CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sasha E.R. A'Hearn

Project Number
J1501

Project Title
Finding Nematode and Friends: Biodiversity and Oxygen in Ponds

Abstract

Objectives/Goals
My project#s goal was to determine the effect of changing the amount of dissolved oxygen present in ponds, and how that will affect the biodiversity of microbes (such as nemotodes, volvoxes, rotifers, and tartigrades, etc.) in the detritus. I used jars filled with pond water to be #puppets# for real ponds. I hypothesized that the jars with no oxygen in them will have the most microbe biodiversity. Last year I had performed nearly the same experiment and found that the jars with no oxygen had the most biodiversity after 12 days. I wanted to see if the pattern would continue.

Methods/Materials
: I went to a nearby pond and filled a big bucket with some healthy pond water, sludge and detritus. I filled nine one-quart glass jars with the pond water. Then, I labeled three of the jars as #x0#, meaning no oxygen could get into the jars. Another three jars were filled with the same water, designated #x1#, meaning there was one way for oxygen to enter, only the air; I left their metal lids off the entire time of the experiment. I labeled the final three jars as x2#, meaning they could receive oxygen from the air; I left their lids off and inserted a fish bubbler which ran the whole time of the experiment. I conducted the experiment for four weeks. Once a week, I checked the biodiversity of microbes. I pulled out one drop of water from each jar with an eye dropper. I placed the drop on a slide, covered it with a coverslip, and looked at it under a microscope. I also checked the phosphorus level using a pool kit.

Results
In the #x0# oxygen jars, the biodiversity of microbes was high in the beginning but dropped in the end. #x1# oxygen jars was all over the place, rising and dropping every week. The #x2# oxygen just rose and rose, and ended up as the winner. The phosphorus level started at 200 ppm, on week zero, but then for the rest of the weeks, it was 50 ppm or 0 ppm.

Conclusions/Discussion
: I think that the #x0# oxygen winded up with the least microbe biodiversity, even though it had the highest biodiversity half-way through the experiment, because of something I call #the volvox effect#. Volvoxes are microscopic algaes that sometimes take over the microorganism community. #x2# oxygen came out with the most microbe biodiversity, and I believe it was because the environment the jars were was most similar to the ponds where I had taken the original sludge from.

Summary Statement
My project was about the effect of dissolved oxygen on pond microorganisms.

Help Received
Dad helped me set up my project and run it, helping me scour the slides I made to check the biodiversity. A big thanks to my mom for helping me buy all the supplies and decorate my board with me. Thank you to Dr.David Polcyn for helping me answer some questions and be a victim of an interview. Thank you,

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Andres Avina Barajas; Hawi Z Desta; Cesar A. Peralta

Project Number

J1502

Project Title

Can Bacteria Predict the Effects of Music on the Human Brain?

Abstract

Objectives/Goals

Our objective was to determine whether selected genres of music#s effect on bacterial growth correlated with the extensive research of music#s effect on human concentration in order to create a bacterial assay for the effect of different types of music on humans.

Methods/Materials

We created a bacterial stock in one plate and used that stock to seed all the other plates. We collected the bacteria from door knobs, water fountains, and table tops and mixed it together in one agar plate. The temperature was controlled using a table top incubator. The bacteria grew for four days. The samples were grown in triplicate to make sure of reproducibility. We quantified the bacteria by using a grid and counting the squares with no growth.

Results

The bacteria that grew to classical music had the most growth, while the bacteria that grew to hip-hop was in the middle, and the bacteria that grew with rock music had the least growth. This confirmed our hypothesis that certain music does affect bacterial growth in a similar way to how it affects concentration.

Conclusions/Discussion

We drew the conclusion that classical music is the genre to which the bacteria grows the best. This correlates with previous known studies that classical music helps concentration while rock music is a distraction. Once we found that the data was consistent with previous work, we thought this could be an assay to test the effects of other types of music on concentration rather than using human beings. An additional theory is that if all cell growth and development is the same (that is, bacterial cells and brain cells grow in the same way, then is it possible our assay could be used to predict brain growth and development.

Summary Statement

The purpose of our experiment is to determine if different types of music have the same effect on bacterial growth as they do on human concentration.

Help Received

Ms.Gross

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Fatimah S. Bari

Project Number
J1503

Project Title
Natural Herbs vs. Synthetic Antibiotics

Abstract

Objectives/Goals
We use herbs like cardamom, turmeric, chili, cumin, and garlic in our daily cuisine. Ancient folks have frequently used these natural herbs for treatment. I was curious if these herbs really have any medicinal and antibiotic properties. In my last year science project I compared to see if natural herbs can kill bacteria additionally which one of these herbs can treat bacteria the best. My project proved that herbs kill bacteria. Cardamom and Turmeric powder were the best. This year my objective was to see if natural herbs act as better antibiotics than the synthetic antibiotics.

