CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Gina G. Catalano

Project Number
S0801

Project Title
The Effect of Earthworms on Fire-induced Hydrophobic Soils

Abstract

Objectives/Goals
The purpose of my project was to see if earthworms would cut through the ash and hydrophobic layer of soil after a fire. If the earthworms succeeded, this would be an additional way to rehabilitate fire-induced hydrophobic soil, specifically relating to erosion control.

Methods/Materials
The entire experiment was performed inside a redwood planter filled with dirt. To stage the controlled burn, leaves, pine needles and other organic matter were added to the planter and set on fire, burning for 30 minutes to achieve hydrophobic soil. Hydrophobicity tests were conducted 24 hours after the burn. This composed of dropping water on different levels of the topsoil, and timing and recording the absorption rate. Once the soil was positively identified as being hydrophobic, small worms were added to the planter. After a few days, the worms' progress was evaluated and deemed unsuccessful. Bigger worms were brought in, and once again, after a few days, the second batch of worms was evaluated for soil penetration. In the end, the soil was sifted and worms were tallied.

Results
There was no recorded penetration of either the ash or hydrophobic soil layers with the first group of worms. In the second group, of the initial 20 jumbo reds and 12 nite crawlers, 8 jumbo reds and 9 nite crawlers were successful in the penetration of both the ash and hydrophobic layers. The worms had spread themselves throughout the box, burrowing on all four sides plus the middle. After the burn, the hydrophobicity of the soil was tested in five different locations on both the experimental and control sides and was recorded to be 35 seconds. After seven days of earthworm activity, the tests were done in the same locations. The timings on the experimental side ranged from 6 to 9 seconds, while the control side rose to 39 seconds.

Conclusions/Discussion
I conclude that certain earthworms have a beneficial effect on rehabilitating soil affected by fire, specifically in high burn intensity areas when hydrophobic soil and thick ash layers are present. Because of this ability to help restore fire-damaged soils, I envision the introduction of earthworms with mulch as a restoration method in post-fire erosion control in areas where only mulch is currently being used.

Summary Statement
What effect does adding earthworms to soil affected by fires have on the hydrophobicity rate of the soil?

Help Received
Father helped build planter, Parental Supervision of controlled burn.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Lauren E. Fukumoto

Project Number

S0802

Project Title

Measurement of Indoor Radon Concentrations in the Palos Verdes Peninsula Unified School District

Abstract

Objectives/Goals

The objective of this project is to quantify classroom radon concentrations in the schools of the Palos Verdes Peninsula Unified School District (PVPUSD), in order to determine if they exceed the maximum recommended level of 4 pico Curies per liter (pCi/L) set by the U.S. Environmental Protection Agency.

Methods/Materials

Short-term, activated charcoal radon detectors were placed in 20 randomly selected, first floor classrooms at each school in the PVPUSD, strictly following the guidelines set by U.S. EPA publication, "Indoor Radon and Radon Decay Product Measurement Device Protocols." After a 48 hour exposure, each detector was collected, sealed inside an airtight aluminum bag, and then sent to Alpha Energy Laboratories, Carrollton, TX for radon concentration analysis.

Results

The mean radon level of the 297 classrooms and offices tested was 1.9 pCi/L, with levels ranging from 0.2 pCi/L to 33.2 pCi/L. To demonstrate the radon potential of the soil at one school site, a sub-slab crawl space measured 590 pCi/L. 11% of the rooms tested exceeded the EPA recommendation level of 4 pCi/L, and of the 15 schools tested, 60% had at least one room with radon levels exceeding 4 pCi/L. Remediation efforts at the highest reading schools were shown to be successful.

Conclusions/Discussion

Radon is a colorless, odorless gas that is the second leading cause of lung cancer in the United States. Past random measurements of California elementary schools have resulted in only 5.6% of the schools displaying one or more classrooms with radon levels exceeding 4 pCi/L. In Santa Barbara County, the worst known county for elevated radon levels, 16% of the schools had one or more classrooms with radon levels over 4 pCi/L. Comparison of those data with the present measurements indicates that localized elevated radon areas can exist within counties with low or moderate radon risk ratings.

Summary Statement

Classroom radon levels in the Palos Verdes Peninsula Unified School District were found to be significantly higher than those from Santa Barbara County, the highest radon risk county in California.

Help Received

Father helped distribute detectors and reduce data; Mr. Richard Blood, California Department of Health Services Radon Program Director, supplied detectors and advice; PVPUSD provided assistance with classroom access.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Saloni P. Kadakia

Project Number
S0803

Project Title
Aureococcus anophagefferens, Toxic Algal Blooms in United States Waters: Control, Prevention, and Mitigation

Abstract

Objectives/Goals
The objective is to deduce the grazing rates of the toxic algal bloom, the isolation and culturing of the algea by using protozoan communities, and the usage of mescocosm experiments to measure the effect and manipulation of nutrient forms and concentrations on these blooms.

Methods/Materials
Control algae were grown in a lab with recorded surroundings. The algae was then run through optimal environments of increased calcium and other such nutrients essential to its growth. Samples of algal bloom were also used in the Mouse Bioassey, the HPLC, and the optical detection method of the ocean color detector.

