ABSTRACT

This dissertation thesis contains scientific results attained in the field of bioremediation. The major part of the results has been published in international journals in 7 papers. In addition, relevant yet unpublished results have been included too.

The first thematic part describes the screening of the degradation ability of white rot fungi (WRF). In the screening, several endocrine-disrupting compounds (EDs; bisphenol A, triclosan, 4-nonylphenol and 17α-ethinylestradiol) were degraded by 8 different fungal strains in the presence of liquid medium. The most promising strains were used for the degradation of an ED mixture (synthetic and natural estrogens) in the presence of a straw substrate. Attention was paid to the evaluation of stimulation or suppression of enzyme activities during the biodegradation processes and changes in residual estrogenic activity. *Pleurotus ostreatus*, *Irpex lacteus* and *Trametes versicolor* showed the highest degradation ability under both cultivation conditions. On the contrary, *Phanerochaete chrysosporium*, to date the most studied representative of white rot fungi, did not degrade bisphenol A and 17α-ethinylestradiol (EE2) at all. Two review articles have been published to summarize the origin, presence and biodegradation of EDs, mainly EE2, in the environment.

The second thematic part is focused on the investigation of EE2 biodegradation mechanisms. Fractionation of fungus bodies and extracellular contents were used in EE2 degradation in order to detect the degradation apparatus. Identification of a number of EE2 metabolites was performed; many of them have not yet been described. The degradation ability of lacase from edible fungus *P. ostreatus* as well as microsomal fraction was tested in a set of *in vitro* experiments. It has been proved that in the EE2 biodegradation by *P. ostreatus* (and other strains) several enzymatic mechanisms (intracellular, extracellular) are involved most likely via cooperation.

The third thematic part focuses on the biodegradation of persistent aromatic organopollutants with endocrine-disruptive activity, such as polychlorinated biphenyls and their bacterial metabolites chlorobenzoic acids. This part also includes the development of sensitive liquid chromatography methods and an extraction method using accelerated solvent extraction. During the degradation experiments in a liquid medium and contaminated soil, *P. ostreatus* and *I. lacteus* showed the highest degradation rate and also the highest toxicity reduction.