CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Elis Baynham; Chad R. Williams

Project Number

J0801

Project Title

Which Type of Mulch Is Most Effective in Controlling Erosion on Recently Disturbed Hillside Soil?

Abstract

Objectives/Goals

The project was conducted to determine which type of mulch would be most effective in preventing soil erosion from raindrop impact on hillside vineyards. The mulches used were a mixture of yard trimmings and wood waste that had been diverted from the county landfill.

Methods/Materials

We made five 1 sq. ft. soil sample trays and placed them on a 3:1 grade. We obtained mulches from a commercial composting facility. The mulch was 60% wood waste and 40% yard trimmings that had been mixed, chopped and passed over a 3 inch screen, the material that fell through the screen was used on two trays, the material that did not go through was used on the other 2 trays. The trays were exposed to the environment for 14 days; there was a total 3.75 inches of rain. The sediment from each tray was collected, dried, and weighted. The results from each test group was compared.

Results

There was no significant difference in the effectiveness of the two types of mulches in the prevention of soil erosion.

Conclusions/Discussion

Farmers growing grapes on hillsides should consider using mulch that has been prepared using wood waste and yard trimmings. The use of the less valuable much, the material that did not fall through the 3 inch screen would be preferable, as it has no commerical value. The use of this mulch would prevent erosion and divert waste from landfills.

Summary Statement

Our project is about testing the effectiveness of two types of mulch, made from wood waste and yard trimming, to prevent sheet erosion on vineyards planted on 33% grade.

Help Received

Martin Melnick of Cold Creek Compost provided mulch and consultation in designing the project, Laura Baynham helped type and arranged for us to meet and work, Myers Apothacary weighted our soil samples, Pat Williams helped locate supplies for our project and assisted with arranging team meetings.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Alex T. Bignell

Project Number
J0802

Project Title
Water, Water, Everywhere...

Abstract

Objectives/Goals
Santa Cruz County is looking for more water options because our current supply of water is overused. Officials have limited choices because of environmental issues with dams and fully employed underground aquifers. One of the options being considered is desalination of seawater. The objective of this experiment was to see if Santa Cruz County residents and plants would prefer tap water over desalinated seawater in relation to taste. My hypothesis is that Santa Cruz County residents and plant life will not be able to tell the difference and therefore will not prefer tap water to desalinated seawater.

Methods/Materials
The experiment consisted of 3 separate tests. It tested 10 barley-seed pots: 5 watered with desalinated seawater and 5 watered with tap water. Measurements were recorded every day. The experiment also ran a test on 6 wheatgrass-seed six-packs: 3 watered with desalinated seawater and 3 watered with tap water. Measurements and sprout numbers were recorded every day. The human test consisted of SCC students tasting both desalinated seawater and tap water, then filling out a survey asking questions about the taste of the water.

Results
The desalinated seawater had the higher measurements in the barley testing. The desalinated seawater had higher measurements but less sprouts than the tap water in the wheatgrass testing. The tap water had a higher average rating but more students preferred desalinated seawater in the human testing.

Conclusions/Discussion
Neither the plants nor the human subjects showed a clear preference for tap water over desalinated seawater, thus supporting my hypothesis.

Summary Statement
My project is a comparison of desalinated seawater and tap water in relation to preference of people and plants in Santa Cruz County.

Help Received
Steven Bignell (Dad) drove me to Sears and provided cash for an electric distiller. Mary Bignell (Mom) helped align my display board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Brian J. Bornemann

Project Number
J0803

Project Title
Solar Water Distillation

Abstract

Objectives/Goals
Can salt water be converted to drinking water using solar energy, and if so, what glazing material would perform the best?

Methods/Materials
The project involved the construction of a 5 chamber solar still, to test 5 different glazing materials including window glass, tempered glass, Plexigals, prismatic acrylic and corrugated fiberglass for best performance. All other variables remained the same. The still was placed at a 25% angle and salt water was poured into the top of each chamber. The condensation caused by the heat of the sun was then collected into graduated tubes for recordation during tests conducted over 2 consecutive days.

Results
The solar stil performed well and produced drinkable water out of salt water. Although there was a weather variable of 4 degrees temperature between the two days of testing, the tempered glass clearly out-performed the other glazing materials on both days. The Plexiglas and prismatic acrylic came in 4th and 5th on both days.

