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Evaluation of the sensitivity of sulfate-reducing bacteria and indicators of the microbiologically influenced corrosion of steel under the influence of dimethyl sulfoxide

Nataliia Tkachuk[1,*] Liubov Zelena[2] and Yaroslav Novikov[1]
[1]Department of Biology, T.H. Shevchenko National University "Chernihiv Colehium", Chernihiv, Ukraine
[2]Department of Virus Reproduction of the Danylo Zabolotny Institute of Microbiology and Virology, NAS of Ukraine, Kyiv, Ukraine
***nataliia.smykun@gmail.com; n.tkachuk@chnpu.edu.ua**

INTRODUCTION & AIM

Anaerobic sulfate-reducing bacteria (SRB) play an important role in the process of microbiologically influenced corrosion. Previously, *Desulfovibrio oryzae* strain NUChC SRB1 was isolated from the ferrosphere of a steel structure that corroded in the soil and identified (Tkachuk et al., 2020). Dimethyl sulfoxide (DMSO) is bioactive compound and possess antibacterial (Kligman, 1965), antibiofilm (Yahya et al., 2018), anticorrosive (Othman et al., 2018), and toxic (Zhang et al., 2016; Tkachuk et al., 2024) properties.
However, the bactericidal properties of DMSO against SRB, the indicators of MIC of steel in the presence of SRB and DMSO, have not been investigated; thus, this forms the aim of this study.

METHODS

1. Study of the Sensitivity of SRB to DMSO

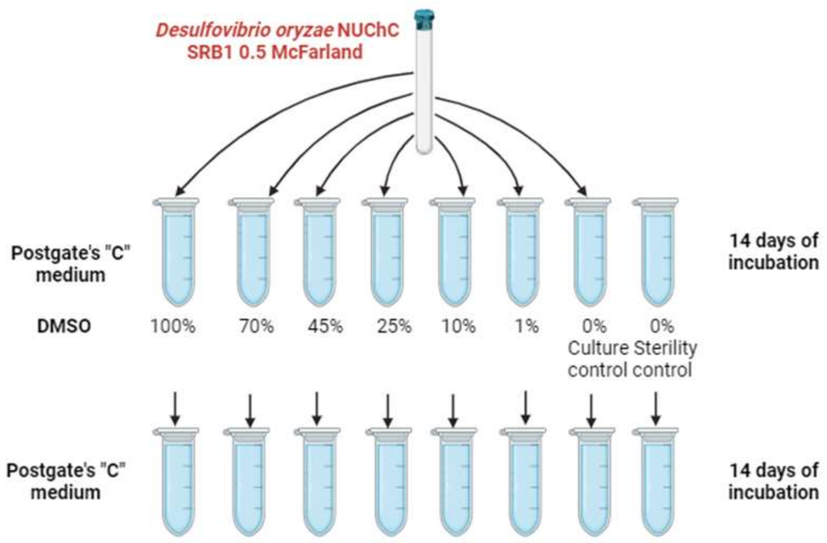

Figure 1. Scheme of the experiment to study the sensitivity of SRB to DMSO (Tkachuk et al., 2025)