Methods/Materials
Prepared Agar dishes and swabbed them with Q-tips soiled from the kitchen floor. We let the bacteria grow in the dishes for one week. Counted the bacteria before applying herb or synthetic antibiotic. Examined each dish after 24, 48, 72 and 96 hours and counted the bacteria with the help of Bacteria Counter. Prepared samples of the 500 mg each synthetic antibiotics and the herb using saline solution. Poured 15 ml each Amoxicillin, Cephalexin, Turmeric and Cardamom solutions onto one each dish and kept one as control. Placed the dishes in the incubator at 98 degrees F

Results
Before adding antibiotics or herbs, the bacteria count was, control dish 410, Amoxicillin dish 362, Cephalexin dish 508, Cardamom dish 327, and Turmeric dish had 318. 24 hours after adding the antibiotics and herbs solutions into their respective dishes, Control had 425, Amoxicillin had 362, Cephalexin had 496, Cardamom had 325 and Turmeric had 318 bacteria count. After 48 hours result was Control 460, Amoxicillin 350, Cephalexin 475, Cardamom 312, and Turmeric 309. After 72 hours Control 465, Amoxicillin 325, Cephalexin 436, Cardamom 292 and Turmeric 301. After 96 hours Control dish was 465, Amoxicillin 296, Cephalexin 420, Cardamom 290 and Turmeric 295.

Conclusions/Discussion
After discussion with my advisor, I have concluded that my hypothesis is inconclusive. This is based on less than 20% (within lab error tolerance) of total bacteria killed. One interesting phenomena was noted, that the control dish, had a continual growth of bacteria throughout the experiment. The dishes that were treated with antibiotics or even herbs had a minimal reduction of bacteria however, no growth. As doctors prescribe to complete the treatment. I believe, if I would have applied more doses at prescribed times, the bacteria would have been killed completely.

Summary Statement
Natural herbs like Cardamom and Turmeric Powder have anti-bacterial and medicinal value as good if not better than synthetic anti-biotic as Amoxicillin and Cephalexin.

Help Received
I am thankful to my Science Teacher Mrs. Boyd for guidance and Apple Valley High School Science teacher Mr. Elmer who let me use his laboratory. My elder brother and dad helped me preparing my science board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sergio Bermudez

Project Number
J1504

Project Title
Lime Juice Eliminates Bacterial Growth

Abstract

Objectives/Goals
My objective was to determine how will lime juice affect the growth of pathogen bacteria (E.coli) and how much time will it take for the lime juice to reduce the bacteria by 95%.

Methods/Materials
.114 kg Alaskan Cob fish and .228 kg Tilapia fish (frozen) were used on Nutrient Agar petri dishes (Bioxon) to isolate E.coli. The use of sterile swabs 6#, Blood agar petri dishes, EMB agar petri dishes, S-S agar petri dishes were necessary for identification of the bacteria. 1 mL saline solution, 1 mL concentrated lime juice and 1 colony of E.coli were introduced in test tubes and set at different times to prove that lime juice affects bacterial growth.

Results
My raw data found that my test tube that lasted 1 hour and 45 minutes with the lime juice reduced the bacteria by 100%, and had absolutely no bacterial growth. Under the microscope, I observed the Tilapia and the Alaskan Cob#s fish released liquid and I found different types of bacteria such as staphylococcus, streptococcus, and bacillus as well as others. I decided to only concentrate on E.coli, because it is commonly found in contaminated food and is harmful to human beings.

Conclusions/Discussion
The citric acid in the lime juice can kill E.coli in one hour and forty-five minutes because the cell membrane of E.coli is made of lipids and sugars that can be easily dissolved by the citric acid.

Summary Statement
Lime juice eliminates E.coli growth in one hour and forty-five minutes.

Help Received
Mother helped in driving and transportation.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Aditi Bharti

Project Number
J1505

Project Title
Hurray! Plastic Just Passed Away! The Effect of Selected Catalysts on the Rate of Plastic Degradation

Abstract

Objectives/Goals
The objective of this experiment is to find out which catalyst would degrade plastic pieces fastest between the microorganisms: Bacilli, Cocci, and Spirilla (soil/compost), Lactobacillus Bulgaricus and Streptococcus Thermophilus (yogurt), and Amoxicillin-Penicillin (anti-biotic).

Methods/Materials
Four two-gallon containers, a Kirkland plastic garbage bag, and a homemade tensile strength measuring device were used for my experiment, in which I put six 6-in x 1/2-in plastic strips (from the Kirkland plastic garbage bag) in each of the four containers with their catalyst and left them how they were for about eight weeks after which I tested their tensile strengths.

Results
The plastic strips in soil/compost degraded the most at 16%, the plastic strips in yogurt degraded second most at 10%, and the plastic strips in anti-biotic degraded least at 8%.

Conclusions/Discussion
The bacteria in soil/compost degraded plastic the most (16%), the bacteria in yogurt degraded plastic second most (10%), and anti-biotic degraded plastic the least (8%). The results of this experiment support my hypothesis since the catalysts degraded the plastic strips from fastest to slowest in the order I hypothesized.

Summary Statement
The purpose of this experiment was to find which catalyst would degrade the plastic pieces fastest between the microorganisms found in soil/compost, yogurt, and anti-biotic.

