

学 位 論 文 要 旨

氏 名

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題 目

Biodiversity of oil-degrading microorganisms in the North-west Pacific
(太平洋北西部における石油分解微生物の多様性)

The islands located in the North-west Pacific are facing dangers of oil spillage, because they are considered predicted contamination sites on a nearby busy transportation route. So far, there is few report on the distribution of oil-degrading microorganisms in tropical and subtropical areas compared with temperate areas. The aim of this study was to select indigenous oil-degrading microorganisms from the two islands, subtropical Iriomote, Japan and tropical Con Dao, Vietnam, and to compare their distributions and degradation abilities.

I used three kinds of samples, sediments from supratidal and intertidal zones, and seawater. Selecting media isolated bacteria and fungi, and the media with *p*-iodonitrotetrazolium determined oil-degradation ability by color changes. The DNA methods identified the microorganisms which showed the degradation abilities. For the bacterial isolates, the degradation experiments using crude oil, *n*-alkanes and recalcitrant polycyclic aromatic hydrocarbons (PAHs), and temperature effect examination were conducted.

As the result, there were no difference between Iriomote and Con Dao in the counts of the total bacteria and oil-degrading bacteria (ODB) in the sediment samples, while those in the seawater samples were significantly lower for Iriomote than for Con Dao. Total 45 ODB isolates, 25 from Iriomote and 20 from Con Dao, were collected. The dominant genera were *Achromobacter*, *Pseudomonas*, and *Ochrobactrum* on Iriomote and *Pseudomonas* and *Microbacterium* on Con Dao. Some bacteria that are close relatives of the isolates previously reported as pathogens were not used in the further experiments. Among the remaining 41 isolates, the counts of the isolates that degraded the crude oil, *n*-alkanes, and PAHs in a high level were higher for Iriomote (3, 11, and 2, respectively) than for Con Dao (2, 4, and 1, respectively). It is noteworthy that the isolates, *Acinetobacter* sp., *Pseudomonas* sp., *Pseudomonas putida* from Iriomote and *Pseudomonas mendocina*, *Pseudomonas putida*, *Microbacterium* sp. from Con Dao, showed the highest degradability for crude oil, *n*-alkanes, and PAHs, respectively, and survived at 42°C.

For the fungi, the counts of the total and oil-degrading fungi (ODF) in the sediment samples on Iriomote were significantly higher than on Con Dao. The seawater samples, however, showed the same result for the two islands. In total, 23 ODF including 11 isolates in 5 genera from Iriomote and 12 isolates in 4 genera from Con Dao were isolated. One *Candida* isolate from Iriomote and two *Aspergillus*, one *Penicillium* and one *Trichoderma* isolates from Con Dao had high potential of oil-degradation, and grew and survived at 42°C.

These results suggest that the diversities on both Iriomote and Con Dao were higher comparing previous reports. The obtained notable isolates, six bacteria and five fungi, showed the potential for autochthonous bioaugmentation application for the treatment of oil contamination in these areas. Further examinations are needed to clarify the abilities for degradation of other crude oil components by these selected isolates. The combined treatment techniques with bacterial and fungal isolates are necessary.