CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Kaitlyn A. Arst

Project Number
J1001

Project Title
The Effect of Yeast as a Biodegradable Solution in Decomposing Plastic and Bio Plastic Cups: Year 2

Abstract

Objectives/Goals
The objective is to find out whether the materials in plastic, cornstarch, sugar cane or home made potato starch cups will deteriorate when a home made yeast solution is applied on them. My research shows that plastic and bio plastic materials take decades to decompose and this can create a problem for the health of people and animals. I hope to find a more eco-friendly solution to degrade plastic materials.

Methods/Materials
A yeast solution was spread onto the plastic, cornstarch, sugar cane and potato starch cups. These 4 different types of cups were then buried into containers filled with mulch to see if they would disintegrate.

Results
The results showed the homemade yeast solution degraded the plastic and bio plastic cups. The plastic cup with no yeast solution did not degrade. After a month all the cups with the yeast solution had some sort of degradation. The plastic cup degraded from a weight of .2 ounces to .1 ounce. The Bioplastic cups degraded from a weight of .5 ounces to .3 ounces. There were visible signs of deterioration on the biodegradable cups but not the regular plastic cups. The homemade potato starch cups deteriorated but had water added to them as they melted. The water increased the weight from 2.7 ounces to 3 ounces.

Conclusions/Discussion
My conclusion is that the homemade yeast solution did work to degrade the cups. My hypothesis that the sugar cane cup with the yeast solution worked the best was proven to be correct since it showed more signs of decomposition. The homemade potato starch cups need more strength for it to be an alternative to plastics. In the future I will like to use eggshell powder to strengthen the potato starch cup and use a different household ingredient like vinegar to see if it can degrade both Styrofoam and plastics.

Summary Statement
My objective was to determine whether plastic and Bioplastic materials could be decomposed using a yeast solution.

Help Received
My mother took photos and checked over my work.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Shivani Bhushan

Project Number
J1002

Project Title
Do Marine Plants Reverse Ocean Acidification?

Abstract

Objectives/Goals
The objective is to determine whether marine plants (seagrass and sea lettuce) reverse ocean acidification.

Methods/Materials
One trial required a total of four aquariums. Aquarium A was the control containing sand and ocean water. Aquarium B had seagrass added. Aquarium C had sea lettuce added and Aquarium D had both seagrass and sea lettuce. The pH, salinity, specific gravity, temperature and calcium levels of these aquariums were tested and compared to the control. A total of four trials were conducted, each lasting two weeks.

Results
The control aquariums in this experiment had fluctuating pH's through all tests. In contrast, the aquariums with sea plants had predictable increasing pH trend lines. The other measurement, were the sanity variable to make sure the ocean water stayed within the natural coral reef range.

Conclusions/Discussion
The control tank's pH did not show any consistency throughout the trials conducted. However, the aquariums with plants showed an increasing trend in the pH values. The pH values of containers with plants would increase until around the 8.6 mark (ideal for coral calcification) where it would stabilize. All the sanity variables stayed within the required range making the entire project valid. If seagrass beds and sea lettuce fields were propagated in coral reefs, this would slow down/perhaps stop ocean acidification from destroying more reefs in the future.

Summary Statement
When seagrass and sea lettuce are added to an ocean environment, they increase the water's pH, therefore reversing ocean acidification.

Help Received
My teacher, Mrs. Gillum, helped by guiding me through this project. My dad helped by driving me from the beach to Petco in order to get the testing equipment. Dr. Jameal Samhouri was my mentor and helped to establish the water parameters to measure. Birch Aquarium provided the test plants.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Eli Bjorklund; Parker Hite

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.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Anna D. de la Rosa

Project Number

J1004

Project Title

An Ap'peel'ling Purifier? Using Banana Peels to Remove Copper from Water

Abstract

Objectives/Goals

The experiment was to determine and measure the effect of banana peels on water containing copper ions. My hypothesis was that the banana peels would decrease the amount of copper in the water and that the more banana peels are used, the larger the decrease would be. My objective was to see if banana peels could be used as a purifier of water contaminated with copper.

Methods/Materials

The experimental set-up was made up of 4 groups of 4 jars per group. Each jar was filled with 300 mL of 1.0 ppm copper ion solution. Each group was mixed with different amounts of pulverized banana peels: none for control, 0.5 grams, 1 gram, and 2 grams. Samples were withdrawn at various times (3, 9, 24, 48, and 72 hours) after the initial set-up. The samples were tested for copper concentration with a LaMotte copper test kit and the results were recorded. The degree of copper extraction at various times relative to the different amounts of banana peels used was graphed based on the average of 4 data points for each group.

Results

All samples with banana peels showed decreases in copper concentration over time. The group with 2 grams of banana peels removed the largest amount of copper within the first 24 hours. At all tested amounts of banana peels, the copper concentration leveled off at very low values after 72 hours.

Conclusions/Discussion

My results supported my hypothesis; banana peels have a positive effect on the removal of copper from the copper ion solution. As such, they could potentially be considered for an environment-friendly method for converting wastewater into "recycled" water.

Summary Statement

My project proved that banana peels show great promise for being able to remove copper from the water contaminated with copper ions.

Help Received

Parents helped take pictures of experimental set-ups and results.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Aidan D. Dougherty

Project Number
J1005

Project Title
Cleaning Up Oil Spills

Abstract

Objectives/Goals
The purpose of this experiment was to determine which natural absorbent would be the best at/most useful in absorbing oil. Three materials were tested including, dried cornhusks, unsalted peanut shells and turkey feathers. The hypothesis was that dried cornhusks would be the best absorbent of oil. One hundred samples of each material were tested and measured for oil absorbency providing results for a total of three hundred samples.

