



Active microorganisms as drivers of dynamic processes in soil: integration of basic teaching into research

Evgenia Blagodatskaya (1,2) and Yakov Kuzyakov (1)

(1) University of Goettingen, Soil Science of Temperate Ecosystems Büsgen-Institute, Goettingen, Germany (sblag@mail.ru),
(2) Institute of Physicochemical and Biological Problems in Soil Science, Russian Academy of Sciences, Pushchino, Russia

Traditionally lecture courses, seminars and even practical training are disconnected from real experimental studies and from ongoing research projects. As a result students passively participate in lectures and are helpless when they come to the laboratory to prepare their BSc or MSc theses. We introduce a training course, which is developed for Bachelor students to integrate the basic knowledge on soil microbiology and modern microbiological methods in ecological studies.

The training course is focused on the importance of active microbial biomass as biogeochemical driver of soil processes. According to our concept soil functioning is closely related to and depends on the microbial activities, and only active microorganisms drive all processes. Despite this importance of active microorganisms, the most of methods are focused on the estimation of the total microbial biomass and fail to evaluate its activity. Our course demonstrates how the active physiological state of soil microorganisms can be related to the activity indicators such as respiration, molecular biomarkers and viable cell compartments (ATP, PLFA, RNA) determined *in situ* in soil. Each lecture begins with the set of provocative questions "What is wrong?" which help students to activate their knowledge from previous lectures. Information on on-going soil incubation experiments is integrated in the lectures as a special block. The students are required not only to learn the existing methods but to compare them and to evaluate critically the applicability of these methods to explain the results of on-going experiments. The seminars foreseen within training course are focused on critical discussions of the protocols and their adaptations to current experimental tasks. During practical part of training courses the students are associated in small research groups with a certain ecological tasks. Each group uses soil sub-samples from ongoing experiments and thus, the experimental data obtaining during the training courses contribute to the research project. This concept aims to motivate the students for their own investigations within the scope of the project and gives the platform for the most active students to publish their results.