CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Ruchi P. Agashe

Project Number
J1501

Project Title
Abundance and Identity of Various Species of Bacteria in Sushi

Abstract

Objectives/Goals
My project aimed to determine which species of bacteria are present in the fish meat from store-bought sushi.

Methods/Materials
I used 3 types of fish meat, salmon, tuna and crab, which are the most common types used in sushi.For the experiment, I plated the bacteria that was found in each different types of fish through centrifuging and pipetting the supernatant onto petri dishes. The colonies of bacteria were isolated according to its morphology, and the DNA was then be sequenced into their nucleotides. (This step was done in a different lab since I was not allowed to perform these procedures) Finally, after knowing the species of bacteria, I was able to research if it is pathogenic or not. Also, when I grew the bacteria on the agar plates, I was be able to identify the different types of morphologies of the bacteria and see which ones are the most common.

Results
My data suggested that tuna has the highest total abundance of bacteria and crab has the lowest. The most common species were Leuconostoc gelidum and Pseudomonas fragi.

Conclusions/Discussion
All of my trials indicated that tuna significantly has the highest abundance of bacteria and crab has the least. Even though crab had the lowest abundance, it had the greatest number of species of pathogenic bacteria.

Summary Statement
In my experiment, I determined the species and abundance of bacteria in each type of fish, figured out whether the bacteria is pathogenic, and discovered the most common morphologies of bacteria in each type fish.

Help Received
I performed my experiment in the La Jolla Public Library BioLab with the supervision of Dr. Callen Hyland.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Amaya M. Bechler

Project Number

J1502

Project Title

Effect of Preservatives on Yeast

Abstract

Objectives/Goals

The objective of this project was to determine the effect of specific preservatives on the growth of yeast (Saccharomyces cerevisiae.)

Methods/Materials

To set up the experiment the materials used were dry baker's yeast, petri dishes, a base for cultures and a variety of preservatives. Weight of cultures was recorded for several days as a measure of growth.

Results

The results show that some preservatives benefit the growth of yeast while others inhibit it.

Conclusions/Discussion

The results were partially in line with my hypothesis. The experiment showed that some preservatives have a positive effect on yeast whilst some have a negative effect. The project is of importance because it shows the effect of certain chemicals on eukaryotic cells, these being cells in human bodies along with other animals. Since humans often consume the preservatives, we should know of the effect on our cells.

Summary Statement

Some preservatives benefit yeast growth while some inhibit its growth.

Help Received

My science teacher, Diana Skiles, helped me with writing my conclusion coherently. Otherwise, I completed the experiment by myself.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Catherine M. Brassil

Project Number

J1503

Project Title

Gut Wars: The Probiotic Force Awakens

Abstract

Objectives/Goals

To determine whether the source of probiotic bacteria (live culture or commercial freeze dried capsules) differ in their ability to survive the stomach after ingestion. The primary hypothesis was that source did not matter.

Goal 1- Establish a model of human stomach conditions.

Goal 2- Compare numbers and growth rate of bacterial sources.

Goal 3- Determine the effect of common breakfast foods on the bacterial growth.

Methods/Materials

Live Kefir culture, probiotic capsules, simulated gastric fluid (SGF), Pepsin, Sodium Taurocholate, Lecithin, MRS agar plates, test foods: (milk & sugar, egg, grapefruit, coffee, diet coke).

1.Establish amount of bacteria in live culture by serial diluting the culture in PBS Buffer and then plating the dilutions on MRS agar plates. Prepare an equivalent amount of freeze dried bacteria.

2.Artificial Stomach incubations consisted of 100 ml SFG, 100 ml of bacterial culture (1 or 10 billion cells) and 100 ml of water or test food solution.

