BIOLOGY OF MICROFUNGI OF THE GENUS ASPERGILLUS AS PROMISING OBJECTS FOR ECOBIOTECHNOLOGY

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Microfungi of the genus *Aspergillus* are typical representatives of saprophytic microflora, widely distributed in natural and technogenic ecosystems, including soils, plant residues, composts, dust, atmospheric air, as well as environments with elevated temperature, acidity, or organic residue content. Their biological features – sporulation ability, formation of a powerful substrate mycelium, survival under stress conditions, active enzymatic and secondary metabolite activity – determine their significant biotechnological potential. One of the key characteristics of *Aspergillus* is the high level of production of hydrolytic enzymes: amylases, proteases, cellulases, xylanases, lactases, as well as secondary metabolites – organic acids, polymers, antibiotics, pentadienes, toxins, and pigments. Numerous studies have proven that *A. niger*, *A. terreus*, and *A. flavus* effectively degrade petroleum fractions, polycyclic aromatic hydrocarbons, chlorinated organic compounds, synthetic dyes, and phenolic compounds. In a patented biotechnological method [1], natural strains of *A. niger* were used to purify water contaminated with pesticides and heavy metals, employing enzymatic catalysis under aerobic conditions.

Research also indicates that co-cultivation of *A. fumigatus* and *A. oryzae* with microorganisms of the genera *Bacillus*, *Pseudomonas*, and *Rhodococcus* allows the formation of bioactive consortia capable of deep mineralization of petroleum-containing substances. In study [2], an enzymatically active biomass of *A. flavus* was developed and immobilized on natural carriers for prolonged use in biofilters and biosensors. These strains are capable of biosorbing cadmium, copper, lead, and zinc ions due to the presence of polysaccharides and melanin-containing structures in their cell walls. After adsorption, insoluble metal complexes form, reducing their mobility and toxicity in the natural environment.

The results of numerous studies demonstrate that micromycetes of the genus *Aspergillus* can be integrated into complex biopreparations for ecobiotechnological tasks, such as soil remediation, wastewater treatment, landfill leachate filtration, and regeneration of agricultural soils. Their biological safety, absence of mutagenic effects on plants, low energy cost of processes, and self-regenerating culture capacity make *Aspergillus* a promising candidate for developing sustainable and environmentally safe technologies in environmental protection.

References:

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2. Bhatt, P., Pathak, V. M., Bagheri, A. R., & Bilal, M. (2021). Microplastic contaminants in the aqueous environment, fate, toxicity consequences, and remediation strategies. *Environmental Research, 200*, 111762.