Results
From these experiments a new method of culturing and treating these blooms, by using bivalve reduction, was found that reduced the bloom rates of this toxic species to nearly 1/4 the original bloom. This process then created an environment of low essential nutrients around the algea that then prevented the blooms from further progressing as quickly as they usually would in the ocean.

Conclusions/Discussion
This method of preventing the algae from blooming to toxic level densities will thus prevent the algae's toxic product to enter the gills of non- motile water species. New methods of detecting potentially devastating blooms will also quickly provide for warning capabilites for the public as well as for businesses that depend on coastal resources.

Summary Statement
Using microcosm experimentation, nutrient exchange, and protozoan communites to control toxic algal blooms.

Help Received
Mother and Father helped for transportation and needed materials; Used minimal lab equipment at Cabrillo Marine Aquarium, advice from Dr. Coran at the University of Southern California, partcipant of Southern California Junior Academy of Science

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Albert Kaladjian

Project Number
S0804

Project Title
Using Ferric Hydroxide to Filter Out Bacteria from Water

Abstract

Objectives/Goals
To filter out microorganisms from water using a new method which includes the use of hydroxides.

Methods/Materials
The source of sand was ¡"All Purpose Sand¡". For coating the sand 1M of FeCl3 was used for 3M of ammonium hydroxide. After the sand was added to (1000cc) 1M of FeCl3 it was left to dry then Ammonium Hydroxide was added layer by layer until all of the 3M solution was finished (3600 cc). The diatomaceous earth was fully coated then was left to dry.
A solution of the three bacteria and water was made that contained 100mL of liquid bacteria for 300mL of water. Samples of the three solutions were taken in three petri dishes and were placed into an incubator at about 24ƒµ were left for about 12-24 hours. The rest of the three bacteria solution was passed trough the columns of 35.5ƒn5 cm that contained 600mL¡'s of the coated sand for the 100mL of the bacteria solution. At the end of each column coffee filter paper was used to prevent the grains of sand from passing through. The solution was passed through and the result water was placed in a petri dish and was left in the incubator at 24ƒµ for 12-24 hours.

Results
A full 1M of FeCl3 and 3M of NH4OH were used, meaning 1 liter of FeCl3 solution and 3.6 liters of NH4OH.
The effect of 1M concentration of FeCl3 and 3M of NH4OH used for modifying the sand on the adsorption of yeast to sand columns, 35 x 5 cm to 600mL sand, successfully removed 99.9% of the all three bacteria.

Conclusions/Discussion
The hypothesis of this experiment is that the modified sand with ferric chloride and ammonium hydroxide inside the columns will significantly remove 99.9% of the three bacteria from the water.
The hypothesis of this experiment proved to be correct.
A simple way the project can be improved or differentiated on our designed experiment and filtration mechanisms is instead of modifying the diatomaceous earth with ferric hydroxide only, but use a concentration of ferric hydroxide and aluminum hydroxide.

Summary Statement
Found, and tested a new method of bacterial filtering from water which would be financially, economically, and enviormentally effiecient.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Brandon S. Kandarian

Project Number

S0805

Project Title

Determination & Elimination of the Toxic Effects of Fire-Retardants on Oncorynchnus mykiss in Aquatic Ecosystems

Abstract

Objectives/Goals

The objectives in this experiment were to first determine the most effective fire-retardant and method to drop the fire-retardant so as to maximize survival of aquatic organisms. The second objective was to pinpoint the agent in the fire-retardant causing acute toxicity toward stream dwelling organisms through observation, chemical analysis, and dissections. Once this was identified and data was acquired an equation could then be developed to determine what minor alterations to fire-retardants chemical compositions would result in a completely non-toxic fire-retardant.

Methods/Materials

A stream environment was designed and created with all the specifications of a real stream and then verified based on research conducted. Once all the specifications were met, the organisms were added to the test and control stream. A retardant drop simulation was then created to replicate retardants being dropped in the field, through the use of aluminum wire and plexi-glass. The organisms were left in the simulated environment where concentrations of components, chemical properties, and mortality rates were measured periodically. A total of 570 fish were used in this experiment.

Results

The retardant manufactured by Astaris (D75) proved to have a much higher survival rate than the retardant manufactured by Fire-Trol (GTS). The most effective coverage level (amount of retardant dropped maximizing retardants potential) for D75 retardant was coverage level 5. GTS retardant at coverage level 6 proved to be its most effective coverage level. The components in the fire-retardants causing acute toxicity were the ammonia and sodium ferrocyanide compounds. This data was analyzed and used to create the "Toxicity Elimination" equation, which makes fire retardants completely non-toxic,through minor alterations to their chemical compositions.

Conclusions/Discussion

With the results I acquired, I recommend D75 be dropped at coverage level 5 and GTS fire retardant be used at coverage level 6 to maximize the retardant's potential. I recommend D75 be used in place of GTS and that each retardant company use the "Toxicity Elimination" equation to rework their retardants formulation in order to eliminate toxicity. Through these changes, the toxicity of fire-retardants can be eliminated while still allowing the retardant to retard the fire.

