

## DESTRUCTIVE ACTIVITY OF MICROORGANISMS IN RELATION TO GLYCOL ETHERS

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Glycol ethers, especially 2-butoxyethanol (BE) and 2-ethoxyethanol (EE), have low human toxicity and are widely used as components of paints and solvents, inks, detergents, liquid soaps, hydraulic fluids, etc. [1]. The high ability of glycol ethers to dissolve in water due to their amphiphilic structure ensures their ingress and accumulation in aqueous systems. Currently, there is limited literature data on the bacterial degradation of these compounds, which makes this an urgent problem to study [2, 3].

Seventeen cultures were previously selected which showed the ability to utilize glycol esters at a concentration of 0.5%. These strains were tested for their ability to degrade glycol ethers in the concentration range from 0.1% to 3%. It was found that 2-butoxyethanol is a preferred carbon source compared to 2-ethoxyethanol.

It is known that the process of degradation of complex organic substances by microorganisms often depends on the presence of calcium and iron ions in the medium, which are part of the enzyme systems involved in the processes of biodegradation of xenobiotics. In connection with this fact, we studied the utilization of glycol ethers in different mineral media containing calcium and iron ions. It was found that the presence of iron ions in the mineral medium significantly intensifies the process of degradation of toxicants in the following strains – *Rhodococcus* sp. VOC 5, *Rhodococcus* sp. VOC 14, *Rhodococcus* sp. VOC 8/7. The rate of glycol ester utilization by cultures of *Rhodococcus* sp. CLV-2, *Rhodococcus* sp. SCV-1, *Rhodococcus* sp. SCV-2 and unclassified strain JD 4.14 were independent of the presence of calcium or iron ions in the medium, which suggests their promising use for the development of a microbial preparation for glycol ester wastewater treatment.

The destructive activity of the selected strains against 2-butoxyethanol was evaluated. The experiment was carried out in flasks containing tap water, iron salts and glycol ether at a concentration of 0.05% as the only carbon source. This concentration was chosen because the most common concentration of glycol ether in wastewater was 100 – 600 mg/l. As a result of these studies, it was shown that the culture of *Rhodococcus* sp. VOC-5 and unclassified strain JD 4.1 most actively utilize 2-butoxyethanol. During cultivation of *Rhodococcus* sp. VOC-5, a change in the odor of glycol ether to the odor of its putative decomposition products (aldehydes and acetates) was noted, indicating the processes of its degradation by microorganisms. The unclassified strain JD 4.1 exhibited more than 90% of its original degradation activity against 2-butoxyethanol in the test solution.

### References:

1. 2-butoxyethanol: Risk assessment, European Union Risk Assessment Report / eds. P. Copestake [et al.] // Geneva: WHO. – 2009. – T. 67. – 60 p.
2. Biology of triacylglycerol accumulation by *Rhodococcus* / H. M. Alvarez [et al.] // *Biology of Rhodococcus*. – Springer, Cham. – 2019. – P. 299-332.
3. Biodegradation of ethyl t -butyl ether (ETBE), methyl t -butyl ether (MTBE) and t -amyl methyl ether (TAME) by *Gordonia terrae* / G. Hernandez-Perez [et al.] // *Applied Microbiology and Biotechnology*. – 2001. – T. 55. – №1. – P. 117–121.