Conclusions/Discussion
My tests demonstrated that Plexiglas and prismatic acrylic were unsuitable glazing materials for efficient solar water distillation. The plastics were unable to stand up to the heat and warped significantly. My tests also demonstrated that tempered glass worked best as glazing material, however corrugated fiberglass and regular window glass both performed well. I would be interested in testing those materials further, and in mathematically modeling the performance.

Summary Statement
This project consists of the construction of a solar water distillation still and testing of 5 different glazing materials for performance.

Help Received
Dad helped with still construction, Mother helped with report.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Mckenzie E. Camp

Project Number
J0804

Project Title
Table Scraps End Power Lapse?

Abstract

Objectives/Goals
The objective is to see if common kitchen waste products: potatoes, orange peels, and cabbage, will produce methane gas, and if so, which will produce the most.

Methods/Materials
I obtained all items needed. Then, I processed and blended all kitchen waste products separately and added five cups of water to each. I opened up the air flow to the tubes with a tire valve tool. Then, using a cake decorating tool, I put the liquid separately into six large tire inner-tubes, having two tubes per product with 3 1/8 cups water and 2 3/8 cups product in each tube.
I put the tubes in a room at regular room temperature for two days. I then put them in a room with a radiant room heater at 86 degrees Fahrenheit for one month and four days, shaking the tubes every few days to keep the product mixed. I then took the tubes outside and opened the cap, putting my thumb over opening so that nothing could escape. I hooked one end of the fuel hose to the campstove, and hooked the other end to the tubes, one by one. I squeezed the tube to get the methane gas flowing up the hose to the stove with a match at the stove. When the fire flamed up and was blue, it meant there was methane gas. I measured the amout of time the methane gas burned for each tube.

Results
For the orange peels, the methane gas burned 7 seconds for the first tube, and 9 seconds for the second tube, giving it an average of 8 seconds.
For the cabbage, the methane gas burned 11 seconds for the first tube, and 9 seconds for the second tube, giving it an average of 10 seconds.
For the potatoes, the methane gas burned 35 seconds for the first tube, and 12 seconds for the second tube, giving it an average of 23.5 seconds.

Conclusions/Discussion
I conclude that my hypothesis was correct. The potatoes did produce the most methane gas. The orange peels produced the least amount of methane gas, but its average was only two seconds below the average of what the cabbage produced. This suggests that we may want to explore using our common kitchen waste products as an alternative fuel source.

Summary Statement
My project is about if these common kitchen waste products- orange peels, potatoes, and cabbage, will produce any methane gas, and if so, which will produce the most.

Help Received
Mom helped glue paper on board; sister helped time the methane gas as it burned; Dad helped come up with the idea, got the tubes for me, and helped put the product in tubes and measure the amout of methane gas.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Yanosh D. Cerovcevic

Project Number
J0805

Project Title
Natural Air Cleaning

Abstract

Objectives/Goals
Observing air quality and visibility in Los Angeles, the following was found: Air was more polluted and visibility was lower before than after rain. Hypothesis: water can clean air.

Methods/Materials
A Rain Chamber was constructed to test the hypothesis. Sprinklers were installed in a plastic cylinder to create rain effect. A hole was drilled and air intake pipe was attached to a lower part of the cylinder. Another hole was made on top of the cylinder and air exhaust pipe was connected to it. A pressure gauge was added before sprinklers. An electric water pump was used to make water pressure and flow. Test was performed in a smog check station. The air intake fitting from the "Rain Chamber" was connected to a muffler of a Plymouth Voyager to conduct tests. To make sure all the pollution out of muffler will come to the device, connecting tubes were sealed with masking tape.

Results
With the water pump turned on and sprinklers creating dense mixture of water particles and mist, CO (carbon monoxide) was decreased 25%, HC (hydrocarbon) 10% and CO2 2%, while O2 was increased by 50%. Results proved my hypothesis correct.

Conclusions/Discussion
The main objective of this project was to create a device that will clean air indoors, similar way as rain does it outdoors. Because of lack of instruments needed to take measurements in that environment that was not possible. The prototype was made for much harder test: to clean polluted air that comes directly out of a car's muffler. With this device, measurements were possible to be taken in any smog test station. My Rain Chamber is good for cleaning air indoors and it can be used in homes, business, hospitals, parking structures, places where people smoke, restaurants and every other place where air may be polluted.