Results

In the initial experiment, the number of bacteria in the kefir culture was determined to be approximately 1 Billion bacteria in 100 ml of culture. It was also observed that Kefir growth rate was 3-4 times faster than freeze dried bacteria (24 h vs. 72 h). It was then decided to test 1 billion bacteria (culture or freeze dried) in artificial stomach conditions. It was determined that 1 billion freeze dried bacteria had insufficient growth as only the PBS control grew colonies. In the next expt, 10 billion freeze dried bacteria were tested. Kefir bacteria survived in nearly all food conditions except for coffee which had a mild effect. In comparison, the 10 billion freeze-dried bacteria were highly affected by SGF alone, with about 50% of the loss bacterial numbers. Diet coke was found to decrease by 30%.

Conclusions/Discussion

The primary hypothesis was disproven. Kefir probiotic bacteria were shown to be more robust and faster growing than freeze dried bacteria. This is important as most people have a regular 24 hr. gut cycle and probiotic bacteria will be ineffective if they do not grow in this timeframe.

The secondary hypothesis is that breakfast foods do not affect the ability of probiotics to survive the stomach and reach the colon has also been disproven. Coffee and diet coke have a negative effect on the growth of culture or freeze-dried bacteria.

Summary Statement

My Project compares the ability of the two most common sources of Probiotic Bacteria to survive artificial stomach conditions and deliver beneficial bacteria to the colon.

Help Received

Dr. Patrick Brassil at Theravance BioPharma provided assistance/guidance and access to lab equipment.
Mrs. Nicole Shimshock my Science teacher provided additional guidance and suggestions.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

James Carlson; Shawn Vinogradsky

Project Number

J1504

Project Title

Heat Controlled Eradication of Fungus

Abstract

Objectives/Goals

The purpose of this study is to learn how to kill pathogens with heat treatment with as much energy efficiency as possible by determining whether, in a controlled environment, high temperatures set for a short amount of time will be more energy efficient at destroying pathogens than lower temperatures set for a longer amount of time.

Methods/Materials

Attached an immersion circulator to a pot, set it to a desired temperature after filling the pot with water, and submerged sealed petri dishes containing agar and a solution of penicillium candidum and water. One petri dish was left outside as a control. At repeated intervals, one petri dish was removed. Growth rates of the culture were measured afterwards.

Results

Multiplying the degrees above 70 degrees Fahrenheit that the immersion circulator was set to during an experiment by the amount of minutes that a petri dish in that experiment was submerged for, it was determined the amount of energy added to the system to kill the pathogens.

For the experimental run performed at 160 degrees Fahrenheit, the kill was complete within ten minutes. So the heat input above room temperature (90 degrees) was multiplied by ten minutes to determine an energy consumption of 900 Energy Units.

For the 145 degrees Fahrenheit experiment, a kill was achieved in a petri dish that was submerged for 15 minutes. The degrees above room temperature (75 degrees) multiplied by 15 minutes submerged equaled 1175 Energy Units

For the experiment run at 120 degrees Fahrenheit, no kill was achieved. The highest submersion time of petri dishes was 40 minutes in this experiment. The degrees above room temperature (50) multiplied by 40 minutes submerged determined 2000 Energy Units.

Conclusions/Discussion

Based on observations of the growth of a culture of penicillium candidum inside sealed petri dishes that were submerged in water heated to a desired temperature, it can be concluded that a sealed petri dish containing a culture of penicillium candidum that was submerged in water heated to a desired temperature would have the culture that it contains killed with maximum efficiency if it was submerged in this water

Summary Statement

My partner and I submerged sealed petri dishes containing a culture of penicillium candidum into heated water, and found that high temperatures set for long times or lower temperatures for long times are more efficient at killing pathogens

Help Received

Dr. Adrian Land, Steve Carlson (father), Illya Vinogradsky(partner's father), and Dr. Jayne Hastedt

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Gwyneth C. Elliott

Project Number
J1505

Project Title
Algae

Abstract

Objectives/Goals
If algae grew in sixteen ounce galvanized steel, silicone, colored plastic, or ceramic bowls placed in simulated light, shade, or darkness which would have: A higher light absorbance? Lowest light transmittance? Higher pH level? Highest weight of grown Algae?