Methods/Materials
Samples of each material were put into non-absorbent organic tea bags. Each sample was weighed and recorded in grams. The samples were laid in a uniform one-inch of oil for exactly twenty-four hours and then taken out and weighed with the weight after testing being recorded. The weight gain and percentage of absorption were calculated based on these measurements.

1 bag of dried cornhusks; 1 bag of peanuts (unsalted, roasted); 300 turkey feathers
3 shallow trays with lids
PEAK Performance Motor Oil (low additive motor oil)
Organic teabags; timer/clock; gloves; metric scale

Results
The average uptake for turkey feathers was 13.8 grams and the average % of absorption was 2,673%. The range of uptake for turkey feathers was from 8.4 grams to 17.6 grams and the range of % of absorption was 1,514% to 5,067%. Dried cornhusks had an average uptake of 11.8 grams and average % of absorbency of 1,198%. The range of uptake for dried cornhusks was from 6.5 grams to 17.7 grams and the range of % of absorption was 715% to 2,933%. The average uptake for peanut shells was 12.4 grams and average % of absorbency of 1,035%. The range of uptake for peanut shells was from 8.0 grams to 16.1 grams and the range of % of absorption was 510% to 1,567%.

Conclusions/Discussion
In conclusion, the hypothesis for this project was proven wrong. The hypothesis for this experiment was that dried cornhusks would be the most oil absorbent. The dried cornhusks ended up as the second most absorbent. The material that performed the best was the turkey feathers. The material that performed the worst was peanut shells. Dried cornhusks did not absorb the most oil, turkey feathers did. Those in the oil cleanup industry may want to consider using turkey feathers to cleanup an oil spill.

Summary Statement
The purpose of this experiment was to determine which natural absorbent (unsalted peanut shells, dried cornhusks or turkey feathers) would best absorb oil following an oil spill.

Help Received
Mother assisted in typing report, teacher provided general guidance and support, parents oversaw testing.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Cameron Garcia Brown

Project Number
J1006

Project Title
Worms: Earth's Answer?

Abstract

Objectives/Goals
My project was to determine what materials were best for the worms and which were best for the soil. I believe that the pot with a combination of dirt, leaves, coffee, fruit, vegetables and eggshells will be best for the soil and for the worms.

Methods/Materials
Five flower pots with drain dishes were filled with top soil (no added fertilizers) leaving 2 inches at the top empty. The soil was tested first using a home soil testing kit and then dampened with 3/4 cup of water. One pot had only the dirt. For the other four, I added some leaves, coffee and twigs to one pot, one pot I added fruits and vegetables, another had only crushed eggshells and the last one had all the ingredients previously listed. Fifty worms were weighed and then added to each pot for a total of 250 worms. Every few days food and water were added as needed. After two months the soil was dumped out. The worms were counted and weighed and each soil was tested again.

Results
After the second experiment (the first time none of the worms survived after a month), the pot with the leaves, twigs and coffee had the most and heaviest worms. The pot with everything in it had the best soil results.

Conclusions/Discussion
The pot with the leaves, twigs and coffee had the best results because it is most similar to where red worms live in nature (the litter level). The everything pot is most like the traditional method of composting and therefore had the best soil results.

Summary Statement
Finding the most suitable environment for red worms and soil for efficient composting.

Help Received
My Mom helped with grammar. San Carlos Science Fair advisors gave advice and guidance.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Brian H.B. Hartman

Project Number
J1007

Project Title
The Power of Peat Moss

Abstract

Objectives/Goals
The purpose of my experiment was to find which mixture of Peat Moss would absorb the most oil pollutant in water.

Methods/Materials
The materials I used were: Greensmix Peat Moss, Uni-Gro Organic Peat Moss, Miracle Gro Peat Moss, Marvel Mystery Oil, water, and Polymer Powder. To perform the experiment I filled a beaker with 700ml of cold water, poured 100ml of oil into the water, then poured 3/4 cup of Peat Moss onto the water and waited for the oil to be absorbed. Next, I scooped the Peat Moss/oil mixture off the water and placed it in a strainer to let any excess oil drain. I used a dropper to extract the excess oil that drained from the Peat Moss. I then poured Polymer Powder onto the oil causing it to solidify and I weighed it the triple beam balance.

Results
In the first trial, Greensmix did not absorb 27 g of oil with polymer, Uni-Gro Organic did not absorb 11.5 g of oil with polymer, and Miracle Gro did not absorb 60 g of oil with polymer. In the second trial, Greensmix did not absorb 27.5 g of oil with polymer, Uni-Gro Organic did not absorb 10 g of oil with polymer, and Miracle Gro did not absorb 70 g of oil with polymer. In the third trial, Greensmix did not absorb 26.8 g of oil with polymer, Uni-Gro Organic did not absorb 14.7 g of oil with polymer, and Miracle Gro did not absorb 67 g of oil with polymer. The results revealed that Uni-Gro Organic Peat Moss was able to absorb and retain the most oil pollutant in water.

Conclusions/Discussion
My hypothesis that Greensmix Peat Moss would absorb the most oil pollutant in water was not supported by the results of my experiment. What I think happened was that Uni-Gro Organic Peat Moss is a species of decayed Sphagnum moss that has more empty cells capable of absorption than Greensmix Peat Moss. If I were to expand my project, I would test many different brands of Organic Peat Moss because of the variations of their capacities to absorb and retain different amounts of oil.