Help Received
I would like to thank my science teacher, Mrs. Mackewicz, for helping me throughout my project by reviewing my work and providing valuable feedback.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Karen H. Cho

Project Number
J1506

Project Title
Synthetic vs. Natural Antibacterials on Inhibiting Bacteria Growth

Abstract

Objectives/Goals
This project compared the effectiveness of two synthetic antibacterials, ethanol and iodine, to two natural antibacterials, vinegar and honey, in inhibiting the growth of bacteria. This project separates from traditional tests by not only measuring the amount of bacteria killed by the antibacterial but also the amount of bacteria that grew on top of the solution.

Methods/Materials
I collected bacteria from the girls' bathroom floor; rather than focusing on one specific type of bacteria, this project better portrays the realistic scenario with a wide spectrum of bacteria in an environment where some bacteria may be potent in than others. I collected the bacteria using sterile Q tips, added the solutions with a 1 mm pipet, labeled the petri dish, then placed them in the incubator for 5 days at 33.2 degrees Celsius. To count the bacteria, I used an eCount bacterial colony counting pen from Carolina Biological (online).

Results
Iodine was the most effective antibacterial and maintained an average of 0 bacteria growth. Vinegar was the second most effective with an average of 25.4 bacteria colonies. Ethanol was third most effective with average 41.8 bacteria colonies. As an outlier, honey was the least effective with an average of 288.4 colonies.

Conclusions/Discussion
The conclusion is that (a) vinegar is a great natural alternative to synthetic antibacterials in schools or households where natural antibacterials may be preferred. (b) acetic acid may be added to vinegar or a strain of iodine to make it a stronger, more effective natural antibacterial. (c) in the future, I'd like to test the effectiveness of light or temperature on the effectiveness of an antibacterial in inhibiting bacteria growth. (d) some trials done by Kondo and his colleagues found that rats that consumed a standard diet with vinegar had significantly reduced systolic blood pressure and leukemia cancer cells. In the future, I strongly want to find scientific evidence if vinegar ingestion may help reduce high blood pressure and reduce growth of leukemia tumors in humans.

Summary Statement
This project compared the effectiveness of two synthetic antibacterials, ethanol and iodine, with two natural antibacterials, honey and vinegar, on inhibiting bacteria growth.

Help Received
School science teacher (Mrs. Julie Warren) supervised experiments; parents bought supplies and board; conducted in school lab

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Alex M. Fera

Project Number

J1507

Project Title

How Does Altering the Circadian Rhythm of Pyrocystis fusiformis Affect Its Bioluminescent Behavior?

Abstract

Objectives/Goals

The goal of my project was to determine if altering the circadian rhythm of Pyrocystis fusiformis affected its bioluminescent behavior.

Methods/Materials

Each night, for 3 nights, 9 test tubes filled with 10ml of sea water were gently sloshed back and forth 5 times per night. The brightness of their flashes was visually calculated and recorded in a lab notebook. An additional set of tests were performed, shortening the cycle each test. These alternate tests started at 19 hours and went all the way down to 8 hours.

Results

The results of my project supported my hypothesis, in that keeping 3 of the 9 test tubes in complete darkness at all times (as opposed to on a normal cycle or in constant light) would hinder the production of bioluminescence the most. The shorter tests had rather surprising results. Instead of not flashing at all, like all the research done on the topic said, rather they ended up flashing even brighter than the ones on a somewhat normal cycle.

Conclusions/Discussion

The tubes in total darkness never had the opportunity to photosynthesize and quickly ran out of the two enzymes luciferin and luciferase. Furthermore, the tubes that were kept in constant light still flashed, however not as brightly as the ones on a cycle. This is because the organelles that produce the flash, the scintillons, never had enough time to fully swap positions with the chloroplasts to go from photosynthesizing to being ready to flash.

Summary Statement

My project is about altering the light/dark cycles of Pyrocystis fusiformis and the effect that has on its bioluminescent flashes.

Help Received

Teacher proofread project report; Parents helped with display board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Jacob R. Gibbs

Project Number
J1508

Project Title
Thinking About the Future: Most Superior Way to Grow Algae

Abstract

Objectives/Goals
Algae is the superfood of the future. Algae are a diverse group of eukaryotic organisms that can be unicellular or multicellular. A fast-growing microscopic blue-green algae, spirulina produces more than 20 times more food protein than other land plants such as soy, using far less water, land and energy than conventional crops. In the future humans are going to be running out of food. Algae is a promising alterative and contains 60% protein which is a great nutritional substitute. Not only can algae be used for food, it can also be used as biofuel, medicine, pollution control, beauty products, and fertilizer.
This experiment was designed to figure out the effect of light, temperature and fertilizer concentration on algae growth. My hypothesis was that algae will grow faster in a microenvironment that is heated, with more fertilizer and with natural sunlight. My goal is to find a better way to grow algae to meet future needs.

