CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Sarah A. Baxter

Project Number
J1501

Project Title
Effect of Nearby Trash Cans on Apis mellifera Bacteria Counts

Abstract

Objectives/Goals
The objectives of this expirements were to determine if the bacteria count found on bees corresponds with the number of trash cans in the area that the bees are found in. By finding these results, a possible explanation for where the bacteria that causes cellulitis could be resolved.

Methods/Materials
The materials included a butterfly net, clear plastic cups, paper plates, MILLIPORE swab kits and MILLIPORE culture kits. First twenty-four bees were captured at each site, two different times. Then the bees were help in the plastic cups for twenty minutes each, using the paper plates as covers to keep them from flying away. After the twenty minutes, the bees were released and the cups were swabbed with the MILLIPORE swab kits. Then the swabs were shaken in culture solution for thirty seconds and later the paddles from the MILLIPORE culture kits were soaked in the solution for thirty swconds. Immediately after, the solution was discarded and the paddles were incubated for three days at 35 degrees Celcius. When it was done, the bacteria colonies were counted and averages were calculated.

Results
The average bacteria count from the area with the most trash cans turned out to be 6.21 colonies, the average from the area with the decent amount of trash turned out to be 4.75 colonies, and the one with no trash cans was 1.79 colonies. However, because of the lack of time allowed and the small numbers that came out with the averages, an ANOVA analysis was performed to verify that the data was distinctly differnt.

Conclusions/Discussion
The bees are likely picking up bacteria in trash cans or areas with a lot of human waste. It is common to get cellulitis and it is also common to find bees in trash because of the sweet scents that can eminate from it. Bees like the sweet scent, for example the scent of nectar. All the time they spend in the trash, they are bound to pick up bacteria, and most likely not all of the bacteria is safe. When people are stung and get cellulitis, it is because their skin is reacting with harmful bacteria, and the source of this bacteria is unknown for now. However, a likely answer to where the source is could be in trash cans.

Summary Statement
The project is about finding the possible source of bacteria on bees that causes the skin disease cellulitis.

Help Received
Father helped catch bees.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Alexandra E. Boville

Project Number
J1502

Project Title
Look Who's Coming to Dinner!

Abstract

Objectives/Goals
One way that diseases can be spread is through unsanitary tables at restaurnats. My project was to see how well local restaurants cleaned there tables and if they could be pathways for spreading diseases. My hypothesis is that out of the restaurants that I commonly eat at, McDonald's tables will have the most bacteria on their tables and thus be most likely to spread diseases.

Methods/Materials
40 Petri Dishes, 40 sterile swabs, an incubator, and tape were used to do this project. For each restaurant (McDonald's, Burger King, Popeyes, Chipotle, Kitchen Table, and School Table), I took five samples over the course of five weeks. I incubated each sample for four days and analyzed bacteria by the number of colonies and characteristics. I also made a control group of a blank sterile Petri Dish with no swab on it. I had one of these for every week of samples.

Results
By taking the mean of bacterial colonies for each restaurant I found that McDonald's had the greatest number of bacterial colonies, followed by Kitchen table, Popeyes, School table, Chipotle, Burger King.

Conclusions/Discussion
McDonald's samples had the most bacterial colonies with a wide variety of bacteria. My own kitchen table came in second with fewer kinds of bacteria plus, in terms of providing a a pathway for disease, only four people use the table in my house while many more use the table at McDonald's . Overall, my hypothesis was proved correct. Out of the restaurants that I tested McDonald's table was the most unsanitary and thus the most likely to be a pathway for diseases.

Summary Statement
My project is about how well do restaurants clean there tables and could it be a pathway for spreading diseases.

Help Received
Dad help glue poster board, Mom help me find interviewers, Dad drove me to restaurants

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Elan E. Filler

Project Number
J1503

Project Title
What Is the Environmental Source of Cryptococcus gattii?