Summary Statement
The purpose of my project was to determine which mixture of Peat Moss would absorb the most oil pollutant in water.

Help Received
My parents purchased the materials for my project, and my mother helped me take photographs for my project.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Cole M. Jarvis

Project Number
J1008

Project Title
Can a Rooftop Garden Help to Keep a Building Cool?

Abstract

Objectives/Goals
The purpose of this project was to find out if green roofs will keep a building cool inside. The hypothesis was if one box is lined with tarpaper only, and another box is lined with tarpaper and sod, then the box with the sod will would keep the inside temperature of the box cooler.

Methods/Materials
For this experiment, the materials needed are two shoeboxes, tarpaper, sod, three thermometers, tape, scissors, and a heat lamp. One shoebox was covered in tarpaper only, which was taped on to the box. The second shoebox was covered with tarpaper and a layer of sod on top of the tarpaper. This experiment was carried out in one day. They were placed outside on concrete with a thermometer in each box, and one placed outside between the boxes. They were allowed to sit in the sun for 30 minutes and then the temperature was checked on all 3 thermometers. Temperatures were recorded. The temperatures were checked at 30-minute intervals for 4 hours. A heat lamp was set up indoors to simulate a hot, sunny day with consistent heat. The boxes were placed evenly under the lamp with the thermometers in place as they were outside. The boxes sat under the lamp for one hour. The temperature was checked and recorded. The lamp was then turned off and the temperature was checked and recorded after 15 minutes. After another 15 minutes, the temperature was checked and recorded.

Results
The box with the tarpaper only consistently had temperatures that were higher than the outside temperature. The box with tarpaper and sod consistently had temperatures that were lower than the outside temperature.

Conclusions/Discussion
The conclusion was that the hypothesis was proven correct. The box that was lined with tarpaper and sod kept the inside temperature cooler than the box that was lined with tarpaper only.

Summary Statement
Rooftop gardens help to keep the inside temperature of a building cooler.

Help Received
Mother helped to type the report, classmate helped to create the boxes

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Madelyn R. Kent

Project Number
J1009

Project Title
What Types of Variables Help Compost Break Down Faster?

Abstract

Objectives/Goals
The objective of this experiment was to see which types of variables help food waste compost the fastest. My goal was to reduce the amount of food waste that would normally go into the landfill.

Methods/Materials
Materials
1.Wood 2.Food waste 3.Wood chips 4.Saw dust 5.Shredded office paper 6.Straw 7.Compost thermometer 8.Water 9.Shovel 10.Tarp

Methods
1. Build the bins 2. Chop up food scraps 3. Layer 6 inches of variables and 2 inches of food waste in each bin until full 4. Take the temperature in the side, middle, and bottom of the compost 5. Turn the piles every 3 days 6. Check the moisture in each bin everyday 7. If compost is dry, water it until it#s moist 8. Check the temperature, water, and turn the compost then cover all of the bins with a tarp 9. Repeat this every day or every other day for two months or until one of the compost piles have fully broken down.

Results
Bins number 1 and 4 barely broken down. In bin number 3 the food broke down but the variables did not. Bin number 2 stayed the warmest and both food and variables broke down the fastest.

Conclusions/Discussion
My conclusion was that my hypothesis was wrong - bin number 2 was the winner. The paper, sawdust, and food scraps all broke down a lot more than the other bins of compost. I believe that it was because of the weather that bin number 2 was more successful. The temperatures in my compost were very low because I live in Prunedale where it is very cold and we hardly get any sun. When I was doing this experiment I noticed that I had to stop turning the compost for a couple of days because when I didn#t turn it, it heats up and when I did turn it, it let out all the heat. Then it has to start heating all over again. It was cool to see what things I needed to change with each bin. It was like they each had a different personality.
I learned that with an 8 cubic compost bin, in 2 months I could remove 70 pounds of food waste and 10 pounds of paper out of the landfill. If every school had a 6 x 6 compost bin, in 2 months we could remove 630 pounds of food waste and 90 pounds of paper. In a year all of that would turn into 3,780 pounds of food waste and 540 pounds of paper! Imagine if every school in our district did that!

Summary Statement
My purpose was to find the best variable to speed up and simplify the composting process so people would want to use their own food scraps to reduce the amount of waste going into the landfills.

Help Received
My dad built the 4 bins; My dad helped turn the composting piles

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Chase W. King

Project Number
J1010

Project Title
Hot and Cold Insulators: Can You Keep Your Cool Naturally?

Abstract

Objectives/Goals
My objective was to determine whether some abundantly available and ofter wasted, natural or recycled materials, such as coconut husks, dirt, rice hulls, straw, cocoa bean hulls, packing peanuts, shredded plastic water bottles or denim, could be used as viable, efficient "green" alternatives to the typical R-19 home insulation used in most buildings today. My hypothesis was that natural or recycled materials, which can be compacted well into small spaces, would prove to be effective insulation in both hot and cold environments.

Methods/Materials
To determine this, I constructed a "room" from 1/2" plywood and surrounded it with an outer plywood wall leaving a 3 1/2" wall space for insulating materials, including floor and ceiling insulation. The materials listed above, as well as R-19 fiberglass insulation, was packed into the wall space around the inner "room". A test with no insulation at all was also tested for comparison. Using a consistent starting "room" temperature, the box was tested with each insulating material in both a hot (65º C oven) and cold (0º C freezer) environments. A digital thermometer probe was placed into the center of the "room" and used to record the temperature rise or drop in 1ºC (hot) and 2ºC (cold) increments until a maximum or minimum temperature had been reached. The data was placed in a spreadsheet and compared in graph format.

