CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

J1003

Project Title

Cactus Clean-up: The Effect of Nopal Opuntia on Oil Consumption

Abstract

Objectives/Goals

Oil spills can be devastating to marine ecosystems. Chemical dispersants, which are frequently used following large spills, may be more toxic than oil alone. We attempted to determine whether Prickly Pear Cactus (Nopal Opuntia), a natural dispersant, could increase consumption of oil by oil-eating microbes and potentially provide a natural alternative to the chemical dispersants currently being used.

Methods/Materials

In the first part of our experiment, we cultured oil-eating microbes available through a commercial science kit and tested three commonly-available oils (vegetable, mineral, olive) to determine which was preferred by the OEMs.

In the second part of our experiment, we prepared 50 samples with 5 mL of OEM culture and 1 mL of vegetable oil. Half were designated as the control group. To the remaining 25 samples we added 0.3 g of dried cactus powder. After 3 days, we measured the amount of oil remaining in each sample and calculated the amount of oil remaining.

Results

We found that on average, the experimental group did consume more oil than the control group. The control group consumed an average of 0.36 mL of oil, while the experimental group consumed an average of 0.91 mL. However, because a number of the experimental samples were entirely consumed before the 3 day period ended, our data was skewed. When we calculated the standard deviation and determined how many samples were within two s.d. of the mean, we found that the control range was 0 - 0.82 and the experimental range was 0.65-1.0 mL.

Conclusions/Discussion

Based on the results of our experiment, we concluded that the cactus powder is likely to be effective in increasing consumption of vegetable oil by OEMs, but that the range of oil consumed by the experimental and control group overlapped. This happened because we did not use enough oil and some experimental samples were entirely consumed. To verify the results of our experiment, it should be repeated with more oil added.

The purpose of our experiment was to determine if cactus powder could be used as a natural dispersant. Based on our experiment, this could be a possibility. The next step would be to test it in more realistic conditions with ocean water and wave action and real crude oil.

Summary Statement

We determined that prickly pear cactus, a natural dispersant, may increase consumption of oil by oil-eating microbes.

Help Received

Our science teacher Ms. Hofmann supervised the experiement and helped us analyze the data.