Abstract

Objectives/Goals
Cryptococcus gattii is a fungus that grows on trees and in soil in regions of the world, including Vancouver and Australia. C. gattii causes life-threatening meningitis and pneumonia in humans and animals. Currently, there is an outbreak of C. gattii infection in California; however, the environmental source of this fungus is unknown. My objective was to identify the environmental source of C. gattii in California.

Methods/Materials
I swabbed different trees and collected soil samples in various regions of California, near known C. gattii outbreaks. Afterwards, I plated these samples onto Niger seed agar, upon which Cryptococcus species appear brown. To determine whether these organisms were C. gattii or other Cryptococcus species, I plated them onto canavanine-glycine-bromothymol blue (CGB) agar. On this agar, only C. gattii grows as blue colonies. The identification of C. gattii was verified at a reference lab by DNA sequencing.

Results
Samples from 12 different locations in California were obtained from 84 trees, representing 30 species, and 25 soil samples. Twenty-four samples from five locations yielded yeast that turned brown on Niger seed agar, indicating the presence of Cryptococcus species. Two of these colonies turned blue on CGB agar, demonstrating the presence of C. gattii, which was confirmed by DNA sequencing. C. gattii was isolated from Liquidamber styraciflua (sweet gum tree) and the soil under Pinus canariensus (Canary Island pine).

Conclusions/Discussion
In California, C. gattii grows on L. styraciflua and P. canariensus, near known outbreaks, suggesting these trees are the environmental sources of infection.

Summary Statement
Through my research, I discovered the environmental source of Cryptococcus gattii, which is a fungus that causes life-threatening infections in humans and other mammals.

Help Received
Dr. Deborah Springer (Duke Univ.) was the project supervisor and gave me protocol for making agar and environmental sampling. My father drove me to sampling sites and helped me take pictures of the trees. Richard Dykzeul helped me identify trees. Lab work was performed at LABiomed.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Danika R. Flemming

Project Number
J1504

Project Title
Comparing the Contamination Levels of the Tops of Soda Cans from Different Brands and Stores

Abstract

Objectives/Goals
The objective of my project was to discover which brands and stores contained the highest level of contamination on the tops of their soda cans. The reason I am doing this investigation is to determine whether it is safe to drink from a soda can without first washing the top. Based on the cleanliness of the store, I believe Wal-Mart's generic brand soda can top will contain the most bacteria.

Methods/Materials
The independent variables that I am using in my science project are soda cans of Pepsi, Coke, Shasta, and generic brands from Target, Wal-Mart, Foodmax and Winco stores. First, I will put on sterile gloves. Next, I will wipe sterile cotton swabs onto the soda cans. Then, I will wipe the same cotton swabs onto the Petri dishes. Next, I will tape the Petri dishes closed and put them into the incubator, where I will let them sit for three days. Lastly, I will count the colonies of bacteria and record the data.

Results
The result of my investigation showed that the Target store soda can tops contained the most bacteria and the Wal-Mart store soda can tops contained the least amount of bacteria. As for the brands, the Shasta brand contained the highest amount of bacteria on the tops of their soda cans and the Coke brand contained the least. Over all, the Foodmax Shasta brand by far contained the highest amount of bacteria on their tops of the soda cans.

Conclusions/Discussion
In conclusion, although Foodmax Shasta had the most amount of bacteria colonies, all of the soda cans tested had bacteria, with Winco's generic having the least. Therefore, it is important that you always wash the top of your soda can before taking the first sip.

Summary Statement
Discovering the cleanliness of the tops of soda cans, by testing different brands from different stores.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
William R. Fullerton

Project Number
J1505

Project Title
Mushroom Mania

Abstract

Objectives/Goals
My objective was to find the best place where chanterelle mushrooms will grow.
My hypothesis was: The best place to find Chanterelles is in a damp shaded area under oak trees with a lot of duff but not a lot of undergrowth.

Methods/Materials
First I selected potential locations based on research. Next I measured the area and listed the characteristics of each location. I would then make a thorough search of the area and gather all of the chanterelles. Then I would weigh them by each area and tabulate the findings in a log. I would repeat this process for each area 2 additional times at 1-week intervals. Once all of the collections were complete I calculated the densities of the mushrooms found at each location.

