CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Matthew W. Wallace

Project Number

S0838

Project Title

The Effect of an Organic Catalyst on Microbial Degradation of Petroleum in Saline Water

Abstract

Objectives/Goals

The goal of this project is to increase the process of microbial degradation of an oil spill. It has been proven that bacteria, Pseudomonas Aeruginosa, have the capability to metabolize oil, but the process can take 30 years to be fully effective. Though my research I will try to speed this process up and reduce the harmful effects of oil spills, I will also see if my tests will hurt any wildlife in the ocean using a brine shrimp test.

Methods/Materials

This experiment was tested by simulating a typical ocean water oil spill. I used three tests in which I evaluated the size of an oil spot to see if the bacteria was breaking down the oil more quickly. The indicator was for the oil spot tests to gradually decrease in size across the experiment, especially in the tests with the catalyst, ethylene, added. I used a "spot" test to evaluate the amount of oil in a specific quantity of water every three days.

Results

After a period of three weeks and all 42 samples were evaluated, the average of test one (with just oil and water) was 5.45cm. The test two average (with oil, water, and bacteria) totaled 4.53cm. Finally, the test three total (with oil, bacteria, water, and catalyst) was 3.11cm. The brine shrimp test results are still pending.

Conclusions/Discussion

To determine whether my project was significant compared to my null hypothesis, which stated that all tests were equal, I used an F ANOVA test. The F statistic was calculated at 10.738. This gave me a P value of 0.00075. By using 0.05 as my confidence factor, I have concluded that I have very strong evidence against my null hypothesis of them all being equal. My test was a success. I can now say that the addition of an organic catalyst makes microbial degradation about 57% more effective; thus, we may be able to reduce bio remediation from a period of 30 years to a period of 13-15 years. This would save billions of salmon and herring eggs, thousands of fish, and many volunteer clean up hours. This helps make our earth a healthier place for all of us to live in each and every day.

Summary Statement

Can oil spills be cleaned up in a more efficient and less harmful manner?

Help Received

Consulted with Marine Biologist, Scott Cashen.