Results
Dirt proved to be the best overall insulator in both hot and cold environments. Furthermore, the majority of the natural ingredients which were found to pack tightly together proved to be efficient insulators and were found to be superior to R-19.

Conclusions/Discussion
I concluded that there are several abundant, natural materials (dirt, cocoa bean hulls, shredded coconut husks, rice hulls and denim) which could be used as highly effective home insulators when compared to R-19 or the uninsulated home. These materials were selected because they are readily available in many countries and are currently discarded or burned. If we can develop a way to contain and easily install these items into an easy-to-use insulation product (i.e batting or fleece), it could be a viable alternative in areas where these materials are plentiful and inexpensive. Designing homes using existing hills to act as insulation, or adding living roofs will cut down on energy use and pollution.

Summary Statement
My project will test natural and recycled materials in both hot and cold environments, comparing them to R-19, to determine if they can be a viable alternative for efficient home insulation.

Help Received
Parents purchased supplies and supervised power tool use.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Jordan T. Kulischak

Project Number
J1011

Project Title
Can Algae Reduce Methane Production from Cow Manure?

Abstract

Objectives/Goals
Globally, 28% of the world's methane emission came from livestock and methane is a contributing factor of global warming crisis. The purpose of this experiment is to determine whether algae has a role in decreasing methane production when it is grown on cow manure. The hypothesis is that algae would be able to reduce methane production by 20% when it is co-digested with cow manure.

Methods/Materials
In the first trial, the cow manure and the cow manure/algae digesters were closed and left outdoor for 1 week. After 1 week, the digesters were placed under a heat lamp for a period of 7 days. Gas sample was analyzed using a mass spectrometer. In trial 2, the digesters were not capped, allowing algae to have air exchange and exposure to sunlight during the first 7 days. The digesters were then exposed to heat lamp as in trial 1. Gas sample were collected and analyzed.

Results
The cow manure/algae digester had 69% methane on day 1 and increased to 72.4% on day 2. The cow manure started with 17.6% and dropped to 16.4% on day 2. The cow manure/ algae digester produced more methane than the cow manure group. In the second trial, on day 4, the cow manure group showed 18% methane concentration. The cow manure/algae group displayed 12.4% methane concentration which is 22% less methane production than the cow manure group.

Conclusions/Discussion
The combined results of the two trials support the hypothesis. The set up for trial 1 was not designed properly to test the hypothesis. The algae was not alive and served as additional organic substrate for the digestion process. A redesign of the experiment that allowed an open, healthy ecosystem for algae growth was done for trial 2. The result of trial 2 supports the hypothesis that algae when grown on cow manure can reduce methane emission from cow manure. Additional trials should be conducted to obtain more data to validate the hypothesis.

Summary Statement
The objective of this study is to evaluate whether algae can reduce methane production from cow manure.

Help Received
Drs Lueker and Paplawsky offered the use of mass spectrometer for gas analysis.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Benjamin Lee

Project Number
J1012

Project Title
DuckWeeding Out Contaminants

Abstract

Objectives/Goals
The objective of this experiment was to investigate the use of duckweeds, Lemna minor and Spirodela polyrhizza, in phytoremediation in removing acetaminophen, caffeine and estradiol safely from contaminated water.

Methods/Materials
Duckweeds were harvested from a pond in the Golden Gate Park. Stock solutions of acetaminophen, caffeine and estradiol were prepared. Eight mason jars were set-up as follow:

1. One jar of 200 ml of distilled water and one jar of 200 ml of the pond water as negative controls.
2. Three jars of 200 ml of each of the three chemicals tested, positive controls.
3. Three jars of 200 ml of each of the three chemical with three grams of duckweeds in each.

Six 2 ml samples were obtained from each jar over seven days. All samples were cryodessicated and reconstituted for analysis using the gas chromatograph mass spectrometer (GCMS). Results were tabulated and plotted.

Results
The chromatograms did not show the presence of acetaminophen, caffeine or estradiol in the distilled water or pond water at any time point.

There was a slight decreasing trend in the acetaminophen concentration without duckweeds over time. In the presence of duckweeds, there was total removal of the acetaminophen after seven days (T0-T168: -100%).

The concentration of caffeine remained relatively constant without duckweeds. In the presence of duckweeds, there was a significant decreased in caffeine concentration after seven days (T0-T168: -41.6%).

There was an overall decrease in estradiol concentration without duckweeds, but the decrease was more marked in the presence of duckweeds after seven days (T0-T168: -93.3%).

Conclusions/Discussion
The experiment proved that duckweeds removed acetaminophen, caffeine and estradiol effectively from

Summary Statement
Duckweeds removed acetaminophen, caffeine, and estradiol from water using phytoremediation.

Help Received
Ms. Bryan at USF supervised the use of lab equipment and advised during the interpretation of results and wiite-up. Dad helped with poster board.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Kimberly J. Mitchell

Project Number
J1013

Project Title
The New Gassy World

Abstract

Objectives/Goals
The purpose of this experiment is to find out if the use of leftover fruits and vegetables from supermarkets used like feedstock in an anaerobic digester is a cheaper alternative to produce biogas in place of specialized energy crops at the same anaerobic conditions.

Methods/Materials
To conduct this experiment, I had to build a biogas system and make samples for Predigester A and Predigester B. After that,I put slurry A into C,D, and E and slurry B into F,G,and H; put the digesters into temperatures 59F (C and F),72F (D and G),and 100F (E and H) for 10 days, measuring biogas using water displacement and Syringe Protocol.