Summary Statement
The main objective of this project was to create a device that will clean air indoors, similar way as rain does it outdoors.

Help Received
Father helped to drill holes in a plastic cylinder. Mr. Ventura, the owner of the smog test center provided equipment and helped with test.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Joshua J. Compton

Project Number
J0806

Project Title
The Effects of Large Woody Debris on Sediment Transport

Abstract

Objectives/Goals
The recent series of storms in December 2002 caused severe flooding in Freshwater Creek. One of the causes of flooding is soil erosion, which results in the transport of sediment downstream. Transported sediment is deposited into the flatter portions of the creek. The upper portions of Freshwater Creek and its tributaries contain significant amounts of large woody debris (LWD).
The objective of this experiment is to determine the effects of LWD on the flow of water and the amount of sediment transported downstream.

Methods/Materials
A model watercourse was constructed, containing two separate channels. An equal amount of soil and rock was placed in each watercourse. Various size limbs and twigs were placed in one watercourse to simulate LWD. The other watercourse was the control. Water was allowed to run down the watercourses at 1.92 oz/sec until 2 gallons of sediment and water were collected. Sediment was separated from the water, dried, and weighed. This process was repeated 5 times.

Results
In all experiments, the LWD watercourse transported approximately one-fourth to one-half less sediment than the control watercourse. The water pushed and trapped sediment against the LWD and caused water to flow around and over the LWD. In both watercourses, there was scouring which created different channels. In the LWD watercourse, the water channel created was narrow and deep. In the control watercourse, the water channel created was wider and more shallow than the LWD watercourse. In the control watercourse, the channel wall was undercut by the flow of water, causing a portion of the wall to collapse into the watercourse and be transported downstream as sediment.

Conclusions/Discussion
The results of this experiment may benefit watershed management. This experiment shows that large woody debris reduces sediment transport, and may reduce undercutting in stream banks. Large woody debris can be placed into watersheds where it is lacking.
Introducing large woody debris in areas where it is lacking may also benefit Freshwater Creek. There would be less sediment transported downstream, and may help the flooding problem.

Summary Statement
This project attempts to simulate the natural conditions of Freshwater Creek, to determine the effects of large woody debris on water flow and sediment transport.

Help Received
My father helped construct the watercourse and stand.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Carolyn Coyle; Julia Doolittle

Project Number
J0807

Project Title
How Does the Soil's Gradient, the Type of Soil, the Flow of Water, and the Presence of Plants Affect Erosion?

Abstract

Objectives/Goals
The purpose of this experiment is to find out how the soil's gradient, the type of soil, the flow rate of water, and the presence of plants affect erosion.

Methods/Materials
Experiment #1 involved 3 different angles of the soil's tilt and measured erosion with constant soil type and drip rate. Experiment #2 involved 3 different soil types with constant angle and drip rate. Experiment #3 involved 3 different drip rates with constant soil type and angle. Experiment #4 was the same as #3 but with plants replacing the soil. All experiments were done in duplicate using gallon water jugs with IV tubing and pans filled with soil placed on angled wooden supports.

Results
Experiment #1 demonstrated that soil erosion as measured by observer visual assessment, volume of erosion channel and amount of eroded material collected increased with increasing angle. Experiment #2 demonstrated that there was greater erosion with sand and potting soil than yard dirt. Experiment #3 demonstrated by all measures that erosion increased with increasing flow rate. Experiment #4 demonstated that when plants were present no erosion took place at any of the 3 different drip rates.

Conclusions/Discussion
We found that soil erosion increases with angle, water flow and varies with the type of soil. Plants were very effective in preventing erosion as a result of their root system. These considerations should be studied any time slopes or hillsides are close to roads or buildings.

Summary Statement
This project examines how varous factors affect the amount of soil erosion.

Help Received
Father helped build wooden angles. Mother helped design water jugs.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Ryan M. Fox

Project Number
J0808

Project Title
Filtration of Toxic Water Using Natural Materials

Abstract

Objectives/Goals
To see if toxins such as Malathion can be filtered from water using natural waste products such as Almond, Pistachio and Walnut shells.

