

## **SPLASH PHENOMENON AS A MECHANISM OF TRANSPORTATION OF SOIL MICROORGANISMS**

Soil, as the natural outer layer of the lithosphere, is the basis of the functioning of most terrestrial ecosystems. It performs a lot of functions, but from the point of view of this project it is important that soil is a habitat for microorganisms. The role of soil microorganisms cannot be overestimated - there could be no, *inter alia*, the plant growth and development without them. However, soil is also a place where pathogenic microorganisms (for plants, animals and humans) are found. Regardless of the origin or function of soil bacteria, they spread through the environment in a variety of ways including active dispersal (e.g. growth- or cell organelle-driven movement) or passive (e.g. soil water-, wind- or organism-driven transport).

One of the transportation route of spreading both beneficial and deleterious microorganisms may be the soil splash phenomenon. The soil splash is caused by the impact of raindrops, and it results in detachment and ejection of soil material in various directions. The ejected material can consist of soil particles, water droplets, and a mixture of these.

The soil splash, which is the first stage of water erosion process, is relatively well studied. However, the mechanism and effect of splash in the context of microorganism transportation is very poorly understood. Yet, it is obvious that microorganisms can be carried from soil together with the detached and ejected particles. Both the microbial community composition and number of microorganisms carried with the ejected material will depend on: i) the genetic diversity of the soil microbiota and their life-strategies; ii) the splash magnitude resulting from the soil properties such as texture or moisture content; and iii) the kinetic energy of the raindrops affecting the amount of splashed material.

**The objective of the proposed project is to provide a quantitative and qualitative description of bacterial transportation during soil splash phenomenon.**

The splash measurements planned in the project will be based on the single drop impact methodology. Experiments will be conducted on three types of mineral soils (with high microbial activity) varying in texture, moisture content and with different kinetic energy of falling drop and dripping sequence (number of impacting drops).

The project has an interdisciplinary character and will be based on research in the field of soil physics and microbiology. The proposed research will allow for the characterization of soil splash, which will be possible through the use of the high-speed imaging technique. This will make it possible to determine the number of ejected particles, as well as their parameters such as size, the range over which they will be displaced, and the height to which they will be thrown. The use of modern microbiology research techniques (qPCR, NGS) will allow to determine the number of microorganisms and microbial community composition carried in the splashed soil material. The compilation of results from individual project tasks will make it possible to relate the basic processes of particle ejection and their characteristics to the spread of soil bacteria. The knowledge provided with the project will contribute to a better understanding of microbiota transport in agroecosystems and the results obtained will be complementary to previous studies on microbial transportation by other mechanisms (e.g. soil water, wind). A better understanding of the mechanism of bacterial transportation through the soil splash seems to be essential in the context of understanding the ways and consequently preventing the spread of diseases caused by bacteria not only in relation to plants but also in terms of animal and human infections.