Results
Most of the chanterelles were found under oak trees, surprisingly however some were found under box elders and willow trees. The area that had the highest density was #2. It had little duff and all of the chanterelles were small. The area with the next highest density was #1, it had deep duff and large mushrooms. The area with the deepest duff had the largest mushrooms.

Conclusions/Discussion
My hypothesis was mainly correct. Most Chanterelles grow under oak trees in a damp environment without a lot of undergrowth. The amount duff does not affect the volume of chanterelles found but it does affect the size of the mushrooms; the shallower the duff, the smaller the mushrooms.

Summary Statement
My project was about finding out where chanterelles grow, where they grow the best and where they cannot be found.

Help Received
Father: advised on project and helped type, Interviewed on topic: Beth McGee, Dan Dan Geraci

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Vineet S. Kosaraju

Project Number

J1506

Project Title

Optimization of Biofuel Production from the Algae Nannochloropsis oculata

Abstract

Objectives/Goals

The demand for oil resources has grown astronomically in recent years. Several models predict that oil production will start to decline after 2020, leading to a shortage of resources and onset of a crisis. An alternative to energy shortages are algae based biofuels. Algae reproduces quickly, and research has shown that it yields at least 23X times more fuel than any other crop. The goal of my experiment was to investigate the optimal conditions for algal biofuel production. I used the algae strain Nannochloropsis Oculata and varied light conditions, air flow, and medium of water.

Methods/Materials

Several stock cultures of Nannochloropsis were prepared. Tests were done in triplicate with the independent variables of salt water, distilled water, and gray water, and the constants of temperature, air flow, amount of water; the dependent variable was the algal biomass produced. A second test in triplicate varied light conditions and a third test in triplicate varied the amount of air flow. The amount of algal growth under each of these conditions was measured. The ideal conditions were identified and these were used in unison to maximize algal growth and produce biofuel. Finally TLC was run on the biofuel produced and compared against vegetable oil.

Results

Salt water produced 15.9mg/400mL of algae, followed by DI water which produced 3.4mg and gray water which produced 0.4mg. The culture which was exposed to grow bulb alone produced 14.9mg while the other two with the grow bulb and an additional light source from 10cm or 15cm killed the algae. The culture with the aerator produced 15.7mg while the one with foam stopper and straw, and loosened cap and tape produced 5.2mg and 3.2mg respectively. Combining the optimal growth conditions produced 87.1mg of biofuel for 188.8mg of algae. The TLC analysis showed that the biofuel produced from algae matches that of vegetable oil.

Conclusions/Discussion

The ideal conditions for maximizing algae growth were identified and my hypothesis was supported. The biofuel produced showed a strong correlation to vegetable oil based on TLC which demonstrates that the biofuel produced is a viable energy source. Based on the data it was also extrapolated that we will be able to produce 50.8g of biofuel from a pond which is 2.5m x 1.5m x 0.7m. My experiment shows that optimizing the conditions of algae growth could play an important role in increasing biofuel production.

Summary Statement

My work shows how the factors affecting algae growth can be tweaked to optimize the production of algal biomass and biofuel.

Help Received

Used lab equipment at Schmahl Science Workshop under the supervision of Dr.Aru Hill

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Primavera Leal Martinez

Project Number

J1507

Project Title

Investigating if Different Soil Types and Ash Additives Are Effective in Removing Bacteria from Polluted Water

Abstract

Objectives/Goals

The purpose of my science project is to investigate if different soil types and ash additives are effective in removing bacteria contaminants from polluted water. The reason I am conducting this experiment is to investigate if filtering contaminated water through different soils and ash additives will remove bacteria from polluted water.

Methods/Materials

5 plastic bottles, 5 plastic cups, 90 nutrient culture dishes, puddle water, top soil, ash, sandy soil, clay soil, ruler, measuring cup, oven, disposable aluminum trays, disposable gloves, goggles, lighter, sharpie marker, 5 test tubes, test tube rack, glass, finger, bowl, bent glass rod, methanol, glass beaker pipette, test tube cleaning brush, labels, plastic trays, 10 milliliter syringe, 3 milliliter syringe, pipette mouthpiece with tube.