Methods/Materials
Materials: Algae (Spirulina), grow light (Incandescent), Miracle Gro fertilizer, 1 liter water bottles, heating mat
Methods: 40 cc of Spirulina algae were placed in each of eight 1 liter plastic bottles of water. 4 bottles received 40 cc of high concentration fertilizer made by mixing 5g Miracle Gro in 1 liter water. 4 bottles received 40 cc of low concentration fertilizer made by mixing 0.5 g Miracle Gro in 1 liter water. Half of the bottles were placed in natural sunlight and the other half were placed under grow lights for 24 hours per day. Half of the bottles were placed on heating mats, and half were exposed to ambient temperature. The experiment was simultaneously duplicated, for a total of 16 bottles. Controls using only fertilizer and only algae were used. A color scale was used as an index of algae growth and measurements taken weekly.

Results
The experiment showed clearly that the algae grew best with continuous artificial light, low concentration fertilizer and with a heating mat with warmer temperatures. This was also true for the duplicate bottles.

Conclusions/Discussion
Spirulina algae grows best at warmer temperatures around 25 Degrees Celsius, versus outdoor ambient temperatures ranging from 10-15 degrees Celsius.

Continuous artificial light grows algae better than natural sunlight.

Summary Statement
This project studied the best way to grow spirulina algae by using different types of light, temperature, and fertilizer concentration.

Help Received
My parents helped order the algae and set up the grow light.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Jacob M. Hershman

Project Number
J1509

Project Title
Does Gluten Affect the Growth of Probiotic Bacteria?

Abstract

Objectives/Goals
The objective is to find out if probiotic bacteria (lactobacillus acidophilus) grow better in a gluten environment.

Methods/Materials
Six test tubes of lactose and water, and six test tubes of lactose, water, and gluten were prepared in a sterile environment. To four of the six test tubes in each category, a bacterial solution was added. Two test tubes out of each category were kept as controls. Ph concentrations were recorded every hour. Data from the two categories was adjusted and compared.

Results
Lactic acid concentration increased at a faster rate in a gluten environment.

Conclusions/Discussion
Lactobacillus bacteria produce lactic acid as a by-product of their growth cycle. The bacteria are anaerobic, making it difficult for the bacteria to grow outside of solution. To measure population size in solution, Ph was used as an indicator. I found that the Ph levels increased faster when gluten was present in the growth environment indicating that probiotic bacteria growth is enhanced by the presence of gluten. This may point to a connection between gluten free diets and the development of lactose sensitivity.

Summary Statement
My project is about the effects of gluten on the growth of probiotic bacteria.

Help Received
My teacher suggested building an incubator. My dad helped me build the incubator. I also discussed the project with my parents. My mom#s medical condition inspired me to do this project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Krystal R. Horton

Project Number

J1510

Project Title

Loop Mediated Isothermal Amplification to Detect Huanglongbing Infections

Abstract

Objectives/Goals

Huanlongbing is a disease spread by the Asian Citrus Psyllid vector which has done billions of dollars in damage to the citrus industry worldwide. Presently, tests for the bacteria are expensive and must be performed in sophisticated labs. My objective was to validate the LAMP process as a portable, inexpensive, simple method for verifying the infection in psyllids.

Methods/Materials

Smart-DART unit, Android tablet with Smart-DART software, mini-centrifuge, loaded PCR tubes, fixed-volume pipette

Results

Using known positive samples and controls in the reaction strips, I was able to verify that the LAMP process is simple and effective. With a few hours of training, a farmer could learn to perform the test on his/her own samples. After validating the process, I used it to test Psyllid samples from around Riverside County and was unable to find any Psyllids carrying the Huanglongbing disease.

Conclusions/Discussion

Huanglongbing has devastated citrus orchards in Arizona, Mexico, South America, and Florida. California is known to have Asian Citrus Psyllids, the vector for the disease. Presently, there are no Psyllids in California known to be infected. After collecting Psyllids from numerous citrus trees around the county, I did not find any infected specimens.

Summary Statement

I validated a simple, inexpensive method for testing Asian Citrus Psyllids for the bacteria that causes Huanglongbing (Citrus Greening Disease)

Help Received

UCR online biological safety course, Dr. Keremane gave me access to and training on the Smart-DART system

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Shakson K. Isaac

Project Number
J1511

Project Title
A Novel Approach to the Analysis of Soil-Based Microbial Fuel Cells

Abstract

Objectives/Goals
This experiment was designed to determine if bacterial metabolism plays an important role in soil-based Microbial Fuel Cells based on its increase or decrease in voltage, amperage, wattage, and chemical process the soil microbes (bacteria) undergo.

Methods/Materials
Using one control (100% soil) and seven variables I added soil (From under the roots to obtain bacteria) and mixtures accordingly into 8 mason jars. I then put in copper and zinc electrodes on opposite ends in the soil. Soldered the wires to the electrodes. Checked every day for the voltage and amperage until the 21 day period and repeat it. Also I did agar plating, gram staining, and microscopic viewing of bacteria. In addition, I conducted an Oxidative-Fermentation test to see if the bacteria oxidized or fermented and to test motility.

Results
The variable 90% soil 10% coffee grounds had the highest linear trend and 90% soil 10% coffee grounds had the second highest linear trend. Soil + peptone had the highest average of all three trials in microwatts and 90% soil 10% coffee grounds had the second highest average of the three trials. Soil + peptone + glucose had the third highest average in microwatts. The soil microbes (bacteria) were mostly all gram negative and the pH was neutral. The seven variables and one control were mostly fermentative except for 100% soil and soil + peptone which were oxidative.

