Effects of Oil and Salt Water Spills on the Growth of A Fresh-Water Algae

J. Liu, C. Vipulanandan
Texas Hurricane Center for Innovative Technology (THC-IT)
Department of Civil and Environmental Engineering
University of Houston, Houston, TX, 77204-4003
Tel: (713)743-4278; Email Address: jliu@mail.uh.edu, cvipulanandan@uh.edu

Abstract

This study investigated the effects of oil spill and inundation of sea water into lakes and rivers on the growth of a fresh-water algae. Test results showed that oil and salt water affected the growth of the fresh-water algae.

1. Introduction

It has been reported that oil spills from wells, storage tankers or pipelines had major influence on the marine or land biota (Fingas 2001). Algae grow in marine, lakes and ponds. Excessive growth of algae is an indicator for eutrophication of water body. With energy crisis in recent ten years, algae has been studied widely for biofuel production, the lipids extracted from algae can be used for energy production (Mata et al. 2010). Oil spill has inhibition effect for the growth of some species of algae (Pulich et al. 1974; Gaur and Kumar 1981). It is possible that lake or pond get polluted by oil spills or inundation of sea water. Hence it was of interest to study how one specific fresh-water algae *Micractinium pusillum* responses to such pollution. Establishing limits to the oil and salt water tolerance can help better understand the effects of spills on the growth of algae. During coastal storm surges inundation of sea water and also salt spills to the fresh water can change the salt content in the fresh water.

2. Objective

Investigate the effect of oil spill and sea water inundation on the growth of a fresh-water algae.

3. Materials and Methods

A fresh-water algae, *Micractinium pusillum*, which was obtained from a fresh water pond, was cultivated in Proline cultural medium. The closed tube and plate methods were selected to simulate various growth conditions. Engine oil was used to simulate the oil spill environment. NaCl solution was used to simulate the sea water. Algae was grown in different percentage of NaCl (0.35% and 3.5%) with or without 1% engine oil in the tubes. Light was provided by a bulb with light density of 2400 lux. About 0.4% of algae was inoculated in centrifugation tube or agar plate. Different concentrations of engine oil (up to 1%) were used in this study. The tubes were stirred at a rate of 250 rpm, while the plates were not. Oil was evenly distributed in the tubes, while a layer of oil film with different diameter covered the liquid containing algae in the plate. Algae was grown at room temperature and in closed systems. Algae growth after 10 days was measured using a UV-vis spectrophotometer at a wavelength of 680 nm. In calibrating the UV-vis spectrophotometer the optical density reading was correlated to the algae dry weight which was linear.

4. Results and Discussion

The algae growth was substantially different without adding any contaminants in the plate or closed tube as shown in Fig.1. For the control, more algae was grown in the plate than in the tube as more light can be in the plate. Fig.1 also shows the algae growth after 10 days of cultivation with different percentage of engine oil in both tube and plate methods. It can be seen that with higher percentage of engine oil, more inhibition on the growth of algae. And it can be seen that oil film could block the light as less algae was grown with 0.1%~0.4% of engine oil in the plate.

Figure 2 showed the algae growth after 10 days with different percentage of NaCl addition with and without 1% of engine oil. It showed that NaCl inhibited the growth of fresh-water algae. Also no growth in algae was observed with the addition of 1% engine oil into 0.35% and 3.5% NaCl solution (Fig.2).

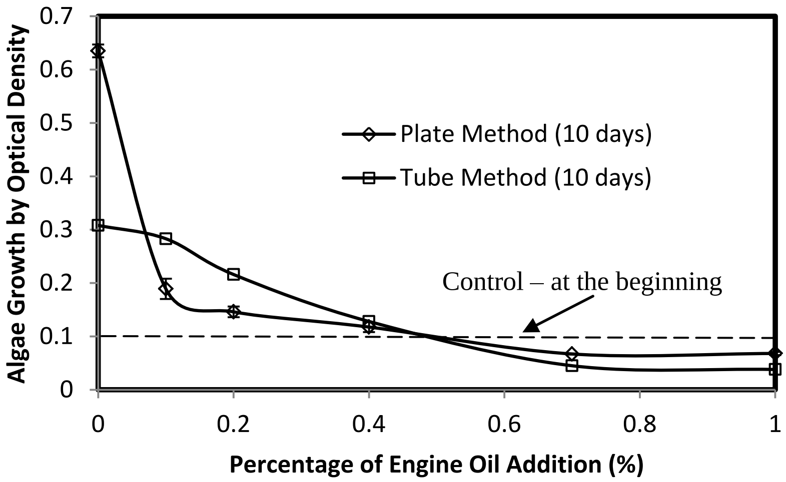
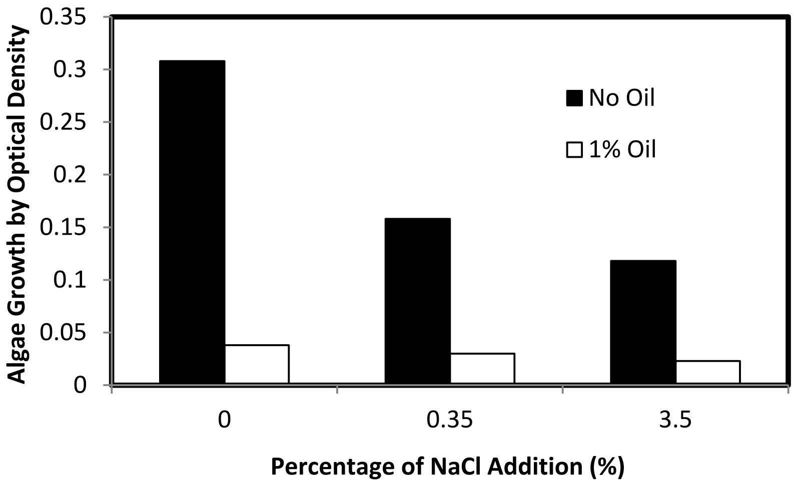


Fig.1 Algae Growth with Different Percentage of Engine Oil Addition by Both Tube and Plate Method (10 days)

Fig.2 Algae Growth with Different Percentage of NaCl Addition With or Without 1% Engine Oil (10 days)



5. Conclusions

Both engine oil and salt water affected the growth of a fresh-water algae. Oil content of 0.5% and higher inhibited the growth of the algae in tube and plate testing conditions. NaCl solution also affected the growth of the fresh-water algae. Oil and salt together further reduced the algae growth.

6. Acknowledgments

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7. References

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