Results

Ash is the most effective in removing bacteria from polluted water. Top soil had an average of 10,347 bacteria colonies. Clay soil had an average of 9,473 bacteria colonies. Sandy soil ha an average of 12,713. The control had an average of 10,347. Clay soil filtered the most bacteria contaminants = 9,473. Top soil filter the least amount of bacteria = 17,207. Ash had an average of 1,640 bacteria colonies. The ash/sandy soil combination had an average of 27,587 bacteria colonies. The 50/50 sandy soil and ash combination filtered the least amount of bacteria = 27,587

Conclusions/Discussion

Sandy soil was not the least effective in removing bacteria from contaminated water. The top soil was the least effective in comparison to the clay and sandy soils. The top soil had an overall average of 17,207 bacteria colonies; however sandy soil had an overall average of 12,713 colonies. I stated that the clay soil will be the most effective soil in removing bacteria from contaminated water. When compared to the control the overall averaged of 10,347 bacteria colonies,the clay soil only had 9,973. I stated that the fireplace ash will be the most effective in filtering bacteria from contaminated water. The fireplace ash only had an overall average of 1,646 bacteria colonies. This was a difference of 8,707 bacteria colonies. For my results, the fireplace ashes was extremely effective in removing bacteria contaminates. I stated that the 50/50 sandy soil/ash combination will create a better filtration for removing bacteria from contaminated water. The overall average of the sandy soil/ash combo was 27,587 bacteria colonies.

Summary Statement

. The reason I am conducting this experiment is to investigate if filtering contaminated water through different soils and ash additives will remove bacteria from polluted water.

Help Received

Received nutrient culture dishes from high school science teacher.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Gabriella S. Lopez

Project Number
J1508

Project Title
The Five-Second Rule: Safe or Sorry? Is Food Safe to Eat after Five Seconds on the Ground?

Abstract

Objectives/Goals
My science project is to challenge the validity of the five-second rule for dropped food. I tested this rule by using a wet food and a dry food. I used Bologna for the wet and Unsalted Crackers for the dry food. I conducted three trials with each food item being dropped, for five seconds, at the school crosswalk and the ground in front of the lunch area water fountain. For comparison, I also conducted three control trials for each food item.

Methods/Materials
I did my experiment by preparing Petri dishes with agar. I conducted three five-second drop tests for each food item, at each location. After picking up dropped food I swabbed the food item and transferred to prepared labeled Petri dishes. I prepared three control dishes for each food item. I put every swabbed Petri dish in a homemade incubator with a constant temperature of 90° F. At every 24-hour interval I photographed, inspected, measured and recorded the growth and quantity of bacteria colonies.

Results
The results of my experiment are that there is bacteria on the ground and five seconds do not protect you from those bacteria. Through my testing I was also able to determine that the crosswalk has more bacteria than the ground by the water fountain and bologna picks up more bacteria than crackers.

Conclusions/Discussion
My conclusion from this experiment is that I discovered that there are bacteria everywhere and it only takes a second of contact to transfer bacteria. This project could benefit the children at our school because almost all of them believe in the five-second rule. If they knew that they could get very sick from the bacteria on the ground then I know they would think twice before eating what was dropped.

Summary Statement
I challenged the validity of the five-second rule for dropped food and I discovered that food is contaminated on contact.

Help Received
Brother drove me around to test locations and helped me time the drops with a stop watch. My mother helped me type my report. My teacher, Mr Fox, provided me the petri dishes, agar and encouragement.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Sean J. Panado

Project Number
J1509

Project Title
Mini Monsters

Abstract

Objectives/Goals
The objective is to determine the quantity of microorganisms collected by 7th and 8th graders after playing during recess.