Methods/Materials
Gather Almond, Pistachio and Walnut shells, Activated Carbon, Malathion, crickets, pH strips, chlorine and total chlorine test strips. Mix Malathion at 100%, 50% and 10% strength. Test the pH of the Malathion and plain water. Spray the crickets with the solutions and time their deaths. Create filters from ground up Almond, Pistachio, Walnut shells and Activated Carbon. Filter the solutions, measure the pH and time of death of crickets, compare to unfiltered solutions. Make various total chlorine solutions and run through filters. Increase concentrations until total chlorine can be measured in the filtered water. Compare concentrations.

Results
The pH of the malathion was 4.5. The pH of plain water was 7.5. Only the pH of the Almond shell filter went back up to 7.5. The rest stayed below 7.0. When the filtered solutions were sprayed on the crickets-none died. The Malathion must be gone. Why didn't all of the pHs change??? Could Tanins in the shells be adding pH??? Maybe pH is not a reliable way to check if the filters were working. In my research I discovered that these filters also took out chlorine. I filtered various concentrations of chlorine through the filters and found the the shells took out extensive amounts of chlorine. Up to 5,000 ppm. The shells in all cases worked better than Activated Carbon.

Conclusions/Discussion
Natural waste products such as Almond, Pistachio and Walnut shells can take out toxins in water. Changes in pH was measurable in Almond shells but not Pistachio and Walnut shells. When the filtered solutions were sprayed on the crickets they did not die. This must mean that pH is not always an accurate way to measure how well a filter works. A different way to measure how well a filter is to measure the contaminat directly. I used increasing strengths of chlorine concentrations and measured it with a pool test kit. All the shell filters worked better than the Activated Carbon (chlorine was found using 400 ppm solutions) with Walnut shells still removing chlorine from solutions of 5,000 ppm.

Summary Statement
My project is about the filtertion of toxic water using an argicultural waste product such as Almond, Walnut, and Pistachio shells

Help Received
Dad helped me do the board, get materials, and helped look over my papers.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
John T. Grasel

Project Number
J0809

Project Title
Characteristics of Efficient Solar Water Heaters

Abstract

Objectives/Goals
Enough solar energy reaches the earth in a half hour to provide the world's energy needs for a year. My objective was to see how easy it is to capture solar energy and to determine which variables affect a solar water heater's ability to heat water. After completing my research report, I hypothesized that a solar water heater with fast pump speed and thin, black tubes would create the largest temperature increase.

Methods/Materials
Using Statistical Experimental Design, I designed eight different solar water heaters to examine three different variables (pump speed, tube diameter, and tube color) at two different levels each. I constructed these heaters from two boards, ½ inch and ¼ inch black irrigation tubing, an insulated storage tank, white spray paint, and a fountain pump. I operated each heater in the sun for twenty minutes and recorded the temperature increase in the storage tank each minute. I also re-ran my best heater for eighty minutes.

Results
The best heater used fast pump speed and a black, ½ inch tube, and it raised the water temperature 21.2 degrees. The worst heater used a slow pump speed and black, ½ inch tubes and raised the starting temperature 11.9 degrees. The average temperature increase for all eight heaters was 14.8 degrees, with an approximate experimental error of 1.5 degrees. Using the statistical analysis, I calculated that the average effect of fast pump speed was 2.6 degrees, the effect of increasing tube diameter was 4.0 degrees, and having black tubes increased the temperature 2.1 degrees. There were no significant multifactor interactions. For the best heater, the temperature continued rising after 20 minutes and slowly leveled off after 30 minutes, at a temperature of 103 degrees F.

Conclusions/Discussion
From these results, I learned how to create an efficient solar water heater. I recommend using a high pump speed and ½ inch, black tubes. Of course, the longer you leave the heater out, the hotter the water will get. The fast pump speed is beneficial, because it gets heat to the storage tank faster, thick tube diameter provides more surface area to acquire more heat, and the black tubes absorb more heat.

Summary Statement
Using Statistical Experimental Design, I ran eight experiments with solar water heaters, discovered the best operating conditions for this type of heater, and found an incredibly easy way to capture the sun's energy.