Methods/Materials
Using a total of twelve bowls; 3 galvanized steel, 3 silicone, 3 ceramic, and 3 colored plastic. Containing small amounts of algae in three different environments; complete darkness, light and shade. How is algae growth affected? Results are measured by comparing pH level, temperature of water, transmittance of light and absorbency of light for each bowl. Tests for pH were done every other day for a 2 week period. Then the water and Algae were changed and another test was completed for 2 weeks. This set up was done for five test to be completed. To find the transmittance and absorbance a light spectrophotometer was used at different wave lengths and the data was recorded. A pipet was used with the light spectrophotometer. pH strips and tablets were used during the experiment to get the pH reading. A thermometer was used for temperature readings. The water used in this project was distilled water each bowl had 2 cups.

Results
During testing it was discovered that out of galvanized steel, silicone, ceramic, and colored plastic. The ceramic bowl in the shaded environment had the highest readings for pH level, final algae weight, and light absorbance with the lowest transmittance of light.
Ceramic shade had the best environment for algae growth based on temperature, pH and light levels. Reference FAO document.

Conclusions/Discussion
The hypothesis was that the galvanized steel bowl placed in a simulated light location would have a higher pH, algae weight (growth), and light absorbance. With a lower light transmittance level at set wavelengths. The hypothesis was proven wrong. The highest pH level was 7.0 for ceramic in the shade environment. The highest weight was also, ceramic in the shade environment with average weight of 1.02. Ceramic shade did not have the highest light absorbance level.

Summary Statement
Using 16 ounce bowls made of galvanized steel, colored plastic, ceramic and silicone which will grow the most algae, have the highest light absorbance, with the lowest transmittance light level, the highest pH and weight of grown algae?

Help Received
Received help writing my research paper for this project. Was provided help by my local water district in the form of being allowed to bring an algae sample into their lab. At the lab I was given the opportunity to use a high powered microscope. On my own was allowed to prepare a slide and put it under the

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Chrysanthe N. Frangos

Project Number
J1506

Project Title
Using Rice and Silica Gel in the Prevention of Bread Mold

Abstract

Objectives/Goals
The objective of this project was to see if rice can safely and effectively delay or prevent the forming of mold on stored, preservative-free bread. Rice is a known desiccant used in salt shakers to absorb excess moisture and prevent clumping. Many cultures twice bake bread (biscotti, zwieback) as a form of preservation. The combination of these two ideas helped me form this project.

Methods/Materials
To conduct this experiment, I home baked loaves of preservative-free bread. Half slices of this bread were placed with packets of rice, silica gel (positive control) or empty bags (negative control), 10 samples for each group. Over nine days, I took pictures of the surfaces of the bread with my iPad. I analyzed the pictures using the National Institutes of Health ImageJ image analysis software. To calculate the percentage of mold on the bread, I found the total number of pixels in an area of bread and compared it to the number of darker pixels within that area (mold), as determined by the ImageJ brightness thresholding process.
In a follow-up experiment, I determined the most effective dose of rice. Bread slices (5 each) were placed with 0, 20, 40, and 80g of rice.
To determine if rice's desiccant properties can be regenerated, I heated packets (5 each) of rice at two different oven temperatures (150 and 180 deg F), weighed every 20 mins, and in the microwave, weighed every 30 secs.

Results
The results were dramatic. In the negative control group, mold was evident on Day 7 and continued rapid growth into Day 9. Silica gel completely prevented mold from forming throughout the experiment. Rice (used in a 40g dose) delayed the formation of mold by two days and reduced the amount of mold by 80% on Day 9 in comparison to the negative control group.
In the follow-up experiment, I discovered that, generally, the greater amount of rice, the less mold.
All methods of heating removed moisture from the rice, but heating at 150 deg F was found to best retain rice's hygroscopic properties.

