Adaptation of soil bacteria to environmental moisture changes

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Soil moisture is defined as the water content of the soil. Natural moisture fluctuations associated with the seasons are an environmental factor that regulates microbial activity. However, in recent years, the frequency of floods across Europe has been increasing and drought periods have become longer[1]. The hydrological stress caused by these phenomena affects the soil environment and the bacteria living in it[2].

Some soil bacteria are known to be resistant to low soil water content[3]. Their ability to produce siderophores, indole-3-acetic acid and exopolysaccharides has been demonstrated[4]. These mechanisms allow the bacteria to survive changes in osmotic pressure caused by lack of water in the soil.

However, there is little data on the effect of excessive moisture on soil bacteria[5]. We conducted research based on a microcosm model experiment in which selected fluvisols were taken from floodplain meadows and subjected to simulated flood conditions. Fresh soilsand soils collected after 7 and 14 days of flooding were analyzed. Results showed a statistically significant decrease in pH values and phosphatase activity[6], while dehydrogenase activity[7] increased as a result of simulated flooding. We also observed an increase in the structural diversity of the bacterial community (NGS, Illumina) and their metabolic potential (Biolog® EcoPlate™) under flooded conditions[8]. Continuing this research, we asked ourselves whether bacteria that survive excessive soil moisture have similar adaptive properties to drought-tolerant bacteria.

These considerations led to a project entitled *The search for bacteria adapting to extreme soil moisture conditions and the assessment of the effects of hydric stress on the quality of the soil environment* (National Science Centre Poland).The aim of the project is to assess the rate of change in the soil environment following changes in moisture content and to isolate bacteria that survive water stress, and to investigate whether the bacterial isolates obtained have the characteristics to survive osmotic stress. The research hypothesis is that

among indigenous soil bacteria there are bacteria that adapt to changes in soil moisture status, including extreme values.

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