Results
Slurry F produced more biogas than slurry C at 59F, slurry G produced more biogas than slurry d at 72F, and slurry E produced more biogas than slurry H at 100F. The most production of biogas produced was at 100F for slurry E and slurry H, but slurry H had the most production of biogas.

Conclusions/Discussion
My hypothesis should be considered false because the feedstock of maize and sorghum produced more biogas than the feedstock of vegetables and fruit.

Summary Statement
My project is about if the combination of unsold fruits and vegetables could produce more biogas than the combination of specialized energy crops, maize and sorghum.

Help Received
Father helped me with building the biogas system. Father and Mother supervised me for my safety.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Maximilien J. Moreno

Project Number
J1014

Project Title
Earth: The Great Decomposer with a Boost

Abstract

Methods/Materials
I collected different soils, manure and compost. I buried orange slices, added water on a daily basis and extracted them days apart to see which method was faster at decomposing.

Results
I found out that a sandy soil mixed with steer manure decomposed the quickest.

Conclusions/Discussion
My conclusion was incorrect. I thought that a sandy soil with compost would decompse faster but it was the sandy soil mixed with steer manure that was a faster decomposer.

Summary Statement
My project is to help land fills speed up decomposition so we dont have to keep destroying more land.

Help Received
My father helped me by providing contact numbers to Mr. Lang and Mrs. Neelson who both work for the agriculture department. My grandfather who provided the steer manure and compost from his nursery. My mom for helping stay awake and some typing. My aunt for providing me with the design of my display

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Kai T. Narum

Project Number

J1015

Project Title

Pay More Attention to Bioretention: Effectiveness of Filtration Media for Removal of Pollutants from Stormwater

Abstract

Objectives/Goals

Raingardens use bioretention to filter pollutants from stormwater using layers of media. The filtered water can then be returned to the environment without causing harm. The objective of my project was to determine the media most effective at filtering pollutants from stormwater. I tested four different media: 1) layered coarse gravel, pea gravel and sand(layers), 2) tire-derived aggregate(TDA), 3) a mix of sand, clay, and organic material(mix), and 4) crabshell below a mix layer(crab).

Methods/Materials

I prepared four testing chambers with each of the different media and collected three samples of stormwater (2 L volumes). Before filtering, I tested the media for saturated hydraulic conductivity, and the stormwater for turbidity (suspended solids), pH, conductivity (dissolved solids), and total solids (suspended plus dissolved solids). I used water quality instruments to measure turbidity, pH and conductivity and a gravimetric analysis to measure total solids. I filtered 300 mL of each stormwater sample into a chamber and tested the filtered water for turbidity, pH, conductivity, and total solids. I repeated each measurement three times for the three stormwater samples resulting in 180 data points.

Results

The average saturated hydraulic conductivity ranged from 91 ft/day for the mix media to 470 ft/day for the TDA media. I found that the mix was very effective at reducing turbidity (80-99%) but greatly increased total solids (546-869%) and conductivity (3743-5151%). Average pH increased from 5.9 to 11.2. My research suggests the increases were due to the presence of hydroxide salts in the clay. The crab media had similar results, (but not as drastic), because of the mix layer above the crab. The layers media and TDA media reduced total solids by 36-39% on average; however, the TDA was more effective at reducing conductivity (19% on average). The reductions in turbidity varied greatly (16-98%) and were dependent on the initial turbidity of the stormwater. Both the layers and the TDA kept the pH at about the same level.

Conclusions/Discussion

The layers and TDA were equally effective at eliminating pollutants based on my testing, but the mix was the most effective at reducing turbidity. I plan to design a new media chamber that incorporates the turbidity-reducing properties of clay and the conductivity-reducing properties of TDA. The results of these experiments will be presented at the state science fair.

Summary Statement

The goal of my project was to determine the effectiveness of different filtration media in bioretention areas at elimination pollutants from stormwater runoff.

Help Received

Lewis McCrigler and Marty Reed of HSU assisted in the construction of the sample cells; used lab equipment at HSU under supervision of Dr. Eileen Cashman; Colin Wingfield of HSU assisted in media preparation; Ms. Diana Skiles and David Narum (dad) helped with editing and suggestions for backboard.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Emerson R. Perez

Project Number
J1016

Project Title
Testing Different Materials That Inhibit the Passage of Airborne Contaminants

Abstract

Objectives/Goals
My objective was to test what materials would best inhibit the passage of airborne contaminants.

Methods/Materials
The materials I used were: 100 copies of 10x10 cm grids, cotton, polyester, Kirkland Brand paper towels, 3-ply toilet paper, kleenex, and Pam cooking spray. Each of the 100 grids was taped on an upright surface with the 5 different materials taped to each grid. The Pam cooking spray was held 13 inches away and sprayed for 5 seconds. I waited 10 seconds for the spray to penetrate the material. I counted the number of boxes that were totally covered or partially covered with spray and determined the percentage of spray coverage. (For example, if 62 of the boxes were covered, then 62% of the grid was covered with spray. I counted partially covered boxes to make wholes.)

Results
The results showed that the cotton was the best material for inhibiting the passage of spray. The polyester was the worst material for inhibiting the passage of spray.

Conclusions/Discussion
I concluded that the cotton was the best material for blocking the passage of airborne contaminants. This is important to know, especially if you work in the health care industry or if you just want to stay well during the cold of flu season. If you know this information you can choose to use cotton masks to stop yourself or people around you from getting sick from airborne contaminants.

Summary Statement
My project is about discovering what material would be best to use to block any airborne contaminants from getting people sick.

