Anti-biofilm activity substances derived from coral symbiotic bacterial extract can be used to inhibit the biofouling

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Marine biofouling, defined as the rapid and extensive growth of marine organisms on submerged inanimate and living surfaces, is a serious problem coursing extensive material and economic costs worldwide. Over the last few decades, significant efforts have concentrated on mitigating biofouling in marine field, with a focus on non-toxic and sustainable strategies. Here, we explored the potential of applying anti-quorum sensing or anti-biofilm bacteria to control biofouling in a laboratory-scale system. About two hundreds strains were isolated from coral species (Pocillopora damicornis) and screened for their ability to inhibit QS using bio-reporter strain Chromobacterium violaceum CV12472. Approximately 15% of the isolates exhibited anti-QS activity against the indicator strain. Among them, a typical coral symbiotic bacterium, 12# (Vibrio alginolyticus) was isolated and demonstrate its anti-QS activity. Using crystal violet staining, we found that the extract of V. alginolyticus has the ability to reduced biofilm formation by 40% in model G− strain Pseudomonas aeruginosa PAO1. The confocal microscopy observations showed the 12# extract exhibited inhibited the biofilm related phenomenon (thickness and roughness) of Pseudomonas aeruginosa. After analyzed by nuclear magnetic resonance (NMR) and mass spectrometry, the bioactivity anti-biofilm molecule identified as rhodamine isothiocyanate. Furthermore, RT-PCR analyze showed that 12# led to a significant down-regulation of QS-regulatory genes and virulence-related genes, including lasI, lasR, rhlI, rhlR, pqsA and pqsR. The whole genome sequence analysis reveals the presence of related rhodamine isothiocyanate synthase gene in strain 12#. We presume that the target bioactor may act as antagonists of bacterial quorum sensing by competing with QS signals for receptor binding. This work indicated that coral microbes sources play a vital role in delivering the novel agents candidates in anti-fouling field.