

Adaptation of microorganisms to white phosphorus as a result of directed selection. Genetic identification of sustainable *Aspergillus* and metabolic profiling of *Streptomyces* A8.

© Anton Z. Mindubaev,^{1*} Alexandra D. Voloshina,¹ Elena V. Gorbachuk,²
Shamil Z. Validov,² Natalia V. Kulik,¹ Farida K. Alimova,²

Salima T. Minzanova,¹ Lubov G. Mironova,¹ Dmitry E. Belostotsky,¹

Keremli A. Saparmyradov,² Rezeda I. Tukhbatova,² and Dmitry G. Yakhvarov^{1*}

¹Institute 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

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

*Supervising author; ⁺Corresponding author

Keywords: Biolog, biodegradation, detoxication, white phosphorus, sewage sludge, *Aspergillus niger* AM1, selection, *Streptomyces* sp. A8, *Trichoderma asperellum* F-1087, culture medium, *Amaranthus cruentus* L.

Abstract

The work with microorganisms spreading over on synthetic culture media, containing white phosphorus as a sole source of phosphorus, is continued. The increase of cultures resistance resulting from directed selection is demonstrated for the first time. After five successive plating the resistance of *Streptomyces* increased fivefold. Fungi grow and adapt slowly, but their resistance was initially higher than that of actinomycetes.

Comparison of sequences of ribosomal genes of fungi, stably metabolising white phosphorus, with those in the GenBank database, allowed us to identify this microorganism as a new strain of *Aspergillus niger*, which we assigned a room *A. niger* AM1. The rate of development of resistance to white phosphorus significantly increases with the medium enrichment with nutrients of plant biomass. Biochemical analysis of the *Streptomyces* sp. A8 strain using the “Biolog” system is performed, allowing one to obtain a metabolic profile by 94 edible substrata basing on the screening test. It allows to collect the amount of information required to optimize the selection of an effective culture media and other biotechnological processes. Also it shows that the presence of amaranth phytomass significantly accelerates the process of adaptation of the microflora to white phosphorus, which is due, primarily, to its nourishing properties.