

DOKTORSKÝ STUDIJNÍ PROGRAM/ DOCTORAL STUDY 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*: **Agroenvironmental Chemistry and Plant Nutrition**

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

Téma/Theme: The fate of soil microbiome in interaction with selected organic contaminants in the soil

Hypotéza/ Hypothesis: 1) The transformation and degradation of the organic contaminants in soil is affected by the composition of the microbial communities in the soil and are specific as affected by the contaminant type and whole complex of the physicochemical parameters of the given soil; 2) The enhanced contents of the organic contaminants in the soil can result in the changes of the soil microbiome composition, and, subsequently, to breach the native biological functions of the soil.

Anotace/Annotation: Soil microorganisms are the most important factor regarding the transformation, decomposition, and/or synthesis of various inorganic and organic substances in soil. This property is most frequently connected with the nutrient supply for plants. The input of risk elements and organic pollutants to soil can result in a reduction of microbial activity, or shifts in the diversity of microbial communities. At the present time, the investigations concern a wide spectrum of organic pollutants such as polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH), pharmaceuticals (antibiotics, antidepressives, hormonal disruptors), and residues of personal care products. The targeted compounds should be investigated both separately, and in their interactions. Moreover, the effect of the potential ability of organic matter-rich waste materials (biosolids, vermicomposts, sewage sludge) for sorption of these pollutants, and/or to improve the degradation potential of soil for these pollutants will be considered. These materials, however, could be potential sources of various organic and inorganic contaminants. For instance, the levels of per- and polyfluoroalkylated substances, brominated flame retardants, and synthetic musk compounds tended to increase in the long-term sewage sludge treated plots, indicating that sewage sludge can contribute to the abundance of these compounds in soil, although the contaminant levels determined do not represent a direct environmental risk. Moreover, the enhancement of the potential biodegradability of these compounds in the rhizosphere was confirmed only in the case of hexachlorocyclohexane (γ -HCH), and the predominant abundance of low biodegradable compounds was observed. Thus, natural attenuation of POPs in the soil-plant system seems to be insufficient for most of the investigated compounds.

The main objective of the work will be the investigation of the changes in the quantity and quality of microbial communities, due to contamination of soil. A specific focus will be on potential disturbances in the processes leading to optimal intake of nutrients by the plant roots. The addition of organic matter in the form of biosolids or organic matter-rich biowaste can stimulate the activity of these microorganisms, and, therefore, increase their ability to immobilise or transform the investigated pollutants.

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