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Neutralization of white phosphorus by means of microbiological decomposition

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Abstract

Possibility of white phosphorus degradation under the effect of waste water sludge (WWS) of waste-water treatment facilities is shown for the first time. It means that toxic effect is conditions by the presence of intermediate products of degradation, which are accumulated in substrates. The P_4 concentration decrease in media is in inverse proportion to the duration of microflora growth lag-phase, as it was demonstrated. Devoted to the search for the white phosphorus metabolites, and the probable way of the phosphorus metabolism. For the first time different taxonomic groups of microorganisms are inoculated on culture medium containing white phosphorus as the single source of phosphorus. On these media microorganisms grew and have not experienced phosphorus starvation. It is the world's first example of the inclusion of white phosphorus in the biosphere cycle of elemental phosphorus. The highest concentration corresponds to 5000 times excess of MPC of white phosphorus in wastewater! The increase of cultures resistance resulting from directed selection is demonstrated for the first time. The comparison of the sequences of ribosomal genes of the fungus, steadily metabolizing the white phosphorus, with sequences of the GenBank database, allowed us to identify this microorganism as a new strain of *Aspergillus niger*, to which we have assigned the number *A. niger* AM1. Inoculation of *A. niger* AM1 in medium containing just two sources of phosphorus (phosphate and white phosphorus) demonstrated that P_4 does not exhibit toxic properties in relation to this microorganism. The slow growth of *Aspergillus* in the medium with white phosphorus is not due to the toxicity of the last one for the strain, but only due its inaccessibility as a phosphorus source. However, with all the advantages of this method, the use of the Ames test only is not enough to reliably assess the genotoxicity. For this purpose a whole battery of tests is used, and the SOS-lux test for DNA damaging activity is among them. In the present work SOS-lux test has demonstrated genotoxicity of white phosphorus. According to preliminary data, resistance to white phosphorus the *A. niger* AM1 is fixed in the genome. A morphological description of resistant strains is given.

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