Conclusions/Discussion
Proteins, glucose, and organic matter along with bacterial metabolism do play an important role in soil-based MFC's. Soil microbes metabolize proteins and organic matter into smaller molecules to release energy or ATP using oxidation or fermentation. They undergo glycolysis and the Krebs cycle to metabolize. These chemicals then get transferred to the electrodes to make electricity. The more electron producing, metabolic bacteria are in the soil, the more electricity the soil-based MFC produces. The more knowledge we have about how bacteria metabolize, the more energy can be produced from a single soil-based Microbial Fuel Cell.

Summary Statement
The analytical analysis of how soil-based Microbial Fuel Cells work.

Help Received
Mom helped keep a schedule. Dad payed all the materials/supplies I needed. Mr. Maxwell an AP Biology teacher from San Jacinto High School helped me with the Oxidative-Fermentation Test.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Alexandra M. Jones

Project Number
J1512

Project Title
Spice Up Bacteria

Abstract

Objectives/Goals
This experiment was created to find the effects of spices on bacteria. Spices are used in many countries to preserve food, and are said to prevent bacterial growth. By testing the effects of spices on bacteria, one can use the results as a natural method to prevent bacteria.

Methods/Materials
The spices cinnamon, garlic, ginger, turmeric, and cayenne pepper were tested in this experiment. A mixture of agar powder and water was made, 1/8 tablespoon of each spice was added into the mixture, and poured in the petri dish. Once 6 dishes were filled, each with a different spice, and one controlled dish, with no spice, they were swabbed with bacteria and placed in a dry, warm cupboard for seven days. After one week, several bacterial colonies formed in the dishes.

Results
The results revealed that out of the five spices tested, cinnamon and garlic inhibited the most bacteria, and cayenne pepper, the least. After four, seven day trials, neither cinnamon nor garlic displayed any signs of bacterial growth, but cayenne averaged 7.75 bacterial colonies, the same as the controlled dish, inhibiting none. The other spices average were in-between; ginger, 1.75 colonies, and turmeric, 2.75. Although all were kept in the same place for seven days, the results could have been altered by daily changes in temperature.

Conclusions/Discussion
The results were supported by the hypothesis. However, it was not expected that garlic would inhibit the same amount of bacteria as cinnamon. The results show that by adding cinnamon or garlic to one#s food, there is a better chance that it will prevent bacterial growth.

Summary Statement
This experiment was conducted to discover which spices inhibited the most bacteria, so the results could be used as natural preservation in foods.

Help Received
Teacher, Dawn Jacobson, helped with the outline for abstract, and final report; Father, Doug Jones, helped purchase the materials for my project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Christopher M. Laurits

Project Number
J1513

Project Title
Comparing the Amount of Bacteria in Raw and Pasteurized Milk

Abstract

Objectives/Goals
My project was to compare the amount of bacteria in raw and pasteurized milk samples using methylene blue dye to estimate bacterial content.

Methods/Materials
Over four days, I tested several 9 ml samples of grade A raw and grade A pasteurized milk, refrigerated and unrefrigerated, which were placed into test tubes with 1 ml methylene blue solution (1% Aqueous solution) diluted 1:20 with distilled water and placed in a water bath maintained at 98 degree F until the methylene blue samples returned to a natural white color. The tubes were observed to see when they turned white.

Results
The raw unrefrigerated samples turned white the fastest, averaging 10.25 hours to turn white. The raw milk refrigerated samples turned white on average in 12 hours. The pasteurized milk samples took the longest to turn white with the unrefrigerated samples taking on average 21. 25 hours and the refrigerated samples taking on average 25.75 hours

Conclusions/Discussion
In all of my tests, the raw milk samples turned white more quickly than the pasteurized samples, supporting my hypothesis that raw milk contains more bacteria than pasteurized milk, and the unrefrigerated milk samples turned white more quickly than the refrigerated samples, supporting my hypothesis that 4-hour unrefrigerated milk contains more bacteria than refrigerated milk. All of the milk samples tested, both raw and pasteurized, were of a high quality and had low amounts of bacteria because in all cases it took more than 8 hours for the milk to turn white.

Summary Statement
My project was to determine if Grade A raw milk purchased in a local health food store was safe to drink.

Help Received
My science teacher provided general oversight, my mom helped purchase the materials for my experiment and board, took pictures and helped me cut and paste my board and my aunt helped me understand the science of my experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Madison M. Mattern

Project Number
J1514

Project Title
Door #1 or Door #2? Does the Choice of Bathroom Stall Matter to You?

Abstract

Objectives/Goals
My goal was to see which bathroom stall door handle would have the most bacteria. The girls and boys bathroom where tested. The first, second, or third stall was the experiment?

Methods/Materials
We used School bathroom stalls (girls and boys), Latex gloves, Staralized Q-Tips, Ogar dish with Agar, and an incubator. These are the critical tools used in this experiment.

