



18th National and 3rd International Conference of هجدهمین همایش ملی و سومین همایش اranian Biophysical chemistry بین المللی بیوشیمی فیزیک ایران

25-26 Des, 2024, University of Hormozgan

6-6 دی ماه ۱۴۰۳، دانشگاه هرمزگان

Design and Development of Bio-Based Coatings Using Protease Enzymes to Prevent Microorganism Growth on Marine Surfaces

Saba Ghattavi^{1*}, Tayebeh Zarei Karyani², Ehsan Kamrani¹, Ahmad Homaei²

1. Fisheries Department, Faculty of Marine Sciences, University of Hormozgan, Bandar Abbas,

Iran.

2. Department of Marine Biology, Faculty of Marine Science and Technology, University of Hormozgan, Bandar Abbas, Iran

Abstract

Marine biofouling on surfaces such as ship hulls and other maritime equipment results in increased fuel consumption, decreased speed, and elevated maintenance expenses. Although chemical antifouling paints are commonly employed to combat this challenge, numerous formulations contain toxic substances detrimental to marine ecosystems. In contrast, protease enzymes present a viable eco-friendly alternative to inhibit the proliferation and accumulation of microorganisms on these surfaces.

Protease enzymes were chosen as bioactive antifouling agents due to their ability to degrade proteins, which directly affects the biological integrity of microorganisms. A series of laboratory and field evaluations have shown that coatings exhibiting protease activity effectively hinder the adhesion and growth of bacteria, algae, and various marine organisms on treated surfaces. In conclusion, protease-based bio-coatings not only exhibit significant effectiveness in reducing fouling but also mitigate negative impacts on marine ecosystems, leaving no harmful byproducts upon degradation. So, protease enzymes is a pioneering strategy for the formulation of sustainable antifouling coatings, emphasizing the potential of enzyme-based solutions to alleviate the environmental consequences of antifouling practices within the maritime sector.

Key words: Bio-Based Coatings, Protease Enzymes, Biofouling, Antifouling, Marine Surfaces





18th National and 3rd International Conference of هجدهمین همایش ملی و سومین همایش اranian Biophysical chemistry بین المللی بیوشیمی فیزیک ایران

25-26 Des, 2024, University of Hormozgan

6-6 دی ماه ۱۴۰۳، دانشگاه هرمزگان

References

[1] Karyani, T. Z., Ghattavi, S., and Homaei, A. Application of enzymes for targeted removal of biofilm and fouling from fouling-release surfaces in marine environments: A review. *International* Journal of Biological Macromolecules, 127269, 2023.

[2] Satheesh, S. and Al Solami, L. Antifouling activities of proteinase K and α -amylase enzymes: Laboratory bioassays and in silico analysis. Heliyon, 10(11), 2024.

[3] Zanaroli, G., Negroni, A., Calisti, C., Ruzzi, M. and Fava, F., 2011. Selection of commercial hydrolytic enzymes with potential antifouling activity in marine environments. Enzyme and microbial technology, 49(6-7), 574-579, 2011.