IMPACTS OF NANO-ER, NANO-DY, ER, AND DY TO THE GROWTH OF BASIDIOMYCETOUS FUNGI AND THE PRODUCTION OF OXIDATIVE ENZYMES

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Abstract

Nanoscience has produced many new materials, which may cause deleterious impacts in the microbial functioning of the soil. Erbium (Er) and Dysprosium (Dy) are rare earth elements which have specific uses in new nanotechnology, e.g. nano-Er is used in semiconductors and nano-Dy in data storage applications. They will be gradually distributed to the environment. Basidiomycetous fungi produce non-specific extracellular oxidative enzymes, laccases and peroxidases, which are essential for carbon cycling by breaking down lignin containing plant residues and manmade xenobiotic compounds. The aim was to test effects of nano-Er, nano-Dy, bulk-Er and bulk-Dy (5-50 mg/ kg) to the growth and oxidative enzyme production of basidiomycetous fungi. Six selected fungi grew on the malt extract agar plates containing ABTS (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid)) as indicator of oxidative enzyme production. The radial growth of the litter-decomposing fungus Agrocybe praecox and the edible mushrooms Pleurotus ostreatus and Stropharia rugosoannulata decreased 5-60 % with tested compounds. The growth of the wood-rotting white-rot fungus Phlebia radiata was more sensitive to nano-Dy than bulk-Dy. Decreased colour formation showed that the production of oxidative enzymes decreased with A. praecox, P. ostreatus, P. radiata and the white-rot fungus Trametes pubescens in the presence of nano- and bulk-Er. Colour zone with S. rugosoannulata decreased more with nano-Er than bulk-Er and with nano-Dy than bulk-Dy. Tested metals caused undesirable impacts to the fungal growth and enzyme activities, which would be a sign of their weakened ability to degrade plant residues and xenobiotics in the nano-metal contaminated soil or waste disposal areas.

Keywords: nano-Er, nano-Dy, fungi, oxidative enzymes

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