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Evaluation of Pharmaceutical Removal Efficiency in Non-Sterile Stirred Fluidized Bioreactor Driving Fungal Consortium

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Microorganisms including fungi and bacteria are used in the biotechnological procedures through exploitation of their natural metabolism, especially the ligninolytic enzymes in the biodegradation of pharmaceuticals. The present study intends the use of the non-sterile stirred fluidized bioreactor (NSFB) driving fungal consortium for the removal of three selected pharmaceuticals, carbamazepine (CBZ), diclofenac (DCF) and ibuprofen (IBP) from synthetic wastewater. The spectrophotometrical method was used to determine the enzymatic activity and the SPE followed by the UPLC-(+)-ESI-QToF-MS methods performed to assess the analytes removal from the NSFB. South African fungal consortium of *A. niger, M. circinelloides, T. polyzona, T. longibrachiatum* and *R. microsporus* in the NSFB was found producer of ligninolytic enzymes laccase (Lac), manganese peroxidase (MnP) and lignin peroxidase (LiP) in the working conditions, pH 4.5 ±0.5 and continuous air supply (dissolved oxygen 8.5 ±0.5 mg/L). MnP was more produced followed by Lac and LiP. The fungal consortium demonstrated a removal efficiency of 89.9% of CBZ, 95.7% of DCF and 90% of IBP achieved within 24 hrs and more than 98% after 5 days. Analyte metabolites were identified, including Iminostilbene, 10,11-dihydro-10,11-dihydroxy CBZ, acridine, 2-hydroxy iminostelbine, 9-hydroxymethyl-10-carbamoyl acridan, iminoquinone, and 9-acridine carboxaldehyde from CBZ, 4'-hydroxy DCF, 5-hydroxy DCF, 3'-hydroxy DCF 4', 5-dihydroxy DCF and 3-hydroxy-4-ethoxy DCF from DCF and carboxyl IBP, 1-hydroxy IBP, 2-hydroxy IBP, 1,2 dihydroxy IBP and the two sodium adduct 1- and 2-hydroxy IBP. The pharmaceuticals degradability was found higher than their lower elimination in conventional biological wastewater treatment systems.

Biography:

Teddy Kabeya Kasonga is currently a PhD student at the Department of Environmental, Water and Earth Science of Tshwane University of Technology, Pretoria, South Africa. Kasonga has obtained D.E.S degree (classified level 9) in physical chemistry at the University of Kinshasa. He is member of several organizations and lecturing at the Department of Biology and Applied Techniques of the "*Institut Supérieur Pédagogique de la Gombe*" since 1998. He has 5 published papers and 3 under review, particularly in the field of sickle cell disease and water science and technology (EDCs removal).