



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Paul A. Westhart	Project Number S0820
Project Title The Effect of Ammoniated Cellulosic Material (Bagasse) on the Bioremediation of Oil Contaminated Water	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment is to determine if the oil degrading activity of Pseudomonas bacteria can be enhanced by the introduction of ammoniated bagasse in an aquatic setting. Bagasse is an abundant byproduct of sugar cane processing.</p> <p>Methods/Materials Prepare white nutrient broth to culture Pseudomonas. Pour 200 mL of distilled water into 7 sterilized jars. Add 20 mL of distilled oil into each jar. Inoculate two jars with 7 mL of Pseudomonas culture, two jars with 7 mL of Pseudomonas culture and 3g of ammoniated bagasse, two jars with 3g of ammoniated bagasse and separate 1 jar containing distilled water and oil as control. Keep the jars together at room temperature. Check the pH of each jar weekly. Observe changes in density and/or turbidity in each sample. Count the bacteria colonies in each sample 3 times by using dilutions and plating-out procedures. Test each sample for oil degradation using a GC mass spectrometry apparatus. Observe the samples under the microscope. Observe the samples every two days during eight weeks.</p> <p>Results The oil degrading activity of the bacteria Pseudomonas mixed with ammoniated bagasse (#Mix#) was higher than the control and the other jars. The change in the bacterial population of the Mix was 85×10^6 compared to 80×10^6 for Pseudomonas alone and 4×10^6 for ammoniated bagasse alone. The decrease in the pH of the Mix was 0.6 compared to 0.3 for Pseudomonas alone and 0.1 for ammoniated bagasse alone. The mass spectrometry test confirmed that the oil degrading activity of the Mix was greater than the other samples. The holding capacity test showed that the bagasse absorbed 3 times its weight in water and oil.</p> <p>Conclusions/Discussion The data support my hypothesis that ammoniated bagasse enhances the biodegradation of oil by Pseudomonas. After 45 days, there was significantly more oil degradation in the samples containing the Mix compared to the other samples and the control. The higher bacterial count in the Mix is evidence that the ammoniated bagasse was effective in enhancing the environment for bio-remediation of oil in aquatic systems. The ammoniated bagasse provides oxygen, nitrogen and an increased oil surface area to the Pseudomonas. The acidic groups identified by mass spectrometry at the end of the hydrocarbon chain in the Mix are evidence of oil degradation because Pseudomonas add acidic groups to hydrocarbons during biodegradation.</p>	
Summary Statement My project tests the effect of ammoniated bagasse on the bioremediation of oil spills by the Pseudomonas bacteria in water.	
Help Received My parents helped me obtain the necessary materials. Dr. Gardiner and Dr. Grun from UCI allowed me to use their lab's GC Mass Spectrometer under their supervision. They also helped me analyze the mass spectra.	