Help Received
My father helped me construct the heaters, and my mother proofread my reports. For my project last year, my parents taught me the basics of Statistical Experimental Design, and I was able to incorporate this knowledge into this year's experiment.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nicholas J. Hennrikus

Project Number
J0810

Project Title
An Efficient, Inexpensive, Space Sparing, Water Desalination Proposal for Residential Communities

Abstract

Objectives/Goals
The objective is to build a model of a desalination chamber and to extrapolate my findings to propose a desalination system feasible for residential communities.

Methods/Materials
Plans for a desalination chamber were drawn, then the chamber was built out of acrylic. Sea water was boiled and fresh water collected. All water was tested for salt, nitrite, ammonia and pH. I measured the time required to boil the water and the amount of water collected and calculated the surface area of my desalination chamber and the cost of the needed electricity. I then used these results to calculate the size of a desalination chamber and the heating price required to produce daily water for family household use.

Results
My desalination model can make 2 gallons of fresh water in a day. Therefore, to make 100 gallons of water per day (the amount allotted to U.S. citizens) an 8ft X 8ft X 8ft chamber would be necessary. A family of 3 would require a 13.7ft X 13.7ft by 13.7ft chamber.

Conclusions/Discussion
My conclusion is that it is feasible to use desalination as a major fresh water source for residential populations. The chamber size that I calculated would fit very easily on the roof of a flat topped portion of a house. Every house could be fitted with a roof desalination chamber that is efficient, inexpensive and of a manageable size. Not only would this proposal solve many of our water issues, it would have far reaching effects on saving our rivers and the vegetation and wildlife that flourish in that environment.

Summary Statement
My project is about efficiently making fresh water from sea water for daily use in residential communities.

Help Received
My parents helped with the calculations, Precision Plastics helped make my desalination chamber, PG&E gave me information on electrical costs.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Erin E. Herman-Kerwin

Project Number
J0811

Project Title
Bond... Paper Bond: Investigating a Sustainable Paper Source

Abstract

Objectives/Goals
We are using up all our trees to make paper and soon we will start to run out of trees. I want to know if I can find a sustainable paper source that can be used to make writing paper. I am going to test three different kinds of plants to find a new fiber source.

Methods/Materials
I tested three types of plants: sage, a woody plant with small pith center; reeds, a hollow dead plant stalk with long fibers; mallow, an annual weedy stem with a thin outer fibrous layer and thick pithy center. Equal volumes of plant stalks were chopped into small pieces, soaked in saturated soda ash solution, pounded with wood beater, cooked in crock-pot in soda ash solution, rinsed and neutralized to pH 7, mechanically processed in blender until all of the plant fibers were small and separated. I then pulled paper from the resulting pulp, dried the new paper on the sliding glass door, and then tested the paper for smooth surface for writing and fiber strength. The overall scores of the resulting papers were compared.

Results
I rated the plants as a fiber source on a scale of 1 to 10 for the new paper's fiber strength and smoothness. The reed stalks made the paper with the smoothest surface and best fiber strength, the sage was too grainy for writing, but fibers were stronger than the mallow, which was an unacceptable source for making paper.

Conclusions/Discussion
The reeds worked best because it did not have a pith to interfere with the fibers binding, had no woody layers with lignin, that were difficult to break down, and the stalk had long cell-wall fibers made of cellulose. The sage did not work very well because the lignin, a plant protein in woody layers, did not break down so it interfered with the binding of the fibers. The pulp fibers need to separate in the vat for making paper. The surface of the sage paper had large pieces of wood that proved that the lignin did not allow the fibers to separate. The mallow plant did not work at all. This plant was an annual that did not have long cell walls or long fibers to make a strong paper. The plant also had a lot of pith that interfered with the fibers binding. If I expanded on this project I would try adding binding agents, such as methylcellulose, to the pulp vat.

Summary Statement
Three types of plants were tested to find a sustainable paper fiber source.

Help Received
Mom supplied paper making equipment, explained pH and chemistry terms

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Cameron A. Huntley

Project Number
J0812

Project Title
High Pressure Reverse Osmosis for a New Kind of Reservoir

Abstract

Objectives/Goals
I believe that I can get lots of fresh water out of the ocean through Reverse Osmosis using the equivalent natural water pressure of the deep ocean, I believe this will be good quality water. If I can show this to be true, then I will show how this could be used in an innovative way, to fill a reservoir for city drinking water.

