IMPACT OF OIL SPILLS ON CORAL REEFS CAN BE REDUCED BY BIOREMEDIATION USING PROBIOTIC MICROBIOTA

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ABSTRACT

Several anthropogenic factors, including contamination by oil spills, constitute a threat to coral reef health. Current methodologies to remediate polluted marine environments are based on the use of chemical dispersants; however, these can be toxic to the holobiont. In this study, a probiotic bacterial consortium was produced from the coral *Mussismilia harttii* (collected at Bahia state, Brazil) and was trained to degrade water-soluble oil fractions (WSFs). Additionally, we assessed the effect of WSFs on the health of *M. harttii* in tanks and evaluated the consortium as a bioremediation agent. Bacterial consortium were introduced into mineral medium supplemented with marine fuel oil MF-380 for 48 h. Selected morphotypes were streaked for isolation. Genomic DNA was extracted and the 16S rRNA genes PCR-amplified with specific bacterial primers. The amplicons were purified and sequenced using random primers. In addition, we evaluate the impact of the oil WSFs and the potential of the consortium to improve coral survival. The treatments were conducted in seawater microcosms as follows: control (seawater only); oil (seawater and oil); consortium only (seawater with the bacterial consortium); and oil+consortium (seawater, oil and the bacterial consortium). We addressed four different parameters: (i) the potential for petroleum hydrocarbon degradation (and coral protection) by the bacterial consortium was analysed by liquid and gas chromatography; (ii) the impact of oil WSFs on the chlorophyll fluorescence of the coral symbionts (zooxanthellae) using pulse-amplitude-modulated (PAM) fluorometry as a proxy for coral holobiont health.; (iii) the biological oxidative-stress and calcification responses to the treatments; and (iv) the impact of oil WSFs on the bacterial community associated with the coral. The consortium was responsible for the highly efficient degradation of petroleum hydrocarbons, and it minimised the effects of degrade water-soluble oil fractions (WSFs) on coral health, as indicated by maximum photosynthetic efficiencies. Moreover, the impact of WSFs on the coral microbiome was diminished by the introduced bacterial consortium. The effective bacterial consortium thus had a dual function, both promoting oil WSF degradation and improving coral health with its probiotic features.

Keywords: Bioremediation, coral reef, oil spill, probiotic, *Mussismilia harttii,* 16S rRNA.

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