Summary Statement

The effects of fire-retardants on a stream organism are being tested in a recreated stream environment to acquire data to determine adjustments to procedures and an equation that can be used to eliminate the toxicity of the fire-retardants

Help Received

In this experiment I acquired the measuring equipment and devices necessary for chemical testing through the forest service, Fish and Game, Fresno State, and my high school

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Amy M. McPeak

Project Number
S0806

Project Title
The Implementation of Recycling at Retail Businesses

Abstract

Objectives/Goals
The objective of this study was to determine how receptive a cross-section of retail business owners would be to implementing a recycling program, how much of an impact the recycling would make, and what factors would influence the recycling behavior of business owners and their customers.

Methods/Materials
Nine retail business owners/managers were asked to participate in a trial recycling program. A 32 gallon barrel was placed in front of each business for three weeks, and the number of cans, bottles, and trash items that came in each day were counted and sorted. Various factors, such as adding two types of educational signs, were varied to determine if the amount of recycling could be increased. A questionnaire was given to each of the participating businesses at the end to determine how the managers/owners felt about the program.

Results
In the three weeks of recycling at six businesses, a total of 2,516 cans and bottles were recyled. One business, a car wash, accounted for 52% of all the recycling. Adding an educational sign to the barrels increased the amount of recycling an average of 50%. The humorous educational sign generated 40% more recycling than the serious educational sign. The questionnaire to the business owners/managers revealed that all of the participants were either positive or neutral about the recycling program before and after the program was implemented. All of the owners/managers said that they would either definitely be interested in participating in a long-term program, or they might be interested.

Conclusions/Discussion
Although recycling in American households is at a record high, recycling at businesses is largely ignored. If cities were to implement recycling for selected businesses, it would have a major impact on the environment and landfill use. Although there was previously no recycling program for businesses for the City of Rancho Palos Verdes, most people affected were receptive to implementing a trial recycling program. This trial demonstrated that a significant amount of recycling can be generated by customers and employees of retail businesses. There are various factors that cities can consider to increase the amount of recycling that is collected. These factors include choosing businesses that produce large amounts of recyling and educating the public about the benefits of recycling, especially using a humorous educational technique.

Summary Statement
This project quantifies the impact of adding recycling barrels, with and without educational signs, to a variety of retail businesses.

Help Received
City official helped choose retail businesses, Father helped create computer images for recycling signs.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Joshua B. Miko

Project Number
S0807

Project Title
The Bioremediation of Hydrocarbon Contaminated Soil

Abstract

Objectives/Goals
The goal of this study is to determine if horse manure can effectivly be used in the active, ex-situ bioremediation of soil contaminated with diesel hydrocarbons.

Methods/Materials
This study contained a control and two experimental groups each consisting of three treatments (replications). All treatments consisted of 150 ml of diesel fuel and one litre of soil (115,890 ppm). Experimental group I was also treated with 200 ml of horse manure. Experimental group II receive 400 ml of horse manure. Water was applied to all groups (Control, Experimental group I, and Experimental group II) over a period of two weeks to maintain soil moisture. An 8015 modified test, to determine the hydrocarbon content in ppm, was conducted by a soil lab before and at the end of the experimental period.

Results
The Experimental group II, which received 400 ml of manure, had the greatest bioremediation rate of diesel hydrocarbons, with an average of 15,979 ppm (mg/kg) at the end of the trial. The Experimental group I, which received 200 ml of manure, averaged 35,381 ppm, and the Control, which received no manure, averaged 77,254 ppm.

Conclusions/Discussion
Differences in treatments were significant with a P-value of .0029, as found with ANOVA in Microsoft Excel. This has led to the conclusion that the use of horse manure may be an effective way to bioremediate diesel- contaminated soil.
The next step in this study is to extend the test period, while using the same treatments, to research the long-term effectiveness of this method of hydrocarbon bioremediation. Another step to be taken is to determine the effect of this process on soil nutrients and future application.

Summary Statement
The ex-situ bioremediation of diesel hydrocarbon contaminated soil via horse manure

Help Received
Lab work processed at Demenno- Kerdoon State Certified Laboratory , overseen by Lab manager Cyrus Pourhassanian; deisel fuel provided by FFA advisor Sharon Tavaglione;Instructed on use of chemical conversions by RHS chemistry instructor Mr. Thorpe.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Carley G. Millian

Project Number
S0808

Project Title
PCR Detection in Genetically Modified Foods

Abstract

Objectives/Goals

This year I am running PCRs and gels to try and detect the transgene for Roundup Ready resistance. This gene is inserted into the DNA and it make the plant resistant to Roundup(Glyposphate). This is a very controversial issue in the agriculture society, because the GMOs(Genetically modified organisms) have already crossbread with weeds(G. soya) in Japan. There are more weed that could possibly cross breed with theses plants in Asia, but non have been found in Europe or the United States. Some people have other concerns about this rampant transgene. Since it is used in many of our crops, we fear that the gene will have more than one effect(this is called pleiotropy) and it will create a disease and kill off all the Roundup Ready Resistant plants. With our food supply gone the world would starve. Another concern people have about these genetically modified foods is the safety of them. Monsanto, the company that makes Roundup, claims that it is, but they tend to slip through the cracks when it comes to safety precautions. I am going to look for this transgene in many different soy products to see which ones have them in this time of worry.

Methods/Materials

Extraction of the Genomic DNA
I used a Qiagen kit and I followed the intrusctions.
PCR
Make a mix with the solutions needed.
Add 1xBuffer
Add the primers and the DNA.
Hot start and add taq.
Run the samples for 40 cycles.
Gel Electrophoresis
Make a gel using the right concentrations, and add the samples.
Turn it on and let it run to the plus side.
Observe your results.