Conclusions/Discussion
My studies indicate that even though rice does not prevent mold to the same extent as silica gel, it is a safe and effective tool in keeping bread from molding over a prolonged period of time. While twice-baking bread results in a hard cracker, the use of rice reduces just enough moisture to maintain the bread's quality. By extending the shelf life of preservative-free bread, less bread will be wasted.

Summary Statement
I found that the hygroscopic (desiccant) properties of rice prevented mold growth on preservative free bread in a safe and natural manner by comparing it to the known desiccant silica gel.

Help Received
I conducted the experiments, baked the bread, weighed the materials, took and analyzed the pictures on ImageJ, recorded and analyzed the data. I received help from my parents and my teachers, Ms. Jennifer Lambert, Mrs. Debra Cota, and Mr. Eric Allen, in the editing of my papers.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Alexa M. Gamble

Project Number

J1507

Project Title

The Effectiveness of Bleach: Its Impact on Microorganism Reduction in Relation to Time in Park Drinking Fountain Water

Abstract

Objectives/Goals

The objective is to determine the efficiency of bleach in relation to the time it remains on drinking fountains' spigots in reducing the amount of microorganisms in its water, as compared to the fountain's Before control sample, and as measured by colonies' total surface area.

Methods/Materials

Stopwatch; spray bottle; 30 LB Agar Plates, pipettes, and swabs; 5 parks with 3 drinking fountains each; incubator made from plastic bin, heat lamp, 2 thermometers. Collected Before and After water samples from each fountain leaving bleach spray on all 5 Fountain #1's for 1 minute, Fountain #2's for 5 minutes, and Fountain #3's for 10 minutes. Measured microorganism colony growth from each water sample in sq.cm, recording totals and characteristics, comparing the total surface area in the Before bleach spray water sample to the corresponding fountain After samples for each time period the spray was left on contact: 1 minute, 5 minutes, and 10 minutes.

Results

In relation to time, allowing bleach to remain on the spigot surface for 5 minutes proved to reduce the greatest amount of microorganisms (10.20 sq.cm), which was 2.05 sq.cm more than waiting 1 minute and almost 6 sq.cm more than waiting 10 minutes.

Conclusions/Discussion

The performance of the bleach was enhanced by leaving it on the fountains' spigots for 5 minutes, showing the greatest average reduction in microorganisms when compared to its Before water samples. Since leaving bleach on contact for 5 minutes proved to reduce the most microorganisms, this would be an important lesson to implement at home for cleaning, and in hospitals for disinfecting.

Summary Statement

I showed that a 5 minute wait time on spigots has a positive impact on bleach's ability to reduce microorganisms in water from drinking fountains.

Help Received

I built the incubator, but my mom bought the materials on my list. My dad drove me to all the parks for my population data and water sample collection.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Ryan Gao

Project Number
J1508

Project Title
What We Can't See: Detection and Identification of Microorganisms in a School Environment

Abstract

Objectives/Goals
The purpose and goal of this project is to find and compare number of colonies of microorganisms on the surface of certain items/places in a school environment, which were: a door handle, a water fountain, a light switch, urinal floor tiles or the sole of my shoe. To accomplish this objective, I conducted experiments in which I collected microorganisms from the various surfaces, grew them into numerous colonies, compared the results and identified what they were.

Methods/Materials
I used sterilized swabs to collect the microorganisms from each surface. Next I transferred the microorganisms onto sterilized petri-dishes filled with standard method agar. Then the microorganisms were grown for 26 hours in an incubator and then observed under a plate counter magnifier where the colonies are counted.

Results
The final analysis is that the sole of my shoe has the most colonies of microorganisms. The following is the rank from the most to the least number of colonies of microorganisms: the sole of my shoe, urinal floor tiles, a light switch, a water fountain and a door handle.

Conclusions/Discussion
Repeated trials show that the sole of my shoe has the most colonies of microorganisms out of the five items/places. In conclusion, my hypothesis was correct.

Summary Statement
I detected and tested for microorganism growth on the items/places that most students come in contact with on a daily basis in our school.

