

Extreme hydrological events always cause stress in a soil environment, which directly affects the activity of the soil microbiome. Natural changes in soil moisture related to e.g., seasonal cycles and precipitation directly affect the metabolism of microorganisms. The appearance of long-term stagnation of water in areas where it does not occur naturally intensively affects the biological activity of soils. Floods are increasing worldwide. At the same time, it is known that an increase in soil moisture affects the processes taking place in the soil. For this reason, research focused on the changes taking place in the soil as a result of floods is necessary, especially that their number till now is extremely limited. At present, in the literature a number of studies on physicochemical and parasitological changes in soil under flood conditions can be found, anyhow there are no data related to the monitoring of changes in particular groups of microorganisms and the dynamics of their functions under flood conditions, as well as on the nature and symmetry of these changes.

Some soil bacteria displayed resistance to low water content in soil and related osmotic stress and excessive oxygenation. Many studies indicated on the ability of such bacteria to produce protective exopolysaccharides. However, previous studies in this field have focused mainly on the analysis of microorganisms from areas affected by drought. The research questions posed in the proposed project are: (1) Do soil bacteria have similar mechanisms of protection against water stress in conditions of excessive humidity? (2) What groups of bacteria can cope with extreme conditions of humidity and oxygen deficiency and are able to restore soil activity after stress conditions have subsided?

The research is planned as a laboratory microcosm experiment in which soils used for agricultural purposes, and soils not used, i.e. without agrotechnical treatments will be exposed to simulated flood conditions. In order to observe the kinetics of changes in the soil environment, samples shall be taken after 4, 7, 9, 12 and 14 days of water stagnation.

In addition to the analysis of changes in soil during floods, the project covers the isolation and characterisation of bacteria that will be present in the soil after 14 days of water stagnation. The aim is to check whether certain groups of bacteria are resistant to hydrological stress and how they adapt to it.

The obtained results will allow determining the dynamics of changes occurring in soil microbiome as a result of flooding and their correlation with soil aeration parameters. They will also allow comparing the type and rate of water stress allowances for agriculturally used and unused soil. Moreover, the project assumes that as a result of flooding, conditions favourable only for specialized microorganisms are created in the soil. Their isolation and preliminary characterization may provide an excellent basis for further detailed research.