Results

All of them came out positive for my control which was lectin. The only two that came out positive were the soy milk and the soy flour. The soy beans turned out with a band for roundup ready resistance at about 1600bp when it should be at 256bp. The rest of the samples came out negative for this specicfic roundup ready resistance gene.

Summary Statement

Finding a transgene in soy products by PCR detection.

Help Received

I worked at UCI under the supervision of David Gardiner.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Katherine E. Nakaba

Project Number
S0809

Project Title
2-Yr Study: Sandcrabs, Sandpipers, Pollution: Factors Affecting Sandcrab & Sandpiper Populations in SM Bay and LA Harbor

Abstract

Objectives/Goals
A study was conducted to determine if water temperature, salinity, barometric pressure, substrate, precipitation and/or pollution factors effect sand crab and sandpiper population densities. I hypothesized that sand crabs and sandpipers would have a smaller population where higher levels of ocean pollution were found. A further objective was to determine if the storm drain reclamation facility in Santa Monica was effecting the sand crab populations.

Methods/Materials
The first year, after measuring the abiotic factors, the number and size of sand crabs were recorded at one location. The trials were expanded to include a second location. Both locations were chosen based on ocean bacteria counts (enterococcus, total and fecal coliforms) - that indicate pollution from numerous sources including fecal waste. The second year, analyzed the difference in substrate as an additional abiotic factor, to corroborate previous results, and to determine if lower sand crab population numbers had a corresponding lower number of sandpipers.
The study continued to measure bacterial levels, salinity, barometric pressure, precipitation, and water temperature and increased the number of sites from two to four, expanding from the Santa Monica Bay to the LA Harbor. The study included the run-off cleaned through SMURRF.

Results
At one site (Pico-Kenter) the storm drain run-off is now being cleaned through a SMURRF facility (Santa Monica Urban Run-off Reclamation Facility). Previous and current bacteria and sand crab data were compared. While the abiotic factors remained constant at all locations, the bacteria count was significantly different.

Conclusions/Discussion
The results obtained support the hypothesis that the population density of sand crabs and sandpipers is effected by bacterial pollution.
There is minor variation in substrate that will generate further study. While the SMURRF project can significantly clean the water, it only funnels the Santa Monica portion of the run-off, not LA County's. Consequently, the bacteria levels at Pico-Kenter are still very high and the sand crab and sandpiper population densities are very low.

Summary Statement
The population density of sand crabs and sandpipers is effected by bacterial pollution and reclamation need to be on a large scale to be effective.

Help Received
My family helped in digging sand/carrying water. Jose Bacallado from the Ocean Discovery Center reviewed my procedures to make them more precise. James Alamillo, who is the program manager of Heal the Bay's Beach Report Card, has shared his bacterial-count data. Kim O'Cain from SMURRF

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Marcey Nemeth; Karen Thang

Project Number
S0810

Project Title
Wave Break

Abstract

Objectives/Goals
Our objective/goal was to determine which shape of jetty works the best to prevent shoreline erosion. We believe the straight jetty will reduce the most amount of erosion.

Methods/Materials
After a plywood box was assembled, a weighed quantity of dry sand was placed into one side the box and constructed into a shoreline shape. From there, a measured amount of salt water was poured in the box opposite to the sand. Our wave maker (which was constructed from a wood board and coil springs) was placed in, pulled back a measured amount, and released. This was done every 30 seconds for 10 minutes (20 times total) for each shape of jetty. (Note: The box was cleaned out and "restocked" with the same amount of dry sand and salt water after completing the testing of each jetty.)

Results
The results show that the straight (angle) jetty accomplished our objective. It precluded the most shoreline erosion, while the curved jetty restrained the least.

Conclusions/Discussion
Due to the fact that our objective was achieved by the straight jetty, we can conclude that our hypothesis was correct. In the future, our results can help jetty developers build a shaped jetty customized for the amount of erosion they want to prevent or create. This can benefit our world's shorelines, humans, animal life, and plant life.

Summary Statement
In our project, we tested to determine which shape of jetty prevents the most shoreline erosion.

Help Received
Naureen Fielding helped brainstorm ideas for building our wave maker; Steve Nemeth helped build the plywood box; Mr. Moore critiqued our project; Jill Nemeth supervised the building and testing of our project

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Greg C. Pilegard

Project Number

S0811

Project Title

Taming the Fury of the Wind: Investigating the Use of Biodegradable Products to Suppress Fugitive Dust

Abstract

Objectives/Goals

Objective: The purpose of this project is to find an agriculturally and environmentally friendly solution to suppressing fugitive dust and particulate matter created by current agricultural practices in the Central Valley. I believe hardpan will do the best job of suppressing fugitive dust.

Methods/Materials

Materials: A control soil and seven organic variables were tested for there ability to stabilize the soil and prevent it from becoming airborne, creating a health hazard.

The soil and variables moisture content was measured to insure the dry conditions found in the Central Valley. Samples and variables were a consistent volume. Samples were weighed before and after the introduction of a wind source measured at 16 kmph, 24 kmph, and 32 kmph which were within the calculated average wind speeds found in the Fresno area in 2002 (as supplied by the weather bureau). The wind source was introduced at one side of the wind tunnel and applied for five minutes. Effectiveness as a dust suppressant was calculated by measuring the loss of soil mass.