Methods/Materials
7th and 8th grade trial participants from two different schools were excused to leave early for recess on each day of the five trials. Each subjects# hands were washed, measured, swabbed, then rubbed in a zigzag pattern onto one half of a 9cm petri dish with his/her name on it. This first swabbing was marked as #before# referring to the before playing during recess. After playing, a second swabbing of my subjects' hands was rubbed onto the opposite half of the petri dish indicating the 'after' period. I chose my subjects to play basketball as it is the most commonly played game at recess and research shows. Using 6in sterile cotton tipped applicators, the technique of the 4 quadrant method, and fifty school subjects, the data was recorded.

Results
The number of colonies produced in the cultured dishes when hands were washed, also known as the #before# playing, was an average of five. Whereas the sample after recess playtime averaged twenty-one colonies. Subtracting the overall mean 'before' from the mean 'after' gives a net of sixteen. Therefore, this shows that you gain sixteen colonies of microorganisms during your time of play. In finding the difference of the after results between the control and the subjects gives a net of fourteen. This explains that you would gain fourteen more colonies playing basketball at recess than you would just walk around with your friends.

Conclusions/Discussion
The readings of the colony forming units (CFUs) after 3 to 4 days of culturing in isolated room temperature were observed. Colonies formed were of big and small sizes along with some close or clustered. I came to conclude that despite the hand size and amount of basketball dribbles and shots a subject takes at recess, these don#t provide results that vary or change significantly the mean of the cultured colonies. Microorganisms gathered and collected through the hands as observed here show that it is based off of how the specific person handles and treats his/her hands daily. These include what one touches, temperature, and where and how long one plays during recess.

Summary Statement
My project was about how I determined the amount of microorganisms 7th and 8th graders gather when playing during recess at school.

Help Received
College professor lent few materials and allowed lab tour; mother advised and supervised throughout; brother assisted in spray painting backboard

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Louis Primeau

Project Number
J1510

Project Title
The Effect of Elevated CO(2) on the Growth of Freshwater Algae

Abstract

Objectives/Goals
To find the effect of elevated CO2 on the growth of freshwater algae.

Methods/Materials
Procedures: 1. I collected pond water with algae 2. I made a CO2 source using yeast to ferment sugar in a bottle 3. I grew algae with plenty of light, nutrients and water, in 4 bottles. In two bottles I bubbled extra CO2 by connecting them using the soft tubing to the CO2 source. The other two bottles were used as controls. 4. I counted the number of cells in a fixed volume of water using the microscope for each bottle each day for a period of 15 days.
Materials: 1. 6 one-gallon clear-plastic bottles 2. 1 aquarium pump and light 3. 4 packets of yeast and 8 cups of sugar 4. 1 bottle of pond water 5. 25 ft soft tubing, 6 ft hard tubing 6. Miracle-Gro fertilizer 7. 1 microscope, 1 hemocytometer, and 1 digital microscope camera

Results
The average growth rates of the algae read as follows: The control bottles had an average growth rate of 0.14 new cells per cell per day, while the elevated CO2 bottles had an average growth rate of 0.23 new cells per cell per day.

Conclusions/Discussion
Elevated CO2 does affect the growth of freshwater algae. My results are in accord with my hypothesis. The doubling time for the population of algae cells in the control bottles was 5 days, while the doubling time for the bottles with elevated CO2 was only 3.6 days.

Summary Statement
My project focused on the growth of algae with elevated CO2

Help Received
My dad helped write the Matlab script and got me my microscope.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Tre' Risk

Project Number
J1511

Project Title
Waste Not Want Not: Reducing Aquifer Depletion through Increased Recycled Water Consumption

Abstract

Objectives/Goals
In the Coachella Valley, the golf industry consumes an enormous amount of water. Golf courses need to have well-manicured, visually pleasing water features. They frequently use aquifer water to achieve this. However, this resource is limited. The other two water sources are Colorado River water which is fed through a canal system and Reclaimed water which is treated waste water. My goal was to mix different percentages of Reclaimed, Aquifer, and Colorado River water to find a solution that encourages little to no algae growth.