Help Received
My mother helped to proofread my typing.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Connor M. Pofahl

Project Number
J1017

Project Title
Phytoremediation Plants that Clean Aquatic Environments

Abstract

Objectives/Goals
The purpose of the project was to determine which plant would absorb copper at the fastest rate. I believe soft rush will be most effective at absorbing copper.

Methods/Materials
I created aquatic environments by using one of the three selected plants: cattail, soft rush, and elodea (independent variable) in a 1ppm copper solution (dependent variable). Each environment was also given a control with 0ppm of copper. For five days, I tested each environment for the amount of copper in the water using copper test strips. Three trials of this experiment were completed.

Results
I averaged the results of all three trials to determine which plant absorbed the most copper at the fastest rate. By day five, the environments for cattail and soft rush measured 0ppm. During the five-day period, soft rush left smaller amounts of copper in the environments than cattail and elodea. Soft rush averages were: 0.37 (day 2), 0.17 (day 3), 0.03 (day 4), and 0.0 (day 5). Cattail averages were: 0.40 (day 2), 0.23 (day 3), 0.1 (day 4), and 0.0 (day 5). Elodea absorbed no copper leaving it at 1ppm at day 5.

Conclusions/Discussion
My results did support my hypothesis of soft rush being most effective at absorbing copper from the water environment. I believe that soft rush#s root system benefits its performance in this task. I think that other plants with a massive root structure would also perform well at absorbing contaminants from aquatic environments. The ability of plants to safely remove contaminants from waterways benefits our efforts to keep the environment healthy and safe.

Summary Statement
This project is about using plants to remove contaminants (i.e. copper) from water environments.

Help Received
A family friend helped me retrieve some of the plants.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Kaitlyn A. Russo

Project Number
J1018

Project Title
The Effect of Elodea on Polluted Water

Abstract

Objectives/Goals
If elodea is placed in polluted water, will it counteract the effects of the pollution in the water by increasing the amount of dissolved oxygen and maintaining a healthy level.

Methods/Materials
My experiment will have two parts. First, I have to collect all the water needed for my experiment. In order to collect rainwater, I must wait for it to rain. When it starts to rain, I will put out 6 containers to catch rainwater. Then, I will gather a gallon or more of the water. Next, I will have my mom drive me to different locations all over town and collect a gallon or more of stormwater. Finally, I will buy 2 gallons of distilled water that can be found in my local grocery store. For the second part of my experiment, I will test all the waters for dissolved oxygen with a dissolved oxygen testing kit. Next, I will fill 4 jars with rainwater. Then do the same for all the waters. I will allow them to sit for a week to allow for any changes. I will then test them for dissolved oxygen again. Then, I will put two elodea plants in each jar. I will seal them all tightly and label them. I will wait and watch for another week. Finally, I will test the dissolved oxygen level of each type of water and record.
Materials
16 quart-sized mason jars, Collection trays, 2 gallons distilled water, Recording sheets, A dissolved oxygen kit, 32 elodea plants

Results
Rainwater went from 9ppm to 6ppm a 33% change and ponding basin water (the most toxic) went from 6ppm to 3ppm a 50% change and stormwater went from 8ppm to 4ppm also a 50% change. Now my control distilled water went from a 9ppm to an 8ppm that is an 11% change.

Conclusions/Discussion
After completing my investigation I found my hypothesis was incorrect.Distilled water showed that the level of dissolved oxygen was less harmful than all the other water types. This shows that if there aren#t any contaminates, then the elodea is better able to maintain a healthy level of oxygen in water. Rainwater showed that the level of dissolved oxygen was the 2nd highest. Ponding basin water showed that the level of dissolved oxygen was the lowest in the experiment. The pollution caused a visible algae bloom and the elodea was unable to counteract the effects to a healthy level. stormwater showed that the level of dissolved oxygen was one of the lowest in the experiment. The oxygen produced by the elodea was not enough to counteract the pollution.

Summary Statement
Determining if elodea, placed in polluted water, will help keep oxygen in the water and maintain a health level.

Help Received
Mother helped me type and drove me to gather water.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Nick T. Scheel

Project Number
J1019

Project Title
The Reverse of Respiration

Abstract

Objectives/Goals
The purpose of the experiment was to observe the effects of fresh water aquatic plants on the acidity levels of bodies of water. Carbon dioxide levels in the atmosphere are on the rise mainly because of deforestation; carbon dioxide affects the pH in bodies of water and the tests will show how well different plants regulate pH through photosynthesis.

Methods/Materials
The purpose of the experiment was to observe the effects of fresh water aquatic plants on the acidity levels of bodies of water. Carbon dioxide levels in the atmosphere are on the rise mainly because of deforestation; carbon dioxide affects the pH in bodies of water and the tests will show how well different plants regulate pH through photosynthesis.

Results
After choosing three common fresh water aquarium plants, the scientists immediately began testing. It was concluded that Elodea not only continued to keep the 1.9 liter bowl of water at an average pH of 6.9, but also retained a average of 6.3 milligrams per liter, blowing away the competition!

Conclusions/Discussion
It was concluded that Elodea not only continued to keep the 1.9 liter bowl of water at an average pH of 6.9, but also retained a average of 6.3 milligrams per liter, blowing away the competition!

The hypothesis was supported in both ways, as the pH increase and was regulated, and Elodea out performed any other plant.

The scientist learned how plants affect our ecosystem and how important they really are. With carbon dioxide levels on the rise and deforestation happening so fast, the supply of oxygen formed from photosynthesis is shrinking; testing how different plants photosynthesize is important in order to see which plants can put off the most oxygen to reverse the effects.