Methods/Materials
1. Get five-gallon bucket of seawater. Take seawater to a professional laboratory where I can experiment with high-pressure equipment that will emulate the real deepwater ocean conditions that otherwise I would need a thousand foot pipe to do.2. Make observations of water being run through membrane at the same pressure as 800-1000 feet deep in the ocean. Find out the quantity and quality of water I would obtain.3. Document observations and readings with photographs and notes so this study can be used to see how a reservoir could be filled below sea level near a coastal city.4. Use a Pressure Gauge to measure pressure.6. Use a digital device to read temperature, salinity. There are some huge RO membrane systems that would convert enough salt water for a small city. I can see a million of them in use some day making fresh water for our cities' drinking water, and agricultural use.

Results
Test results and conversions on the quantity and quality of water
QUANTITY
17ml 24ml 22ml
I obtained 1.8984 Gallons per hour per square foot of membrane.
I learned at the lab that a typical RO unit has 400 square feet of membrane and the size is 8 inches in diameter by 40 inches long. With a standard size unit my rate of RO would be:
759.36 x 24 = 18,224.64 gallons per day (24 hours).
1,000 units could make 20,404 acre feet per year. Enough water for 40,807 families, 4.3% of San Diego's households.
To make up a 20% loss from other sources like the Colorado River 4,650 8# x 40# RO units would be needed.
QUALITY
440mu 560mu 336mu Mean: 214ppm
Conversion factor 2.7mu=1ppm
I started with 30,000 ppm and ended with average of 214ppm.

Summary Statement
I had an idea that I could get fresh water out of an RO membrane using natural pressure of the ocean, tested it, and had a new idea about it.

Help Received
Used lab Equipment at Unnamable Company

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Thomas K. Mouwen

Project Number
J0813

Project Title
Its Getting Hot In Here!

Abstract

Objectives/Goals
My project is a study of solar energy collection. California has been faced with an energy crisis. Could solar energy provide a possible solution? I believe it could, but I want to make solar energy more efficient. The way that I might do this is to make the collectors better; after all, they gather the energy. The advantages to solar energy could be endless: reduced bills, energy conservation, less pollution, to name a few. Although the idea of using the sun's light as energy has been around since the 1970s, there is much room for improvement.

Methods/Materials
In this study, I tested three different designs of solar collectors. One design was a basic solar collector, one was a concentrated solar collector, and one was my designed solar collector. The basic solar collector was composed of a metal pipe. The concentrating collector used mirrors to direct light to the metal pipe. My designed collector made use of mirrors to create a room in which the pipe would be efficiently heated. Inside of the pipe was water. The water represented the carrier fluid in which the energy would be transferred. I tested the collectors against each other by placing them in the sun and taking the temperature of the water during different times throughout the day.

Results
I found that my hypothesis was correct, in that my designed collector was the most efficient in heating the carrier fluid. My design solar collector reached a temperature of 35° Celsius, within the first half-hour. The concentrated solar collector reached that temperature in an hour and a half. The basic solar collector, on the other hand, took five hours to reach that same temperature. Eventually, all three collectors were within one to two degrees of each other. Therefore, all collectors proved capable of reaching the same temperature. However, the difference was the time that it took for each collector to reach the highest temperature.

Conclusions/Discussion
I found that my collector was the best of the three designs for heating the carrier fluid. These findings show that there is still room for improvement in the solar energy industry. This study made me realize that what I focused on in this project is a tiny fraction of the endless possibilities for a pollution free and an energy efficient society.

Summary Statement
A study to determine if previous solar collectors can be improved to help collecting efficiency, bennifiting the enviroment in many different ways.

Help Received
Mr. Cohen (teacher) guided me through the project. Father helped me build collectors.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jennifer C. So

Project Number
J0814

Project Title
How Efficient Are Direct Electrical Stainless Steel Plates in Reducing the Amount of Impurities from Water?

Abstract

Objectives/Goals
My objective was to see if the application of direct electrical charged plates would reduce the amount of impurities from different samples of water. I believed that the process would be more efficient than water without it.