Results

Results: My results showed a fascinating fact. Shape was a determining factor in the success of a variable as a dust suppressant. Hardpan was the best to suppress dust. The second best was wood chips, straight from a chipper machine. The third best was a fine mulch. This suggests a layer of wood chips would provide a solution that might last for more than one season as it breaks down to a fine mulch. Furthermore, the wood chips could provide an alternative to agricultural burns which add to the air particulates. However, straw gave the clue that shape was significant. It was the lightest variable , but out performed some of the heavier ones.

Conclusions/Discussion

Conclusion: My conclusion is that hardpan does a great job on barren fields. However, wood chips has the greatest agricultural impact> It has the potential of suppressing fugitive dust, decreasing agricultural burns, a decrease in commercial and chemical suppressants, and can act as a barrier to prevent unwanted vegetation between crop rows. The success of the fine mulch suggests the wood chips may be effective for more than one growing season.

Summary Statement

This project was designed to find a solution to a growing concern of the Central Valley air pollution by looking at agriculturally and environmentally friendly solutions.

Help Received

Mother and Neighbor helped design and assemble board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Joshua H. Simmons

Project Number
S0812

Project Title
The Effects of Water on a Hillside

Abstract

Objectives/Goals
My project is to determine which plants would prevent erosion on hillsides the best.

Methods/Materials
The materials consist of dirt, wild grasses, ice plant, two curved pipes, two plastic containing bins, Artificial Rain system built of PVC, hose and water. After I planted the plants on the hillside I used my artificail rain system to rain on each side for equal amounts of time. Then measured the soil that was eroded.

Results
After the five minute trials were done the Wild Grass prevented the most erosion and on the ten minute trials the Wild Grass once agian prevented the most erosion.

Conclusions/Discussion
After all of my trials were done the wild grass prevented the most erosion, but the only place were erosion took place was were the roots had not grown yet. But I think that if I were alowed more time and had it been spring I think that the results would have been different. Also if the plants were full grown I think that would not have been very much erosion at all.

Summary Statement
To find out what kind of plants would best prevent erosion on hillsides.

Help Received
Mother and Father helped with financial support.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jennifer C. Wang

Project Number
S0813

Project Title
The Effect of a Soluble Calcium Solution on an Aquatic Plant's Ability to Withstand Global Warming

Abstract

Objectives/Goals
Hypothesis: A soluble calcium solution will increase an aquatic plant's ability to survive global warming

Methods/Materials
1. 9 healthy ulva plants
2. 3 small (approx. 1.5 gallon) fish tanks
3. an abundance of salt water make-up
4. Reef Success Calcium Solution
5. 3 water heaters with temperature range of at least 45 to 95

Methods:
1. Tanks labeled A, B, C. Tank A (control) maintained at 65 degrees farenheight. Tank B and C (experimental) both kept at 85 degrees farenheight
2. Tanks filled with salt water makeup
3. The water was heated. [Tank A: 65 degrees, Tanks B/C: 85 degrees]
4. 25 drops of calcium solution were added to Tank B, nothing added to tank A/C
5. The experiment was run for 24 hrs
6. Results/observations were recorded. The zones of depletion were counted on each plant, colors and textures were recorded.
7. The experiment was repeated three times. The second trial included 50 drops of calcium in tank B, and the third trail included 60 drops of calclium in tank B. The temperatures were maintained at 65 degrees in tank A, and 85 degrees in tanks B and C.
8. All tanks were washed and filled with new salt water. New healthy plants were used for each trial.

Results
The results of my experiment proved my hypothesis; soluble calcium does increase an aquatic plant's chances of survival during global warming. There was no change in tank A. The ulva in tank B appeared healthier than the ulva in Tank C. The ulva in tank C was also brittle and lighter in color. The ulva in tank C had a large amount of zones of depletion. In trials 2 and 3, the increase of calcium added to tank B decreased the number of zones of depletion of the plant.

Conclusions/Discussion
My results are directly correlative to the amount of calcium that was added to tank B. The ulva in tank A was healthy because were was no environmental stress on the plant. The health of the ulva in tank B was

Summary Statement
My project is about the effect of a soluble calcium solution on an aquatic plant's ability to withstand global warming.

Help Received
Used Aquarium of the Pacific's tanks, sea water, and heaters; used Mr. Starodub's calcium solution (my mentor); used ulva collected by Cabrillo Marine Aquarium.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Paul A. Westhart

Project Number
S0814

Project Title
The Effect of a Biopreparation on Oil Degrading Microbes under Low Temperature

Abstract

Objectives/Goals
The objective of my experiment is to determine if the oil degrading activity of Pseudomonas bacteria in colder climates, like Alaska, can be enhanced by the introduction of a biopreparation. A biopreparation is a compound of naturally occurring bacteria and enzymes used to bioremediate hydrocarbons.