Results
In the girls bathroom the second stall has more bacteria than the first and third stalls. I'n the boys bathroom the second stall has more bacteria the the first stall.

Conclusions/Discussion
After completing the investigation. The girls second stall has the most bacteria and that the second stall in the boys bathroom has the most bacterial.

Summary Statement
Which stall has the most bacteria on the door Handel in the girls and boys bathroom. The first,second, or third stall?

Help Received
I used my teachers, school facilities and parents to construct my testing to come to my conclusions.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Daniel A. Miret

Project Number

J1515

Project Title

Extras in Your Raw Vegetables

Abstract

Objectives/Goals

My Science project was about what vegetable is safer to eat raw the ones domestically produced here in the U.S.A or of the same type but imported from Mexico. I based my interest on Nathaniel Simms that imported products are as safe as homeland products because they go through tests to guarantee that they are safe to eat. I believe that imported raw products from Mexico contain more contaminants than those produced in homeland U.S.A.

Methods/Materials

Materials used to find and help understand my conclusion and results are in the following: Petri dish, swabs, bowl with cold water, incubator, microscope, gloves, transparent graph that measures squared centimeter per square. My procedure started in my school's science lab, first I prepared the vegetables: Beets, Cilantro, Asparagus, Green Onion, Green Squash, both imported or homeland by washing each in a separate bowls. Then I used a sterile swab to collect samples from the contaminated water, next I inoculated the agar with the contaminated water sample, after I repeated my procedure from steps 3-6, later observed growth on the petri dishes and after took the samples and did a wet mount and examined it even closer.

Results

The results indicated that Mexico#s vegetables were contaminated more than USA#s (shown on the graphs) the average bacteria grown on Mexico#s vegetables was a total of 14.97 yellow bacteria and 4.44 purple bacteria and together a total of 19.41. For USA#s was 6.57 yellow bacteria and 7.113 purple bacteria and together a total of 13.683.

Conclusions/Discussion

From the results of the colony counts and identification of microorganisms, those raw vegetables produced in Mexico has about 20% more bacteria than U.S.A.#s vegetables. Regardless of whether the products are produced in U.S.A. or imported from other countries, it is still safer to wash as much as possible to clean off any contaminated particles grown on your vegetables by using sprays sold at stores for example Fruit & Vegetable Wash or you could use boiling water or the old fashion, water.

Summary Statement

My project is about what vegetable is safer to eat raw the ones domestically produced here in the U.S.A or of the same type but imported from Mexico

Help Received

Dad And Mom helped in taking me to get my materials and always were there when needed special help; Mrs. Urbiztondo my teacher who helped me in my procedure

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Autumn K. Peak

Project Number
J1516

Project Title
Can Colors Inhibit Dangerous Algal Blooms?

Abstract

Objectives/Goals
The Purpose of my project was to determine if colors can inhibit dangerous algal blooms. In other words which color of light of the primary colors prevents algal growth the most.

Methods/Materials
The experiment involved growing algae from a local stream in Meadow Vista, CA in 6 ounce glass mason jars with lids. The jars were painted with red, yellow, and blue watercolor stain. There were three of each color and three controls without any paint. The algae was left to grow for 24 days. Then the data was collected. Measurements were made by counting the number of algae per drop of water for three drops of water from each jar then finding their average.

Results
The results were that on average, blue inhibited algal growth the most and yellow the least.

Conclusions/Discussion
The experimental data supported my hypothesis, indicating that it should be accepted.I think that I got the results that I did because blue is the darkest color that I used for my experimentation. Therefore, blue lets the least light through. Since algae thrives in light because it depends on it for energy the little light caused it to die off. On the other hand the yellow jar had the highest average amount of algal growth. I think that this was for the same reason that there was the least average algal growth in the blue jar. The yellow was so light that it allowed more light through which provided energy for the algae to thrive. The algal growth also may have been effected by the different wave lengths. Blue was the color with the shortest wave length and had the least average amount of algal growth. The yellow jar had the highest average algal growth and medium wave lengths. Red had an average algal growth only slightly higher than the blue and the longest wave length.

Summary Statement
The purpose of my project was to determine, on average, which of the primary colors inhibts algal growth the most.

Help Received
Mr. Scott helped edit and printed graphs; dad spray-painted board and helped print paper.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Avinash Ramaswamy

Project Number
J1517

Project Title
Got Spoiled Milk?

Abstract

Objectives/Goals
I conducted an investigation to find out if the amount of fat in store bought milk affects the time it takes to spoil. My experiment was designed to test Kirkland Signature 2% Reduced Fat Milk, Kirkland Signature Whole Milk, and Kirkland Signature Fat Free Milk as the 3 variations of my independent variable.

Methods/Materials
For the materials, I used the three milk types stated in the objective. I also used a refrigerator, pH meter, 15 containers, and a measuring cup.
In my method, I put the milk types into 5 containers each, and put them all in the top shelf of the refrigerator. Every day, I would test to see if the milk was spoiled by using the pH meter every day. If the pH is below 6.4, the milk is spoiled. Also, qualitative observations such as smell, look, and texture helped identify spoiled milk.