Help Received
I swabbed, collected and examined the microorganisms myself. I got helped in having the sterilized materials ready and having the microorganisms grown from the Alpha Analytical Laboratories, Inc.. My Science teacher reviewed my project and my parents advised my project.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Shloka V. Janapaty

Project Number
J1509

Project Title
Fueling a Sustainable Planet: Accelerating Algae Growth with Industrial Wastewater

Abstract

Objectives/Goals
Algae have the potential to rescue mankind from lack of sustainable fuel sources and global warming. Algae absorb 90 percent of surrounding CO2 into their cells and produce lipids that are usable as biofuel. Biofuel so produced is not only sustainable but also cleans the atmosphere. This project takes an additional step to accelerate algae growth using industrial waste and thereby putting the pollutants to good use. This project aims to use industrial wastewater to accelerate algae growth.

Methods/Materials
In this experiment, chlorella vulgaris cultures were grown with varying concentrations of industrial wastewater. In the first four samples, the industrial waste concentration was varied from 0, 1/32, 1/16, and 1/8 teaspoons. Four additional samples were prepared as counterparts with a regulated pH of 7.5.They were placed in a 72 degree fahrenheit room and 1 foot away from a 1500 lumens lamp. The lamp was on for 16-hours and off for 8-hours. pH of the solution was measured at the end of #light period# and at the end of the #dark period# and the fluctuation was noted.

Results
Algae growth was highest in samples with industrial waste. Samples with industrial waste and algae growth also showed the least pH fluctuation. The culture with a 1/32 tsp concentration of industrial water at a regulated pH exhibited the highest algae growth rates. In 1/16 tsp. industrial waste culture and 1/8 industrial waste cultures, growth rates were the higher than that of its controlled counterpart

Conclusions/Discussion
In conclusion, high concentrations of industrial waste stabilize pH and provide nutrients, thereby accelerating algae growth. Such acceleration of algae growth can pave the way for sustainable yet economical biofuel production. Algae will also absorb CO2 from the atmosphere, thereby reducing global warming.

Summary Statement
I measured that industrial wastewater provides nutrients and stabilizes pH, therefore accelerating algae growth

Help Received
My science teacher Mrs. Kristi Chung advised me on concentration levels, and my geometry teacher Mrs. Shobita Sinha taught me standard deviation for my data plots.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Kirsten A. Jilot

Project Number
J1510

Project Title
How Does an Electromagnetic Field Affect Single-Celled Organisms?

Abstract

Objectives/Goals
The purpose of my project was to determine the effects of an electromagnetic field on single celled organisms. The experiments involved observing three different types of single-celled organisms exposed to an electromagnetic field. This involved obtaining live single-celled organisms (paramecium, euglena, and amoeba). Then, using a bell wire, I attached a DC power pack to a light bulb, creating a complete circuit. One side of the wire was attached to a pool of organisms. Measurements were made by visually recording the behavior of the single-celled organisms before, during, and after they were exposed to the electromagnetic field.

Methods/Materials
Electromagnetic Field (DC powerpack, wire, light bulb), Microscope, three types of single-celled organisms (euglena, amoeba, paramecium). I observed each type of organism before, during, and after exposure to the electromagnetic field. This procedure was then done two more times.

Results
The results showed that paramecium acted by moving slower. They were affected by the field for a few minutes, but then adapted to the field and returned to their original speed. The amoeba began to shake and move slower once the field was turned on, and continued this behavior for the whole time that the field was on. A few minutes after it was turned off, they returned to their original behavior. The euglena shook and changed direction once the field turned on, and many died. Once the field turned off, it took much time for the remaining euglena to return to their original behavior.

Conclusions/Discussion
The information gained from this project could be used by scientists to confirm a possible variable in their experiments with single-celled organisms. The information gained could also be used by scientists to aid in in determining the effects of electromagnetic fields on humans. Since there still has been no conclusion to this debate, my results could assist in finding the truth to whether or not the fields are harmful to human cells.