2. Study of Microbiologically Influenced Corrosion Indicators Under the Influence of DMSO

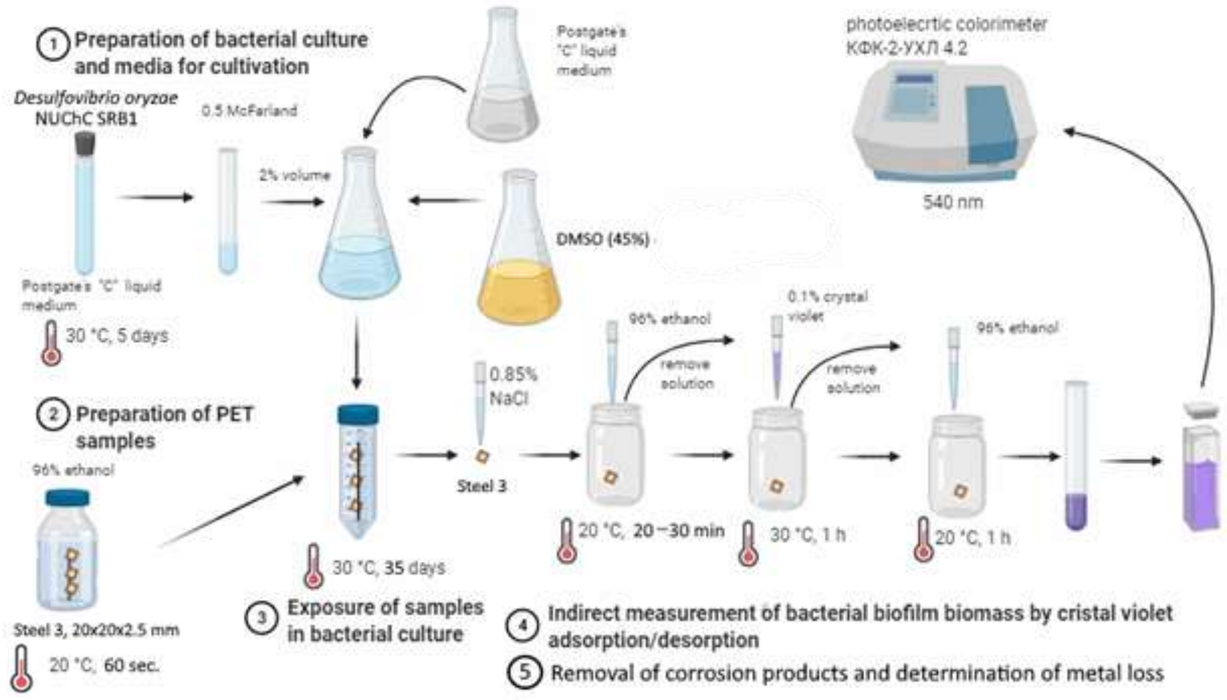

Figure 2. Scheme of the experiment to study the indicators of microbiologically influenced corrosion under the influence of DMSO (Tkachuk et al., 2025)

RESULTS & DISCUSSION

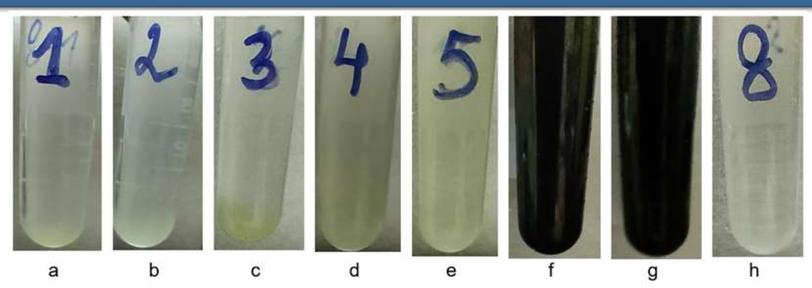

Figure 3. Growth of the culture of sulfate-reducing bacteria *D. oryzae* NUChC SRB1 in liquid Postgate's "C" medium (5th day of the first passage) with DMSO at the concentrations: (**a**) 100%; (**b**) 70%; (**c**) 45%; (**d**) 25%; (**e**) 10%; (**f**) 1%; (**g**) 0% (culture control); and (**h**) 0% (sterility control) (Tkachuk et al., 2025).

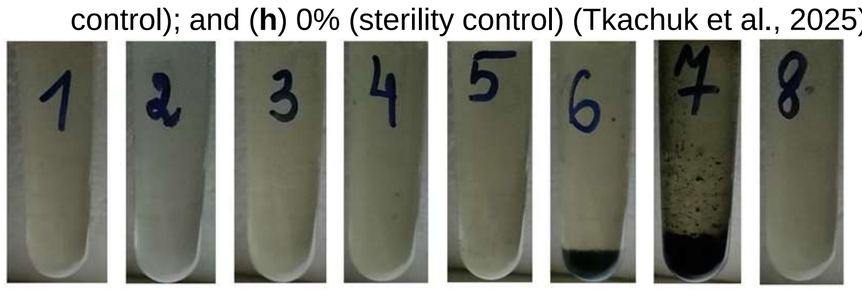

Figure 4. Growth of the culture of sulfate-reducing bacteria *D. oryzae* NUChC SRB1 in liquid Postgate's "C" medium (14th day of the second passage) with DMSO at the following concentrations: (**a**) 100%; (**b**) 70%; (**c**) 45%; (**d**) 25%; (**e**) 10%; (**f**) 1%; (**g**) 0% (culture control); and (**h**) 0% (sterility control) (Tkachuk et al., 2025).