Methods/Materials
33 5-gallon buckets; 16 gallons of aquifer, 15 gallons of reclaimed water, 14 gallons of Colorado River water; Microscope; Test Strips; Color Chips to measure algae development.

Results
I ran 11 various combinations of water sources (from the Colorado River, the Aquifer, and Reclaimed Water). 3 tests of each sample type were made. I sampled each water combination for a total of 33 tests and examined the samples for algae growth. Algae started growing in the second week of the tests and continued throughout the study. At the end of the six week period, I had the following results:

Composition:	Algae Growth
100 % Aquifer	4.3
100% Reclaimed	2.0
100% Colorado	5.7
33% Aquifer/33% Reclaimed/33% Colorado	2.3
50% Aquifer/20% Reclaimed/30% Colorado	3.0
30% Aquifer/50% Reclaimed/20% Colorado	2.7
20% Aquifer/30% Reclaimed/50% Colorado	3.7
50% Aquifer/30% Reclaimed/20% Colorado	2.7
60% Aquifer/20% Reclaimed/20% Colorado	3.3
20% Aquifer/60% Reclaimed/20% Colorado	2.3
20% Aquifer/20% Reclaimed/60% Colorado	5.0

Conclusions/Discussion
Colorado River water and its high percentage combinations allowed the highest levels of algae growth. Reclaimed water is highly treated and as a result, it hinders the algae growth the most in the initial growing period stages.

Summary Statement
In order to conserve as much aquifer water can I find an alternate water source combination that hinders algae growth.

Help Received
The Coachella Valley Water District provided water samples that I used.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Rajiv Sancheti

Project Number
J1512

Project Title
Portable Milk Purification System

Abstract

Objectives/Goals
The objective of this project is to determine whether UV sterilization can pasteurize milk.

Methods/Materials
To test my hypothesis I used 8 different UV exposure durations: 16 seconds, 32 seconds, 1 minute, 1 minute 16 seconds, 2 minutes, 4 minutes, 8 minutes and 25 minutes. In each test 500 ml of milk was exposed to UV light. Then, using an aseptic procedure, I took 100 microliters of milk from each test run and placed each sample onto separate Agar Plates. The Agar Plates were then placed in the incubator for 24 hours. The materials used included.
UV LAMP (11w 254 nm), UV light Shield, Receptacle, Ballast, Raw Goat Milk - 3 quarts, Raw Cow Milk - 4 quarts, Incubator, Magnetic Spinner, 2 Beakers - 500ml and Agar Plates.

Results
Overall, increased exposure to UV light led to a decrease in new bacteria growth. Results for the Goat Milk plates were negative because almost all of them had fields growing. However in the case of Cow Milk no colonies were observed with 25 minutes exposure.

Conclusions/Discussion
My results showed me that 25 minutes of exposure to UV light could pasteurize Cow milk. Goat milk did not get pasteurized probably due to the fact that it is more opaque than Cow milk, and UV light has a hard time penetrating it. The economics of UV pasteurization vs. heat pasteurization needs to be studied. Additionally, research should be done it see if UV pasteurized milk has more nutrients than heat pasteurized milk.

Summary Statement
I have demonstrated that it is feasible to pasteurize Cows milk using UV light.

Help Received
The experiments were preformed at A Schamhl Science Workshop under the supervision of Dr. Youssef. My neighbor George Pontis helped me select and setup the UV light and ballast.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Joseph M. Shell

Project Number
J1513

Project Title
The Amazing Slime Mold, Physarum polycephalum

Abstract

Objectives/Goals
The objective of my project was to independently confirm the results of a Japanese scientist named Dr. T Nakagaki who observed that the physarum polycephalum developed pseudopodia connecting two food sources along the shortest path in a maze. I predict that my cultures of slime mold will exhibit #maze-solving# behavior at least a few times.

Methods/Materials
In my procedure, I cultured the physarum polycephalum protist so that I would have enough of the growing organism to place in ten plastic-film mazes. Then I cultured the slime mold inside the maze until the protist filled the whole space between the plastic-film barriers. Then I placed the food at the two endpoints of the maze on top of the slime mold culture and observed its behavior.