Methods/Materials
Place 100 mL of distilled water, 30 drops of refined oil and 0.5 g of nutrients into 12 jars. Inoculate 3 jars with 7 mL of Pseudomonas culture, 3 jars with 0.01 g of biopreparation and 3 jars with 6 mL of Pseudomonas culture and 0.01 g of biopreparation. The last 3 jars are the control jars and they contain no microbes. Separate the 12 jars into 3 identical groups. Each group will have one type of jar plus a control jar. Incubate one group of jars at 7 C, another group at 15 C and the third group at 30 C for six weeks. Measure the rate of oil degradation in the jars every five days using the scale of oil degradation. Measure the change in the pH of the jars weekly. Count the bacteria in each jar three times by using dilutions and plating out procedures. Use HPLC Columns chromatography to analyze the different compounds in each jar. Repeat the experiment twice.

Results
The oil degrading activity of Pseudomonas mixed with the biopreparation (mix) was higher than the other jars at 7 C: The change in the bacterial population of the mix was 20 X 10^6 compared to 16 X 10^6 for Pseudomonas alone and 13 X 10^6 for the biopreparation alone. The decrease in the pH of the mix was 0.2 compared to 0.1 for Pseudomonas and 0.1 for the biopreparation. HPLC results revealed a greater number of peaks and peak area in the chromatograms of the mix samples when compared to the chromatograms of the Pseudomonas samples and the biopreparation samples. There was no oil degradation evidenced in the control jars.

Conclusions/Discussion
The results support the hypothesis that a biopreparation can enhance the oil degrading activity of Pseudomonas at low temperatures. Bioremediation using biopreparations as enhancing agents could possibly help clean oil spills in cold waters such as the Exxon Valdez spill in Alaska. More testing, a larger number of samples and knowledge about the ecosystems in the contaminated area would be needed before the application of in-situ bioremediation using biopreparations.

Summary Statement
My project tests the effect of a biopreparation on the bioremediation of oil spills in cold water.

Help Received
My parents helped me obtain the materials necessary for the experiment. Dr. Gardiner and Dr. Grun from the School of Biological Sciences at UCI allowed me to use the university's HPLC equipment under their supervision. They also helped me analyse the chromatograms.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Brandee L. Woolsey

Project Number
S0815

Project Title
How Does Runoff Affect the Growth and Development of Artemia nyos, Sea Monkeys?

Abstract

Objectives/Goals
My objective or goal of this experiment was to see how runoff affected the growth and development of Artemia Nyos, a type of brine shrimp very closely realted to the type of microscopic organisms found in the Santa Monica Bay. Then using the information that I learned from this experiment and apply it to the microscopic organisms, in the Santa Monica Bay, to show, if my hypothesis is correct, that sooner or later this problem of runoff will affect us through the marine food chain.

Methods/Materials
Materials: three fourteen oz. containers, thirty oz. of distilled water, three set of instant life Sea Monkeys packets- that include a water purifier, food, and sea Monkey eggs , three oz. of motor oil, three oz. of raid, three oz. of fertilizer, three oz. of weed and grass killer, six oz. of water,five gallon bucket, twenty five oz. cup, and a fourth of a teaspoon.

I raised three container of Sea Monkeys, the first container recieved no runoff acting as my control variable. The second container recieved a homemade runoff solution half way through the experiment. The third container recieved the same homemade runoff, everyday of the experiment.

Results
My results show that the two conatiners that recieved runoff, their specimens died within three days. While the other container that did not recieve any runoff throughout this whole experiment basically did not change.

Conclusions/Discussion
The conclusion that I formed from my results are that the runoff, over time, built up in the Artemia Nyos' gills, making it impossible for them to breathe. Since the Artemia Nyos are very closely related to the Zooplakton that we can assume that the runoff will have the same affect on them. When this happens it will serverly cripple the marine food chain, which will soon cripple our food chain as well.

Summary Statement
To determine how runoff affects the growth and development of Artemia Nyos, Sea Monkeys

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Robert G. Wright

Project Number
S0816

Project Title
Water, Water, Everywhere, but Not a Drop to Drink: Portable Desalination

Abstract

Objectives/Goals
Objective: The purpose of this experiment was to determine the most efficient design for a portable, candle-powered desalination plant that would give people a way to make pure water from salt water using simple materials and only small amounts of thermal energy. It is postulated that altering the design (changing the structure of each plant) of a portable desalination plant will affect the rate at which it produces pure water from ocean water. The difference in the design will affect the rates of vaporization and condensation, thus affecting the rate of pure water production.

Methods/Materials
Materials and Methods: The materials used in this experiment were all easily obtainable and the designs of the systems were not complicated. Four designs were built. The first was a one-gallon paint can with a funnel (turned upside down) on top, which had a tube running from the spout to the graduated cylinder, which collected the pure water. The second was a one-quart paint can with a funnel (turned upside down) on top, which had a tube running from the spout to the graduated cylinder. The third was a baking pan with plexi-glass sides forming a greenhouse. U-shaped channels ran down both sides of the "greenhouse" and into pipes that drained into two graduated cylinders. The fourth design was a steel bucket with a plastic garbage can on top. Inside the top of the garbage can was an upside down cone. A pipe traveled through the can (which collected the water from the cone) and into the graduated cylinder.

Results
Results and Conclusions: This experiment showed that the "greenhouse" design was the best. It had the most, drainable surface area on which the condensation occurred. The amount of drainable surface area is a major factor in the efficiency and effectiveness of the desalination plant.

Conclusions/Discussion
See above.

