

DOKTORSKÝ STUDIJNÍ PROGRAM

NÁVRH TÉMATU/PROPOSAL OF THEME

Studijní program/*Study Program*: **Special Agricultural Science**

Studijní obor/*Branch of Study*: **Exploitation and Protection of Natural Resources**

Katedra/*Department of*: **Microbiology, Nutrition and Dietetics**

Školitel (včetně titulů), email/*Supervisor*, email: doc. RNDr. Markéta Marečková, Ph.D., mareckova@af.czu.cz

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Forma studia/*Form of Study*: **Full_time**

Typ tématu/*Type of Theme*: **Framework**

Téma/Theme: Microbial communities providing key ecosystem services in soil.

Hypotéza/Hypothesis:

1) Microbial communities with higher diversity are more stable not only in their composition but also in their functions. These functions are considered redundant in some cases because they are provided by many unrelated organisms. 2) The redundancy can only be apparent because different groups of microorganisms perform the function in specific local or climatic conditions. 3) Antibiotic interactions are part of intra and interspecies communication about the sources of organic compounds. 4) Extreme habitats are inhabited by strains with exceptional metabolic activities. These strains can be used in medicine and industry, but their acquisition depends on the knowledge of their ecological properties.

Anotace/Annotation:

Microorganisms are an essential part of all ecosystems, but their role is often little known. Their importance for the functioning of the ecosystem is therefore intensively investigated in various natural and anthropogenic environments. Recently, the use of molecular methods has significantly accelerated and refined the monitoring of microbial activities, but despite this, they are still underestimated in assessments of human impacts, including the sustainability of land management. Microorganisms have been found to share large sets of metabolic pathways that are present in genomes, but their use in nature is limited or unknown. Other findings indicate that individual metabolic pathways change depending on environmental conditions, and therefore gradually lead to the development of new capabilities of the microorganism, such as the degradation of unknown substances, including xenobiotics. For these reasons, it is necessary to analyze decomposition processes not only in field ecosystems and contaminated soils but also in natural sites. The undisturbed environment serves not only for comparison, but also as a source of diversity, and therefore possibly also as a source of strains suitable for biotechnological applications. Methods of study include the extraction of nucleic acids from natural environments, but also from plants and animals, and their further processing either by amplification or metagenomic sequencing. At the same time, methods for the determination of exo-enzymes from degradation processes will be used, as well as advanced chromatographic methods such as LC-MS-MS for the determination of degradation products. Additionally, the production of secondary (special) metabolites and their participation in communication within microbial communities during decomposition processes will be evaluated.

Zdroj financování/Source of: Center for excellence NutRisk. Project TAČR, No. TL02000160. The student will be financially rewarded beyond the regular scholarship if her/his performance is excellent.

Datum/*Date*: 14.1.2020

Podpis/*Signature*: