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The resistance of *Aspergillus niger* strains and bacteria to white phosphorus. The impact of divalent copper on biodegradation.

© **Anton Z. Mindubaev**,[1]*+ **Edward V. Babynin**,[2] **Elena K. Badeeva**,[1] **Gulfina G. Kabirova**,[3] **Anastasiya A. Sinitsina**,[3] **Ramil Komil Ugli Shaykhutdinov**,[3] **Abdumanon A. Sharipov**,[3] **Salima T. Minzanova**,[1] **Lubov G. Mironova**,[1] and **Yaw Abaye Akosah**[2]

[1] *Institute of Organic and Physical Chemistry named after A.E. Arbuzov. Kazan Scientific Center of the Russian Academy of Sciences. Arbuzov St., 8. Kazan, 420088. Republic of Tatarstan. Russia. E-mail: mindubaev@iopc.ru ; mindubaev-az@yandex.ru*

[2] *Kazan (Volga Region) Federal University. University St., 18. Kazan, 420008. Republic of Tatarstan. Russia.*

[3] *Kazan National Research Technological University. Karl Marx St., 68. Kazan, 420015. Russia.*

*Supervising author; +Corresponding author

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Abstract

Despite the duration and depth of research on the biodegradation of white phosphorus, until recently there were still doubts whether the biodegradation really did occur. White phosphorus, reacts with ions of divalent copper even at room temperature. and the Pridham-Gottlieb medium, which we have chosen for our purposes, contains copper sulfate in its composition. The addition of an emulsion of white phosphorus led to the formation of a black precipitate, which is evidence that a chemical reaction took place. Thus, the growth of microorganisms occurred in the presence of not so much white phosphorus as the products of its chemical transformations, and the experiments were not completely clean. Therefore, in the present study, we carried out further modification of the Pridham-Gottlieb nutrient medium, excluding from it not only phosphates as a source of phosphorus, but also copper sulfate. In addition, we compared the white phosphorus resistance of our *A. niger* strains AM1 and AM2, with three strains from the All-Russian Collection of Microorganisms (ARCM) (strains FW-650, FW-2664 and FW-2731), as well as four different bacterial species. Though highest resistance was observed in strain AM1, the three strains of *A. niger*, sent from ARCM, also showed a higher resistance to white phosphorus than the bacteria. It was shown that exclusion of copper sulfate from the composition of the nutrient medium with white phosphorus does not prevent the growth of fungi. In addition, white phosphorus does not react with the formation of a precipitate and remains for a longer period under these conditions. This fact is a serious argument in favor of biodegradation and has practical applicability in the method of microbial detoxification of white phosphorus. However, a higher resistance of AM1 in comparison to the ARCM strains was only observed in a medium with copper. Apparently, strain AM1 is most resistant to the toxic products from the reaction of white phosphorus with Cu^{2+}.

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