Summary Statement
This project tested the effectiveness of different designs for a portable, candle-powered, desalination plant.

Help Received
Father provided some materials and minimal assistance during construction and testing.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Robin K. Yam

Project Number
S0817

Project Title
The Effects of Chemical Fertilizer vs. Legumes

Abstract

Objectives/Goals
The objective of my project is to reduce the amount of harmful nitrogen due to chemical fertilizers in the runoff water of golf courses. This can be achieved by using legumes to fixate nitrogen that will be beneficial to grass but not harmful to the environment.

Methods/Materials
To conduct my project, five crates of rye grass were planted in boxes lined with filter fabric and filled with purchased soil. Three types of legume seed mixtures containing crimson clover, white dutch clover, and lupine were planted in three of the crates along with the grass. One crate was just grass for the control and one crate was grass fertilized with chemicals. All of the grasses were watered the same amount and were all under the same amount of sunlight. Measurements of length and width were taken of random grass blades from each crate. After watering, runoff was collected in a plastic tray and tested with a home garden nitrogen testing kit to determine the amount of nitrogen in the runoff water.

Results
The results of the various T-tests and the nitrogen tests showed that the grass fertilized with chemicals did produce taller and thicker grass blades than the grass grown with legumes. The runoff water from the grass fertilized by chemicals had a surplus of harmful nitrogen whereas the runoff water from the grass/legume mixtures and from the control showed no nitrogen. An expert golfer evaluated the grasses and stated that although the grass grown with chemical fertilizer looked best, the grass/legume mixtures were fine for the rough of a golf course, an area that takes up almost 50% of a 18 hole golf course and is not used very often by good golfers.

Conclusions/Discussion
The grass fertilized with chemicals displayed a taller and thicker grass blade than the grass with legume mixtures. However, the nitrogen test showed that the chemically fertilized grass had a surplus amount of harmful nitrogen whereas the grass/legume mixture and the control showed none. Although the quality of the grass/legume mixture may not be preferable for the putting greens and tees of a golf course, the legume mixture would be suitable for the rough. Making this change to legumes in the rough areas would reduce the fertilizing demands and consequently reduce the nitrogen runoff from a golf course by about half while still being of acceptable quality to the notoriously picky golfer.

Summary Statement
In order to reduce harmful nitrogen runoff in our waterways, legume plants were used to fixate nitrogen as an alternative to chemical fertilizers on golf courses.

Help Received
My mom and dad helped me get materials and my science teacher helped me edit my paper. A golfer friend of my dad's came over to evaluate the grass quality.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Vijay Yanamadala

Project Number
S0818

Project Title
Eutrophication Control with Ion Exchange Filters and Accelerated Denitrification in Fresh Water: Bacterial Analysis

Abstract

Objectives/Goals
Eutrophication, the process by which a lake becomes rich in dissolved nutrients due to point and non-point pollutant sources, is a major cause of the loss of natural lake ecosystems throughout the world. The goal of these experiments has been not only to improve the ecological balance of lakes by reducing eutrophication, but also to better the ecosystem from an environmental and health perspective.

Methods/Materials
Previous experimentation involved the testing of calcium carbonate as a phosphate binder in the laboratory and in the real ecosystem. Various approaches for reduction of ammonia were also tested including aeration, use of bacteria growth medium, and plants, mainly in an attempt to increase population of Nitrobacter and Nitrosomonas.
The effect of phosphate and ammonia reduction on the populations of enterobacteria was the main focus of this experiment. Varying concentrations of phosphate, ammonia, and calcium carbonate in conjunction with phosphate were tested in Madrona to determine their effects on the populations of enteropathogens on non-specific blood agar, MacConkey agar, and Hektoen agar.

Results
Calcium carbonate was found to be an excellent phosphate binder, reducing up to 70% of the phosphates. There was a strong correlation between phosphate concentrations and bacterial populations: a 66% decrease in phosphate resulted in a 35% reduction in bacterial populations and a 45% reduction in enteropathogenic populations. Likewise, a strong correlation was shown between calcium carbonate concentrations greater than that which can be attributed to the phosphate reduction alone.

Conclusions/Discussion
The experiment was extremely successful in designing a working phosphate binding and ammonia reducing filter, and a large-scale filter is currently being constructed in Madrona Marsh; this filter will reduce phosphate and ammonia levels substantially in the following years, and also reduce the populations of pathogenic bacteria in the water. The results of this experiment will hopefully improve the Madrona Marsh Preserve in many different ways: ecological, economical, and health-wise.

Summary Statement
Ion exchange reduction of phosphate and accelerated denitrification can significantly reduce eutrophication and populations of harmful enteropathogens, thus leading to the betterment of lake ecosystems.

Help Received
Lab space in Physics classroom; Parents helped with driving, etc.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Geoffrey D. Young

Project Number
S0819

Project Title
One Man's Trash is Another Man's Treasure: The Conversion of Cellulosic Municipal Waste to Ethanol

Abstract

Objectives/Goals
My objective is to determine which cellulosic waste product (newspaper, grass and eucalyptus sawdust) produces the greatest amount of ethanol through concentrated acid hydrolysis. I believe that the grass samples will produce the most ethanol because the hydrolysis of newspaper and sawdust may produce toxins that inhibit yeast growth.

