http://dx.doi.org/10.4172/scientificreports.118

Open Access Scientific Reports

Rapid Communication Open Access

: Algal-bacterial consortium; Crude oil; Degradation process; Population dynamics

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e extensive use of petroleum and petroleum products leads to serious oil contamination of the environment, thus considerable interests were taken in microbial degradation and detoxi cation of these pollutants. Microalgae play an important role in the environmental cleaning of pollutants. Microalgae provide O2 to aerobic bacteria to mineralize pollutants and then take-up the released CO_2 [1]. Furthermore, microalgae can help in co-metabolic degradation or produce biosurfactants and extracellular matters to enhance bacterial activity for increasing pollutant bioavailability [2]. Additionally, microalgae can accumulate hydrocarbons, and subsequently make those compounds available to the associated hydrocarbon-utilizing bacteria [3]. e cooperation of phototrophic microalgae and heterotrophic bacteria could potentially improve the degradation of environmental contaminants including oil pollutants [4,5].

Petroleum products contain thousands of individual hydrocarbons and related compounds. eir main components are usually subdivided into saturates (n- and branched- chain alkanes and alkylcycloalkanes) and aromatics (monoaromatic hydrocarbons and polyaromatic hydrocarbons). e less abundant resins and asphaltenes consist of more polar compounds, containing heterocycles, oxygenated hydrocarbons and aggregates with high molecular weight [6]. Given the complexity of oil pollutants, however, it is hard to nd a microorganism species that can breakdown a mixture of pollutants completely [7], one microorganism can only degrade a limited number of crude oil components [8]. Oil-degrading mixed cultures with broad enzymatic

Citation: Tang X, Dang Z, He LY, Lu GN, Tao XQ (2012) Biodegradation of Crude Oil by an Artifcial Microalgal-Bacterial Consortium. 1: 118. doi:10.4172/scientifcreports.118

[14]. GY2B could only degrade polyaromatic hydrocarbons; GS3C was able to degrade aliphatic chain hydrocarbons, and GP3 could utilize both saturates and aromatic hydrocarbons [9] 2 ml (chlorophyll content was 2.62 μg/ml) algae culture and 1ml mixed (v:v:v = 1:1:1, 1.0 $\times 10^7$ cells/ml bacteria culture were initial inoculated into 30 ml BG11 medium for the consortium construction, and the consortium culture were transferred into fresh BG11 medium once every 7days.

In the biodegradation study, 3ml microalgal-bacterial cultures were inoculated into100 ml asks containing 30 ml BG11 medium. Oseberg crude oil was added as the initial concentration was 0.3% (v/v). Flasks were incubated at 25 ± 1°C with constant shaking at 150 rpm under a light-dark regime of 14:10 (illumination: 165 μmol photons/m^2·s) by cool white uorescent tubes (Opple, T5). Samples were taken on the 0 (original), 2, 3, 4, 5, 7 and 10 day, respectively, for chemical analysis, and all assays were carried out in triplicate.

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e residual oil was recovered from the culture with n-hexane. Biomass was removed by centrifugation and the supernatant oil recovered with the addition of 15 ml n-hexane, oil adhering to the microalgae or the ask was extracted ultrasonically with another 15

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source [11] and it has reserved preferential degradation property for the high molecular PAHs such as phenanthrene and methylphenanthrenes.

e extensive decrease of PAHs leaded to sharp increase of GY2B in the 4th day. e cooperation of GS3Cand GY2B would cause co-oxidation of alkylbenzenes [9] the intensive growth of GY2B thuslead the long-chain alkylbenzenes homologues dropped abruptly between the 3rd and the 4