Summary Statement
What is the Best Aquarium Plant?

Help Received
Checked out equipment from St. Margaret's ; Friend helped design logo on board

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Anna D. Singer

Project Number
J1020

Project Title
Warm It Up! Grass or Fruit Cup? Do Grass Clippings or Fruit and Vegetable Waste Create More Heat Energy in a Compost?

Abstract

Objectives/Goals
The purpose of this experiment was to see if grass clippings or fruits and vegetables create more heat in a compost pile. When I was in 5th grade, we had a compost bin at school, and it heated up a lot, so I was wondering what I could do to make it heat up more. Also, French innovator Jean Pain developed compost-based energy to create all the energy he and his wife needed to live on their farm. For the purpose of my project I wanted to see which one would be most effective for the Jean Pain method: grass or fruits and vegetables.

Methods/Materials
First, I made two compost bins by taking garbage cans, cutting off the bottom, and drilling holes on the sides. Next, I set up the compost bins by putting the bins on dirt and layering them with the carbon (woodchips) and nitrogen (fruit and vegetables/grass). I then waited a day and measured the temperature of the composts by taking two tin cans, pouring 200mL of water in them, and placing them in the middle of the compost to record the temperature. I repeated that step 14 times. Every couple of days, I aerated it by using a compost aerator and shovel to make sure the whole compost received air. Then I converted all my temperature measurements into heat energy.

Results
The results of my experiment showed that grass clippings as the nitrogen source in a compost pile produced more heat energy than fruit and vegetable waste. Heat energy from the grass clippings compost bin was higher than the fruit and vegetable bin for 14 of 15 days.

Conclusions/Discussion
My hypothesis that fruit and vegetable waste would release more heat energy than grass clippings in a compost pile was proved false. I think the reason why the fruit and vegetables did not produce as much heat is because the grass is smaller, so there is more surface area, which helps the bacteria decompose the materials. If I were to change my experiment, I would a) add more carbon because the grass compost did not have many woodchips left in it after about a week and b) have larger composts because the one made by Jean Pain was 80 cubic meters, about 661 times bigger than mine, and his compost got much hotter.

Summary Statement
To investigate if grass clippings or fruit and vegetable waste create more heat energy in a compost pile.

Help Received
My dad helped me by showing me how to use an electric drill and a lawn mower. My mom helped me ask friends, local supermarkets, and Sky Chef for produce waste.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Serena J. Soh

Project Number
J1021

Project Title
Air for the Microbes

Abstract

Objectives/Goals
Objective: To find the most effective method of aerating compost

Methods/Materials
Materials and Methods: 12 plastic bins were filled with equal amounts and types of waste. They were split into groups of three, and in each group, a different technique of aerating compost was used. Group 1 was the control group, Group 2 was the turning method, Group 3 used the piling method, and Group 4 used the mixing method. Composts were mixed and tested in the lab for nitrate levels.

Results
Results: The #mixing# method proved to be the most effective because it showed the lowest level of nitrate, which indicates higher maturity of the compost.

Conclusions/Discussion
Conclusion: The mixing method introduced the largest amount of air to the microbes in the compost, which sped up their decomposition activity.

Summary Statement
My project tested the most effective way of aerating composts by measuring the nitrate level in composts that were aerated with different methods.

Help Received
Used lab equipment at university of California Santa Barbara

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Gemma M. Taylor

Project Number
J1022

Project Title
Can Mushrooms Clean Up Fertilizer Runoff?

Abstract

Objectives/Goals
To find if Pleurotus ostreatus mycelium is an effective ammonia remover in freshwater environments.

Methods/Materials
Materials:
-18ml Scott's MiracleGro liquid houseplant fertilizer
-3 Critter Carriers
-75 grams of Pleurotus ostreatus mycelium
-75 grams of alder sawdust
-2 empty medium sized mesh filter bags
-APA aquarium test kit
-Rainwater(with zero ppm of ammonia, etc.)
Methods:
1. Place an equal amount of water into each container
2. Take all the mycelium and place it into a filter bag
3. Take all the sawdust and place it in a filter bag
4. Add 6ml of fertilizer to each container
5. Place the sawdust in one container and the mycelium in another. Mark as such
6. Leave one undisturbed as a control
7. Measure daily for ammonia
8. Record all relevant information
9. Continue experiment for nine days

Results
This experiment had some very interesting data. All of the tanks tested had the same level of ammonia for the first four days, at approximately nine ppm (parts per million). Then the mycelium test dropped to eight ppm. The next day it plummeted to four ppm, then two ppm. It remained at two ppm for the rest of the experiment. The sawdust stayed at nine ppm for the first five days, then dropped to eight ppm. The control stayed the same throughout, at the original nine ppm.

Conclusions/Discussion
Pleurotus ostreatus mycelium did reduce ammonia while the other tests did not. Therefore, the hypothesis was correct. The major drops in the data of the mycelium occurred when the author tried to partially suspend the mycelium in the water using surgical gauze. This was due to the fact that the mycelium was

Summary Statement
Pleutrotus ostreatus mycelium is an effective de-ammoniator in a freshwater environment.

Help Received
Mother sourced outcast work materials to be repurposed in experiment. Father assisted in formatting presentation board.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Elma del Aguila; Paulina Valerio

Project Number

J1097

Project Title

The Efficiency of Eco-Friendly Insulation: Smart House Science

Abstract

Objectives/Goals

The purpose of our experiment was to evaluate different types of Eco-friendly plant insulators in a home setting. We expect the Armeria plant to be the most efficient insulator because it is a close knit, and drought tolerant plant.