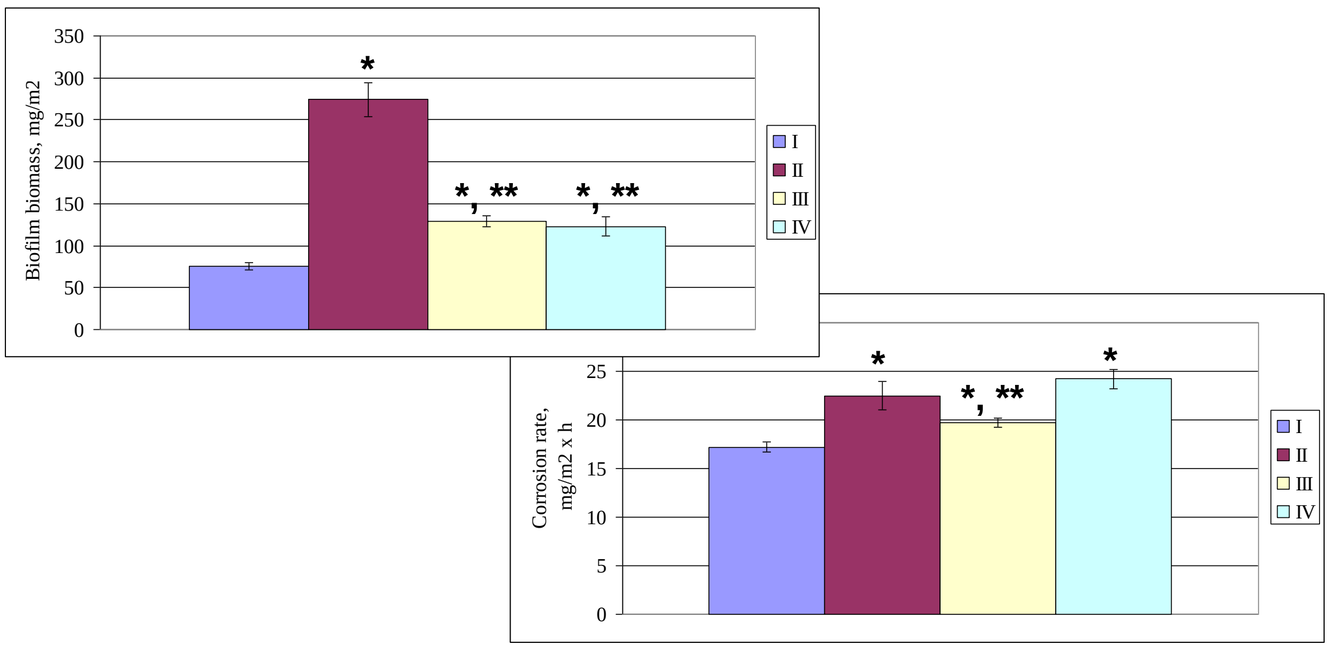

Figure 5. Indicators of the microbiologically influenced corrosion of steel: a - biofilm biomass of *D. oryzae* on the surface of steel 3 ; b – steel corrosion rate: I—steel 3 without bacteria; II—steel 3+SRB; III—steel 3+SRB+DMSO; IV—steel 3+DMSO; *—the difference was significant compared to option I at $p \leq 0.05$; **—the difference was significant compared to option II at $p \leq 0.05$; ***—the difference was significant compared to option IV at $p \leq 0.05$ (Tkachuk et al., 2025).

CONCLUSION

The sulfate-reducing bacteria *Desulfovibrio oryzae* NUChC SRB1 were sensitive to DMSO. DMSO (45%) demonstrated bactericidal and antibiofilm properties, but not anticorrosive properties under microbial corrosion conditions.

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