. degree in microbiology, molecular biology, biogeochemistry, biochemistry or any related fields are welcome to contact Dr. Engy Ahmed (engy.ahmed@upb.cas.cz).