Summary Statement
The purpose of my project was to determine how electromagnetic fields affect single-celled organisms

Help Received
I designed and conducted the experiment myself. My science teacher helped me understand how to present the data in graphs.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Amira J. Maldonado

Project Number
J1511

Project Title
Investigating the Effects of Various Cleaning Methods on Bacteria Growth on Cutting Boards

Abstract

Objectives/Goals
The objective of this study is to determine the effects of various cleaning methods on bacteria growth on cutting boards.

Methods/Materials
3 cutting boards (plastic, antibacterial, wooden), 90 petri dishes, 100 sterlized swabs, bleach, dish soap, 9 pieces of raw chicken breast, water, large box, disposable plastic gloves, and face masks.
Chicken swab before, wash board, swab after cleaning, sterilize board, and dried board completely.

Results
The best board to use is plastic it resulted in less bacteria growth. The most effective cleaning solution is bleach, it is the most effective cleaner on killing bacteria growth.

Conclusions/Discussion
In this project I conducted multiple trials to determine which cleaner was the most effective on bacteria growth on cutting boards. It is concluded that plastic cutting boards have the least bacteria growth. Where as bleach is the most effective cleaning solution on preventing bacteria growth. This study would be beneficial for food prep industries kitchens to provide what would be the best products to use for cleaning.

Summary Statement
I showed that plastic cutting boards have less bacteria growth and bleach is the most effective cleaning solution to use on cutting boards.

Help Received
Parents assisted in prepping materials for experiment and preparation of board. My teacher assisted in initial steps for project.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Dylan D. McMullen

Project Number
J1512

Project Title
The Effect of Fertilizers on Mushrooms

Abstract

Objectives/Goals
The objective of this experiment is to determine what benifits the growth of mushrooms the most; water, plant-based fertilizer or animal-based fertilizer.

Methods/Materials
3 Oyster mushroom logs, 3 cardboard boxes, 3 spray bottles, blood meal fertilizer, plant-based compost, 3 gallons of water, a ruler. Three mushrooms logs were used in this experiment, one log was sprayed with water, the second with a plant- based fertilizer the third with a animal-based fertilizer. Over ten days I fertilized and watered each log and I measured the size and the quantity of mushrooms grown. Afterwards, I harvested the mushrooms and recorded size, weight and quantity of mushrooms of each log.

Results
The mushroom log sprayed with the plant-based fertilizer produced the largest and highest quantity of mushrooms.

Conclusions/Discussion
The results of my study show that plant-based fertilizers clearly make a difference in Oyster mushroom growth. Not only was there an increase in the size and weight of the individual mushrooms but in the overall quantity of mushrooms produced from the mushroom log was greater.

Summary Statement
I found that using a plant-based fertilizer on an Oyster mushroom log would produce a greater quantity of larger mushrooms, than if using water or animal-based fertilizer.

Help Received
I conducted my research by myself.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Khushi T. Parikh

Project Number
J1513

Project Title
The Effect of the Timing of Light Exposure on the Circadian Cycles of Dinoflagellates

Abstract

Objectives/Goals
The objective of my project was to determine if the circadian cycles of an organism could be artificially altered using a timed light source without having a negative impact on the mental, behavioral, and physical health of the organism.

Methods/Materials
8 containers of dinoflagellates as bioassays, 4 closets equipped with a light source and a light timer which were programmed to turn on and off at different times of the day, self-built light measurement device using a light sensitive chip (the TSL237), an Arduino board, and C++.
Four closets with different light cycles were used to alter the circadian rhythms of the different groups of dinoflagellates. The first group was the control, the second group had a phase shift back, the third group had a phase shift forward, and the fourth group had a complete reversal of the timing of the control group. Each day, I recorded the amount of bioluminescence produced by each container of dinoflagellates at very specific times in the day (their nighttime) by agitating them. Since the bioluminescence produced by the dinoflagellates was at a very low intensity, I had to build and program a special light measurement device.