Results
Of my ten trials, three of the slime mold cultures grew pseudopodia connecting the two food sources, but not along the shortest path in the maze.

Conclusions/Discussion
I have concluded that my hypothesis was partially correct. My cultures grew pseudopodia connecting the two food sources. This is the same #maze-solving# behavior discovered by Dr. T Nakagaki that allows the physarum polycephalum to select the shortest path through the maze under proper laboratory conditions.

Summary Statement
To test the behavior of a culture of slime mold, I made a maze and grew the physarum polycephalum in that maze to see if it would connect the two food sources along the shortest path through the maze.

Help Received
I received help from my mom with my display board and my dad for helping me understand the project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Zack S. Silverman

Project Number
J1514

Project Title
Hidden Bacteria: Are Your Cutting Boards Really Safe?

Abstract

Objectives/Goals
My objective was to find out which type of cutting board resisted bacteria the best.

Methods/Materials
The materials I used are: six agar petri dishes, six disinfected swabs, one bottle of distilled water, one used wooden cutting board, one used plastic cutting board, one used antimicrobial cutting board, six pieces of raw chicken, and tap water. I poured the agar into three petri dishes. Then I placed a piece of raw chicken on each of the three cutting boards and chopped it into small pieces. I washed each cutting board with running tap water and let them air dry. Once they were dry, I rubbed a sterilized swab onto each of the different cutting boards. I carefully lifted the lid of the appropriately labeled agar plate and then streaked the swab onto the agar solution in the petri dish. I quickly replaced the lid after making each streak. I repeated this procedure for each of the remaining two cutting boards. Then I taped the three petri dishes closed. The three petri dishes were stored in a cool, dark location for a month. I recorded daily observations in my project journal.

Results
I learned the antimicrobial cutting board resists bacteria the best. I believe it resists bacteria because it is coated with Silver Ion. I also believe the plastic cutting board had the second least bacteria because when you cut on it, it leaves grooves for bacteria to grow in. The wooden cutting board, being porous had the most bacteria due to the fact that bacteria can penetrate deeper into the wood and reproduce.

Conclusions/Discussion
My hypothesis did support my results. I learned bacteria is everywhere and there's nothing you can do to stop all of it. I also learned the antimicrobial is what type of cutting board to use. You should wash it in the dishwasher since that removes most of the germs.

Summary Statement
In my experiment I tested 3 types of cutting boards to see which resisted bacteria the best.

Help Received
Mother helped put board together, Father helped pour the agar into petri dishes

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Kapil Sinha

Project Number

J1515

Project Title

Organic Remedy for Tomato Plants: Effects of Vicia sativa and Rye Secale cereale for Protection from Verticillium dahlia

Abstract

Objectives/Goals

Tomato plants often suffer from a fungus, Verticillium dahliae, which stunts the plant and wilts their leaves. In the fields, for commercial production, farmers fumigate the plants with methyl bromide, as this is the only known technique to get rid of this fungus. In my project, I tried to find ways to eliminate or reduce the effects of Verticillium dahliae using organic techniques. Rye Secale cereale AGS104 and Vicia sativa are cover crops that are used in farming to add organic material to the soil and improve soil structure. I used these plants to check if they can help prevent or reduce the effects of Verticillium dahliae in tomato plants.

Methods/Materials

I crushed the Rye Secale cereale AGS104 and Vicia sativa and put it in the soil of the tomato plants to see if that could supply the tomato plants with enough nutrients to allow them to fight the effects of Verticillium dahliae. I used dilution plating and a microscope to count the number of fungus spores in the soil to see which plant, Vicia sativa or Rye, will get rid of the most fungus. I also measured the height and counted the number of leaves to see their visible effect on the tomato plants.