Results
As a result, the Reduced Fat Milk had an average spoilage range of plus 2. 8 days from the expiration date. The Fat Free Milk, however, took the longest time to spoil since it had an average of plus 4.8 days from predicted expiration date. The Whole Milk expired the quickest due to its average spoilage time being minus 2 days from the predicted expiration date.

Conclusions/Discussion
In conclusion, the amount of fat in store bought milk does affect the time it takes to spoil, because fat-free milk spoiled the slowest, and whole milk spoiled the quickest.

Summary Statement
The amount of fat in store-bought milk affects the time the milk takes to spoil.

Help Received
Father bought milk and pH meter; Mother bought containers and measuring cup; Mother supervised pH testing.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Aadil M. Rehan

Project Number
J1518

Project Title
Avocado "Root Rot": A Novel Approach to Combatting Phytophthora cinnamomi

Abstract

Objectives/Goals
In 2014, California avocado farmers lost over 40 million dollars in crop damage due to root rot caused by Phytophthora cinnamomi. This pathogen infects the roots of avocado plants, resulting in an eventual death. I became aware of P. cinnamomi when my family purchased a neglected avocado grove. The trees were infected with some disease. I took soil samples and sent them to a local agriculture lab, which confirmed that it was P. cinnamomi. Consequently, I began to search for a safe, practical, and eco-friendly solution to counter root rot. After conducting research, I hypothesized that employing a functionally defined soil amendment in conjunction with a solarization bed might be more effective than the currently popular phosphorus acid treatments used in combatting Phytophthora cinnamomi.
I had three goals in mind: First, to disrupt the pathogen's life cycle by forcing it into dormancy prematurely due to the soil amendment. Second, to thermally inactivate the spores by elevating soil temperature using the solarization bed. Lastly, to promote new root growth using a plant hormone.

Methods/Materials
My soil amendment was composed of gypsum, eggshells, coffee grounds, poultry manure, and a root-stimulating hormone. Gypsum and eggshells provide calcium, improve soil porosity and cause spores to encyst prematurely. Coffee grounds maintain a favorable pH, and poultry manure releases nitrogen. Indole Butyric Acid, a plant hormone, helps promote new root growth. I installed plastic tarps over the soil amendment to create my solarization beds. This created a greenhouse effect to increase soil temperature, which would thermally inactivate the P. cinnamomi spores.

Results
My experimental group consisted of 48 avocado trees. 12 infected, mature trees and 12 infected yearlings were treated with soil amendment and the solarization beds were created around them. My control plants (12 infected mature trees and 12 infected yearlings) were not treated. Avocado feeder roots are shallow and are known to remain within 25 centimeters beneath the tree. Using a surface and a probe thermometer, I measured the temperature variation of the soil at the surface and at 25 cm below, over the course of 8 weeks. I also monitored visible changes to the plants.

Conclusions/Discussion
At the conclusion of my experiment, the soil samples were retested, and were confirmed to be devoid of P. cinnamomi. My hypothesis was supported.

Summary Statement
The goal of my project was to develop an economical, comprehensive, commercially viable, and environmentally friendly method to control the spread of avocado root rot, which is caused by Phytophthora cinnamomi.

Help Received
My science teacher, Mrs. Hunker, helped guide me in this project. I purchased most of my materials from various gardening stores. My father supervised me for safety whenever necessary.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Kami E. Richardson

Project Number

J1519

Project Title

Liquid Gold: The Effects of Sunlight on Algae Based Biofuel Production

Abstract

Objectives/Goals

Curious about a "Corn Fed" bumper sticker on a passing car, I decided to look into alternative fuels. The objective of my project is to determine how sunlight affects the lipids that algae produces, and what the optimum amount of sunlight would be to maximize algae lipids.

Methods/Materials

Algae was gathered, then separated into fifteen flasks of approximately six grams each. Baseline measurements were conducted using a vortex method and repeated on the first three flasks. The remaining twelve flasks were subjected to varying degrees of sunlight per day (4hr, 8hr, 10hr, 24hr), over a six week period, with lipid test measurement two weeks. Two grams of algae from each flask were crushed and acetone added to break down the cell walls. The liquid on the top was put on pre-weighed paper towels so that the water would evaporate, but not the oil. The old weight of the paper towel was then subtracted from the new weight to see how much oil the algae produced.

Results

The algae stimulated with eight hours of light produced the most amount of lipids, with a 0.233 gram average, which was 8.58% of the original weight. Contrary to the hypothesis, the algae stimulated with 24 hours of light a day produced the second worst average, 0.067 grams. Algae stimulated with ten hours of light a day produced 0.61 grams of algae on average.

Conclusions/Discussion

The quest to maximize the lipids produced by providing it with 24hrs of continuous light, proved counterproductive. When the algae is pampered at 24hrs, it doesn't need to provide as much oils for itself long term. When the algae is given minimal amounts of sunlight at 4hrs, it dies off quickly. Eight hours seems to be the ideal mid-point.

Summary Statement

Optimal light conditions to maximize algae lipids for biofuel production.