Methods/Materials
To experiment, attach a stainless steel plate to two opposite sides of two rectangular containers. Add wires on one container and attach to slots on a current meter. Add 1000 mL of water. Cover container. After 30 minutes, record necessary data. Apply electricity and measure initial current for test container. After 15 minutes, record necessary data. Covering the containers prevents dust from entering the water, which might decrease resistance. Electric flow is observed with a current meter and implies an accurately functioning process. The two electrodes pull impurities to the sides, leaving the middle of a container with fewer impurities.

Results
Overall, the results indicated that the direct electrical charge plates did improve the process of separating dirt from dirty water. After each trial, the original water samples' k ohm (KU) resistance were higher. Also, the original water samples# (mA) current was lower. In other words, the water gets cleaner after being tested with the direct electrical charged plates. In trials #1, #2, #3, #4, and # 5, the water resistance (after each test) for the test container increased after being tested with direct electrical charge plates. After the water samples were tested for the test container, the currents decreased, which meant that there was more ionization going on between the plates, then the water will have less impurity.

Conclusions/Discussion
My hypothesis for my project was that the reduction of impurities from water using direct electrical charged plates would produce cleaner water than without. The findings of the results from the water samples support my hypothesis. It is found to be 75% effective. The data I collected agreed to what I predicted. The average resistance improvement of the reference container is 0.3 KU and 5.4 KU for the test container. (The higher the resistance the less impurity it contains.) The average current improvement of reference container is 3.9 KU and 3.8 KU for test container. (The lower the current, more ionization is occurring, which means ions are getting ionized.)

Summary Statement
This project is about reducing impurity from water by applying direct electrical charge plates.

Help Received
My dad assisted me in my procedure; Sister helped with editing my data collection and research; Mom and science teacher provided supplies necessary for project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Vinay Tripuraneni

Project Number
J0815

Project Title
Which Plant Is Most Beneficial to the Environment? A Six Week Study

Abstract

Objectives/Goals

The Purpose of this experiment was to determine which plant produced the most oxygen, thus converting carbon dioxide to oxygen by means of photosynthesis (Carbon Dioxide is a major contributing factor to global warming). I live in the Central Valley where the concentration gradient of airborne particulates and carbon dioxide is alarmingly high, rendering the air quality unhealthy. So I wanted to design an experiment that would eventually help similar residents, and environmentalists seeking a way to impede global warming/habitat degradation.

My hypothesis entailed that the plant with a large surface area to gather light, and a spacious area to grow throughout will be the most prolific oxygenating plant.

Methods/Materials

I used a plant growing apparatus that could only hold six plants. So I used the following plants in the specified weights:

1.Ceratophyllum demersum- 4.55g 2.Ceratophyllum Submersum- 4.8g 3.Lysimachia nummularia-4.55g 4.Myriophyllum aquaticum- 4.5g 5.Vallisneria americana- 4.7g 6.Vallisneria spiralis- 3.8g

After gathering these plants and placing them in their growing chambers under 'grow-lux' light bulbs I set an automatic timer to turn the lights on at 10:00 AM. and off at 8:00 P.M. (a total of a 10 hour time lapse). From then on, I monitored the plants visually and chemically by measuring the pH, presence of trace elements (i.e. nitrates, proteins ect.) and noting any significant physical changes in my log.

Results

Each plant was dried and then weighed on a triple beam balance, where it was measured 5 times to insure no error was made in reading the biomass. The following list details the analysis of the net biomass accumulation and oxygen production from most to least (biomass/oxygen):

1.Myriophyllum aquaticum- 1.8g/0.46g 2.Vallisneria spiralis- 0.5g/0.1g 3.Ceratophyllum Submersum- 0.3g/0.06g 4.Lysimachia nummularia- 0.2g/0.04g 5.Ceratophyllum demersum- 0.15g/0.03g 6.Vallisneria americana- 0.1g/0.02g

Conclusions/Discussion

My hypothesis was not supported by my conclusion because my experiment demonstrated that a plant's surface area may not be the major determining factor of a plant's ability to photosynthesize. Perhaps other environmental factors such as lack of submersion, and exposure to an open air environment allowed Myriophyllum Aquaticum, to be the most successful at photosynthesizing

Summary Statement

My project was geared towards testing for the most environmentally beneficial aquatic plant.

Help Received

Miss Amie Mazzoni arranged for me to borrow the plant growth apparatus and any other materials I needed. My father helped in assembling the board.