Methods/Materials
93% sulfuric acid was added to cellulosic waste to break down polysaccharides into monosaccharides which are fermentable by yeast. I used a ratio of 1 part feedstock to 2 parts acid. After 1 hour, I neutralized the pH of the hydrolyzed cellulose with a dilute of baking soda (30 grams baking soda to 800 mL water) yielding a pH of 5 to 6.5 for optimum yeast growth.
Sample solutions were put into airtight jars to which yeast, Saccharomyces cerevisiae, was added. Plastic tubing through each jar lid into a container of water maintained an anaerobic environment and allowed the release of carbon dioxide during fermentation. The jars were kept at 20 to 25° Celsius. At 36 hours a new supply of yeast, S. cerevisiae bavanus, was added. Total fermentation time was 108 hours.
I used four samples of each waste product and four controls which were identical to the samples but without a cellulosic waste.
At the beginning, at 36 hours, and at 108 hours of fermentation I measured temperature and pH. I used a hydrometer to measure specific gravity and potential alcohol.

Results
The grass produced the most ethanol with a mean .3076% alcohol followed by newspaper (.0681%) and sawdust (.0286%). T-tests confirmed the statistical reliability of my data.
Results supported the hypothesis that grass clippings would produce the most ethanol, but the control had the largest drop in specific gravity indicating it produced the most ethanol. I tested a second hypothesis to find which hydrolyzed cellulose was least detrimental to fermentation as compared to the control. T-tests showed that sawdust and newspaper harmed fermentation. There was no statistical evidence that the hydrolyzed grass inhibited fermentation. This again proved that grass was the best cellulosic waste for ethanol production.

Conclusions/Discussion
Ethanol from waste is potentially an efficient and environmentally sensible alternative fuel source and would help lessen our dependence on foreign petroleum. This experiment increased my understanding of biofuels and the need for cost-efficient energy alternatives.

Summary Statement
This project shows that after the fermentation of three hydrolyzed cellulosic municipal waste products, grass produced the greatest amount of ethanol followed by newspaper and eucalyptus sawdust.

Help Received
Jasun Tenenbaum, a chemistry student at UCI, helped refine my procedures for safety. My parents helped me stay safe and understand the more difficult concepts behind the project. My brother taught me about statistical analysis and t-tests which I applied to the project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Hastin L. Zylstra

Project Number
S0820

Project Title
Salt Cedar, and Its Effects on the Mojave River

Abstract

Objectives/Goals
To find if Salt Cedar trees effect the salinity of the Mojave River.

Methods/Materials
Standard method; go to study sites, and collect Total Dissolved Solids information, using a Hanna brand handheld water quality device.

Results
When the river's Total Dissolved Solids is compared to a small puddle of water, directly effected by Salt Cedar trees, the Mojave River's salinity raised, and fell at the exact same dates.

Conclusions/Discussion
Yes, my hypothesis is correct, because of the rises and falls in the data, on the exact same dates.

Summary Statement
The effects of Salt Cedar trees on the salinity of the Mojave river.

Help Received
Mojave Water Agency - Provided Hanna water quality collection device.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Shamsher S. Samra

Project Number
S0899

Project Title
Heat of Condensation: A Natural Source of Protective Heat: A Third Year Study

Abstract

Objectives/Goals
This investigation centered on the effects of utilizing heat of condensation of water from an ambient source, induced by a structural net-matrix, on growth and crop development of Raphanus sativus during frost susceptible maturation. Research objectives hoped to develop a more cost effective frost protection than current fossil fuel based sources of protective heat.

Methods/Materials
In conducting the investigation Raphanus sativus seeds were enclosed within overlying net matrixes with hole diameters of .1", .5", porous holes, and within a control group with no overlying protection. Twenty-four seeds were planted within the previous media on December 24, 2002. Raphanus sativus seeds were used in the investigation because the radish crop is harvest in cool temperatures thus is susceptible to frost damage. The rate of germination, percent germination, daily growth, and final masses of the individual crop were recorded. In order to correlate radish development to condensation rates, temperature readings were recorded hourly from all four media throughout the investigation. To obtain temperature readings, a self-designed computer program and thermister interface was used. Relative dew point and humidity readings were acquired nightly through the utilization of a sling phsychrometer. The investigation concluded on March 14, 2003.

Results
My investigation revealed that the Raphanus sativus seeds grown beneath the porous net matrix were the first to germinate, had the highest percentage germination with 23 of the 24 seeds germinating. These plants went on to have the fastest growth rates, and when the radishes were massed the ones grown beneath the porous net matrix had a substantially larger mass relative to the control group. There was a direct correlation between increased relative humidity and temperature gradients beneath the net matrixes. The .1#, .5#, and control group followed in all categories respectively, in correspondence to decreased surface area for water nucleation.

Conclusions/Discussion
Results suggest that net matrixes promoting ambient heat of condensation actually deter frost development and promote growth in cold weather stress, thus presenting an inexpensive alternative to fossil fuel dependence for frost protection.

Summary Statement
To determine if heat of condensation inducing structural net-matrixes can increase growth and crop development of Raphanus sativus during frost susceptible maturation by detering freezing temperatures.

Help Received
Mother Provided transportation; Science Teacher and School Provided Materials (Triple Beam Balance and Sling phsychrometer);