Help Received

Dr. Dominique Mendola, Ph.D, UCSD, answered questions via email about how to grow algae and was encouraging me to continue pursuing alternative energy solutions.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Justine E. Sato

Project Number

J1520

Project Title

Preventing Major Viral Outbreaks: The Effect of Ultraviolet Radiation on Coliphage T4r

Abstract

Objectives/Goals

My objective was to learn which wavelength of UV radiation (253 nm, 365 nm, and 390 nm) had the greatest effect on Coliphage T4r.

Methods/Materials

Coliphage T4r, E. coli B, Micropipettes, hundreds of disposable micropipette tips, nutrient peptone broth, soy tryptone broth, LB agar, agarose, an incubator, a temperature-controlled water bath, 35 mm petri dishes, 100 mm petri dishes, a camera, an oscilloscope, two germicidal bulbs, a 365 nm LED, a 390 nm LED, Si photodiode, PCS software tool, UV ChiphEraser-20, Canon document camera

Results

The 253 nm UV radiation started inactivating the virus when it was exposed to at least 700 microjoules per cm^2. To inactivate at least 99 percent of the virus, it needed to be exposed to greater than 150,000 microjoules per cm^2. The plates containing virus exposed to the UV LEDs had little to no difference in plaque count. Finally, the percent of remaining plaques for the plates in the multiple trials of 253 nm UV radiation, versus the radiant exposure, fit to a power curve with an R^2 greater than 0.96.

Conclusions/Discussion

The data supports my hypothesis by indicating that ultraviolet radiation effectively inactivates Coliphage T4r with a wavelength of 253 nm because it is the closest wavelength to the germicidal point (264 nm) where the thymine bonds within the virus DNA is damaged the most by absorbing its maximum energy. The data helped obtain my objective by proving 253 nm UV radiation greatly inactivated the virus while the 365 and 390 nm UV radiation had little to no effect. My project proves that at 150,000 microjoules per cm^2, 253 nm UV radiation kills more than 99 percent of Coliphage T4r.

Summary Statement

Using E. coli B as an indicator, I found the point at which an exposure of UV radiation began inactivating Coliphage T4r.

Help Received

Borrowed micropipettes from science teacher; went to Ask-a-Scientist night to get ideas for project; loaned/purchased equipment from parents

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Johan G. Thuen

Project Number
J1521

Project Title
Lights from the Sea: How Do Light/Dark Cycles Affect Bioluminescence?

Abstract

Objectives/Goals
The purpose of my project is to see how different light/dark cycles affect bioluminescence in dinoflagellates. I believe that as the light cycle nears zero hours per 24 hour cycle the glow will diminish and at zero hours per day of light I believe they will stop glowing. I also predict that if there is no dark time (24 hours of light) they will stop glowing.

Methods/Materials
Twenty-one test tube samples of the dinoflagellate, Pyrocystis fusiformis, a large unicellular bioluminescent algae, were observed under seven different light/dark cycles. These cycles ranged from zero hours of light during a 24 hour cycle to 24 hours of light during a 24 hour cycle. Observations were recorded four times a day for seven days. The seven day experiment was then repeated two more times.

Results
The data results showed that 12 to 20 hours of light produced the most consistent brightness during the dark cycle. Eight hours or less of light during a 24 hour cycle began to lose brightness during its dark cycle and zero hours of light could not maintain its brightness.

Conclusions/Discussion
My conclusion is that bioluminescent dinoflagellates need a minimum amount of light during a 24 hour cycle to maintain their glow and that too much light or dark will diminish their brightness.

Summary Statement
My project demonstrates how different light/dark cycles affect the bioluminescence of dinoflagellates.

Help Received
My Mother helped type my report. She also did the 11 a.m. observations on school days.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Diana C. Valenzuela

Project Number
J1522

Project Title
Clean Hands?

Abstract

Objectives/Goals
Handshakes, fist bumps, and high-fives are ways of greeting someone. They have become rituals and they seem pretty normal to us. But, have you not ever wondered how many germs can be transmitted through these forms of salutation. So I would like to know which form of salutation (fist bump, handshake, or high-five) spread the most germs?

Methods/Materials
What I used for my project was the following:
-Glogerm
-Blacklight
-Petri Dish
-Agar
- 15 Volunteers
- Camera

Results
Handshakes had the highest results it transmitted 90-95% of germs .As well for the agar experiment, it grew sixteen colonies. Then the high-five was the second highest germ transmitter. It transmitted 50-55% of germs in the glogerm test and it produced eleven colonies. And lastly, the fist-bump transmit 25-30% of germs on the glogerm test and on the agar test the fist-bump only produced at least six colonies.

Conclusions/Discussion
As a conclusion I found out that in fact, a handshake will transfer at least twice or more germs than a high-five. You would think the high-five would transfer a lot of germs, but no it at least transferred 50% of germs as for the handshake it at least transmitted 80-90% of germs. The fist bump was the most effective salutation. It did not transmit or pass a large amount of germs. I would say if you do not like getting sick try fist bumping, it might not look appropriate, but it's cleaner.

Summary Statement
What greeting transferred the most germs: Hanshake, High-five, or Fist-Bump.

Help Received
None