Results
My results indicate that the control group was the most consistent and had the highest average out of all of the groups. However, the other groups did survive and even did thrive. The third group had the highest peak out of all of the groups, including the control, and had the highest average out of Group 2, 3, and 4. The fourth group had an average and peak just below the average and peak of Group 3. Group 2 had the lowest average and peak.

Conclusions/Discussion
The main conclusion of my experiment was that my hypothesis was unsupported, and it is possible to artificially alter the circadian cycle of an organism using a timed light source and maintain the physical, mental, and behavior health of the organism. This knowledge will be very helpful to us when NASA decides to send people to Mars, which has a 24 hour 39 minute cycle. It would be important to know how bodies would react to an altered light cycle so the journey can be efficient and safe.

Summary Statement
I used a custom-built light measurement device and the bioluminescence property of dinoflagellates to measure the effects of an artificially altered circadian cycle on organisms.

Help Received
I received help from my teacher and research on the internet to build the light measurement device.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Otto A. Rahmel

Project Number
J1514

Project Title
Algae Farm: Finding the Best Nourishment for Biofuel Algae Growth

Abstract

Objectives/Goals
The objective of my project was to find the best nourishment (in the form of various types of water) for algae to be used to create biofuel.

Methods/Materials
Homemade grow-box with grow lights and reflective surfaces inside, algae, different types of water. I let the algae sit for 1 week with the grow-lights constantly on. At the end of this period, I measured the average amount of cells per drop for each trial.

Results
Algae was put in several different types of water to test the best water for algae to grow in, determined by the average amount of cells per drop. The water with the highest average cells per drop, or is the best water for algae to grow in, is sugar water. Initial results showed tap water with more cells per drop but further analysis showed that sugar water had produced large clumps of cells not always found in each drop.

Conclusions/Discussion
Algae was put in different types of water to find which water it grows the best in. It is concluded that the algae grew the best in sugar water. This information is important to us because we now know the best way to grow algae for biofuel purposes.

Summary Statement
I measured the average amount of algae cells per drop in each type of water to find the best water for algae to grow in for biofuel, and found that algae grew the best in sugar water.

Help Received
David Rahmel, my father, helped me with basic designing for the grow box. Other than that, I conducted the experiment and built the grow box on my own.

CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Katherine L. Tolles

Project Number
J1515

Project Title
Can We Terraform Mars?

Abstract

Objectives/Goals
The objective of this study was to try and grow Anabaena (blue-green algae) in the atmospheric aspect of a simulated Martian environment, to help determine whether this microbe could survive on Mars and begin terraforming the planet.

Methods/Materials
Scientific Vacuum, with meter to gauge pressure (measurable in Kpa). Tank of CO2. Samples of Blue-Green algae. Sterilized Petri dishes, transfer pipets, beakers and graduated cylinders.

Results
A sample of Blue-Green algae was placed in a scientific vacuum for a week, and a photograph of its progress was taken every day at approximately the same time. At the end of the week, a color picker tool of a software application was utilized to identify the hue. The hue degree showed a steady increase throughout the week, indicating a steady increase of cultivation. Although, when I determined the percentage difference of the hue between each day, the data suggested a slight decrease in speed of the algae's daily cultivation towards the end of the week.

Conclusions/Discussion
I concluded that the Blue-green Algae was capable of surviving in an aspect similar to that of Mars, therefore beginning that process of converting the atmosphere. However, my data shows that it is possible this microorganism may not thrive for a long period of time, perhaps due to the minuscule amount of nitrogen available within the simulated atmosphere. My results can contribute to the research on possibly using microbes as the first step in terraforming Mars.

Summary Statement
I showed that Blue-Green Algae is capable of cultivation in a simulated aspect of a Martian Environment.

Help Received
I talked to many scientists about which direction I should take my project, including Josh Schimel of UCSB, and Frank Kinnaman. I also received guidance from my science teachers at school to help me with learning how to properly use the scientific vacuum and to check my calculations of some formulas.