Results

Both cover crops drastically reduced the fungus in the soil. Rye Secale cereale AGS104 had over 83% fewer CFUs per gram than the control and Vicia sativa had over 78% fewer CFUs per gram than the control. Both were effective in preventing stunting in the tomato plants. Vicia Sativa was 40% and Rye was 44% more effective in plants with fungus than in plants without. Both cover crops were also effective in stimulating leaf growth in the tomato plants. Vicia Sativa was 117% and Rye was 112% more effective in plants with fungus than in plants without.

Conclusions/Discussion

Rye Secale cereale AGS104 and Vicia sativa helped reduce the impact caused by Verticillium dahliae. Rye and Vicia sativa had a beneficial impact on the soil- with significantly less fungus (CFUs per gram) than the control. They also had a beneficial impact on the tomato plants- both in terms of plant height and number of leaves when Verticillium dahliae was present. The Rye was not as effective as the Vicia Sativa in increasing growth (plants without fungus). I found that this was because another "mystery fungus" (Fusarium) affecting the Rye plants besides the Verticillium dahliae.

Summary Statement

My project is about finding an organic remedy for tomato plants that suffer from the fungus, Verticilllium dahliae, by using Vicia sativa and Rye Secale cereale AGS104.

Help Received

I used lab equipment at USDA. My parents drove me to and from USDA. Lorena Ochoa, Biological Science Aid, taught me how to use the different pieces of equipment. Dr. Klosterman, Research Molecular Biologist, was my mentor. He gave me advice and guidance on my project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Junyu Yang

Project Number
J1516

Project Title
The Choices of P. polycephalum

Abstract

Objectives/Goals
The objective of my experimet is to see the reaction of the protist the Physarum polycephalum (also known as the "true slime mold") when confronted on all sides by a mixture of a repellant and an attractant while situated in an ideal environment.

Methods/Materials
A culture of Physarum polycephalum was grown on nutrient agar in a petri dish. It was situated in the middle, with a ring of oatmeal around it. The oatmeal was the ideal environment. Beyond the ring of oatmeal there was a circle of the attractant-repellant mixture. Two attractant-repellant mixtures were used: Valerian root/salt and Valerian root/light.

Results
The Physarum polycephalum, when confronted with Valerian root/salt, stayed within the oatmeal boundaries. When confronted with Valerian root/light, it went on to the attractant/repellant mixture. In both cases, there was heavy microbial contamination.

Conclusions/Discussion
In conclusion, salt is a stronger repellant of the Physarum polycephalum than light.

Summary Statement
A culture of the Physarum polycephalum, a slime mold, was placed in an "ideal enviroment" while being confronted by a mixture of an attractant and a repellant, and its actions were observed.

Help Received
Mother and Father bought me materials.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Angela Yoo

Project Number
J1517

Project Title
How Much Metabolic Efficiency Does Yeast Grown with Sugar Substitutes Have Compared to the Amount Grown with Sugar?

Abstract

Objectives/Goals
The objective of this study was to determine the metabolic efficiency of yeast grown with sugar substitutes in comparison to yeast grown with sugar.

Methods/Materials
Yeast and 115º F water were mixed with, in turn, sugar, nothing, and the sweeteners saccharin, sucralose, and aspartame. The different mixtures were correspondingly attached to a gas collection apparatus, and the amount of carbon dioxide collected after 15 minutes was recorded by measuring the amount of water displaced in the gas collection apparatus. Each experiment trial was repeated 3 times.

Results
Sugar, collecting an average of 68 milliliters of carbon dioxide, had the highest metabolic efficiency, followed by sweeteners saccharin, sucralose, and aspartame at average amounts of 62 milliliters, 61.3 milliliters, and 57.3 milliliters, respectively. The yeast solution with nothing in it did not bubble, which resulted in that solution collecting the least average amount of 3 milliliters.

Conclusions/Discussion
The results suggest that sugar is the most likely to have the highest metabolic efficiency.

Summary Statement
My project observed and examined the question of yeast metabolism using various sugar substitutes in replacement of sugar, testing the metabolic efficiency.

Help Received
Borrowed graduated cylinder from teacher, Mrs. D. Shah; Mother helped cut and paste papers onto the board.