

Greater San Diego Science and Engineering Fair

2015 PROJECT SUMMARY

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Project Title: Is the Solution Worse Than The Problem? – Comparing the effects of natural and chemical oil dispersants on brine shrimp. A Year 2 study.

Abstract

Objectives/Goals

The objective was to compare the effects of natural and chemical oil dispersants on the survival rates of brine shrimp. The goals were to find the lowest concentration of chemical oil dispersants that had a significant impact on the survival of the test organisms, and to demonstrate that natural oil dispersants are a better alternative to chemical oil dispersants.

Hypothesis

The hypothesis for this experiment was that the presence of chemical oil dispersants would start to impact the survival of brine shrimp starting at a concentration of 30 mg/L and that natural oil dispersants will have no impact on the survival of brine shrimp even at the highest tested concentration of 100 mg/L.

Methods/Materials

Live adult brine shrimp, cactus powder, chemical dispersant, and diesel were purchased. 13 glass beakers with 400 mL capacity were used to hold the seawater, brine shrimp, diesel, and varying concentrations of natural or chemical oil dispersant (10 mg/L to 100 mg/L). In all trials, the adult brine shrimp were counted at 12, 24, 36, 48 hours.

Results

An average of 78% of the brine shrimp survived with the highest tested concentration of 100 mg/L of cactus powder at 48 hours. About 29% of the brine shrimp survived when exposed to diesel and the highest tested concentration of cactus at 48 hours. About 25% of brine shrimp survived when exposed to just diesel at 48 hours. 45% of brine shrimp survived at the highest tested concentration of 100 mg/L of sorbitan oleate after 48 hours. Only 20% of brine shrimp survived when exposed to both diesel and chemical dispersant at 48 hours.

Conclusions/Discussion

Brine shrimp had a higher survival rate with natural dispersant than with chemical dispersant. In the presence of diesel, at lower exposure times, brine shrimp had higher survival rates when either chemical or natural dispersant were present. It was observed that diesel oil bubbles or chemical dispersant particles surround the appendages of newly hatched and adult brine shrimp. It is possible that this in turn has a negative effect on locomotion, respiration, feeding, and blood circulation, which leads to death.

Summary Statement

Natural oil dispersants are much less harmful to marine microorganisms than chemical oil dispersants.

Help Received

I received encouragement and guidance on the project from Mrs. Gillum. Dr. Aluwihare (Scripps Institute of Oceanography) provided mentoring. My parents provided support with proofreading and statistical calculations.