Methods/Materials

We made a total of four houses, one being our control. The other three had different types of plant species on the roofs. Our tests were limited to temperature regulation. We tested in a controlled environment, and used thermal couple wire to measure temperature.

Results

Our hypothesis was correct, Armeria was the most efficient plant. It was not the lowest in temperature, but it was the most stable. It had a consistent pattern throughout the experiment.

Conclusions/Discussion

We found that using an Eco-friendly insulter not only gives back to the environment, but is a useful tool in regulating temperature in the home.

Summary Statement

Our project is about finding the most effecient, eco-friendly plant insulator to use in the future building of homes.

Help Received

Father helped in supervising the building of house

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

James Isaac T. Staten

Project Number

J1098

Project Title

Bags to Bricks for Humanity

Abstract

Objectives/Goals

The objective is to make bricks by reducing plastic waste and mixing it with other materials to determine which compound will make the best brick for human habitats. I hypothesize that melted plastic bags mixed with rock pebbles is the best material to build bricks because they will have a higher density and can withstand a greater amount of force.

Methods/Materials

I melted 1oz of plastic grocery bags with canola oil in a fryer and molded them into a rectangular block shape in a mint tin. The first brick contained no added materials and became the control sample. This process was repeated three more times, to create samples 1,2 and 3, as I combined the melted bags with patching compound, rock pebbles or saw dust respectively. Once I had my sample bricks, I tried to break them with a drill press to measure the maximum force I could apply, before material failure. I measured the volume and mass and calculated the density for each sample. I then measured the force required to reach failure using a scale, located beneath the sample. I analyzed the results by comparing the density of each sample with the maximum force at time of failure and graphed the outcomes.

Results

Although in theory, the highest density could withstand the greatest force, my second sample, made of melted plastic bags and patching compound, was more dense than my control, but withstood less force before the breaking point. The plastic and wood brick were less dense than the pebble brick, but withstood exceptionally high levels of force before failing. However, the pebble brick, which had the highest density, withstood the highest maximum force before its breaking point.

Conclusions/Discussion

My hypothesis was accurate because the plastic grocery bags combined with the pebbles made the best brick due to its higher density and withstood the maximum force applied. Further analysis of some samples lead me to conclude that certain variables may have existed that were not controlled for, however, the directions of the results were still in line with my hypothesis. Present applications for the bricks could be light construction and home and garden decor. Hopefully, future uses of these bricks will include more efficient and stable construction, while equally reducing waste and toxins released into our environment.

Summary Statement

Recycling plastic bags into bricks to help reduce the trash in our landfills and helping humanity construct homes at lower cost can be a great investment in our future.

Help Received

Mother supervised melting of plastic; brother-in-law provided use of drill press

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Mary Travis H. Doepner

Project Number

J1099

Project Title

Findings from the Field Yr2: Cont. Study of Pervious Materials in LID Project at Riv.Co. Flood Control/H2O Conserv. Dist

Abstract

Objectives/Goals

Year 1 I designed an experiment to determine if oil inhibits water flow through porous materials by studying the infiltration rates of H(2)O with soybean oil (nontoxic proxy for motor oil). Year 2 of this project continues my research of porous materials & low impact development to determine the conditions of permeable surfaces (asphalt, concrete) tested in Year 1 to ascertain if oil has had negative effects on infiltration rates of previously tested locations by retesting these locations with water only & by comparing infiltration rates of water on new locations. I further test my findings using porous concrete core samples in a home lab to compile data to compare with my field findings.

Methods/Materials

Field: Make infiltration rings with section of air conditioning duct & plumber's putty & mark measurements. Test H(2)O infiltration on Year 1 locations & additional Year 2 locations on three days per location(concrete/asphalt). Calculate results using Aker's formula. Lab: Cut porous concrete cores into 30mm sections, find density & make proxy infiltration rings. Divide into H(2)O/sediment, H(2)O/oil/sediment, & H(2)O control. Time infiltration, weigh H(2)O & sample, test H(2)O turbidity with multi-parameter tester.

Results

The Year 1 porous concrete(PC) test site was totally impermeable. I then tested new PC locations whose rates were quicker than Year 1 sites. The H(2)O infiltration rates of porous asphalt (PA) water/oil locations when tested with H(2)O (no oil) 1 year later were indeed slower than the H(2)O-only control from Year 1 & new H(2)O-only locations. The new PA locations had infiltration rates consistent with the PA Control. When testing PC core samples in a home lab, I observed that oil caused infiltration to be slower than H(2)O alone & that sediment slowed down infiltration immensely for all samples (H(2)O-only control not included.)

Conclusions/Discussion

Locations on the PA which had oil introduced in Year 1 had much slower H(2)O rates than H(2)O-only control & than last year's oil/H(2)O rates. I believe that sediment has attached to the oil over the year. I found the Year 1 PC test site was completely impervious due to lack of maintenance. The new well-maintained PC test site had even quicker rates than the original Year 1 site. My lab results support my field study. Oil does slow down H(2)O infiltration & appears to trap sediment causing a lack of effectiveness of porous materials.

Summary Statement

This project determines conditions of permeable surfaces tested at RCFC&WCD 1 year later to find if oil has ill effects on infiltration rates of these surfaces by retesting with H(2)O only & comparing rates on new locations & core samples.

Help Received

Robert Cullen allowed my research to take place at RCFC&WCD & provided core samples & information. Wes Blasjo & Fred Pontius at CBU supervised my use of a masonry saw, loaned caliper & multi-parameter tester. Mother & sister took pictures, helped carry & pour water. Father helped research.