CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Michael Baghdassarian

Project Number

J1501

Project Title

What Isolated Substances in Manuka Honey Can Preserve Raw Unrefrigerated and Unpasteurized Milk from Spoiling?

Abstract

Objectives

The objective of this project was to identify which substances in manuka honey give it its anti-bacterial properties. It was also to determine if the same beneficial effects of manuka honey (from my previous experiments) could be independently replicated with only two isolated chemical substances, methylglyoxal and hydrogen peroxide.

Methods

1.Pour raw milk into sixteen beakers, two with only raw milk, one manuka honey (15mL), one manuka honey (5mL), two hydrogen peroxide (1.2mL), two hydrogen peroxide (2.4mL), two methylglyoxal (0.5mL), two methylglyoxal (1.0mL), two methylglyoxal (0.5mL)/ hydrogen peroxide (1.2mL), two methylglyoxal (1.0mL)/ hydrogen peroxide (1.2mL) 2. Stir the raw milk to mix components. 3. Let all the beakers sit in room temperature with no seal. 4.Check pH using a digital pH meter.

Results

The results of the experiment shows that methylglyoxal and hydrogen peroxide are the main contributors to manuka honey's antibacterial properties. Methylglyoxal was significantly better at preserving raw unrefrigerated milk and was even more effective than a combination of hydrogen peroxide and methylglyoxal. While hydrogen peroxide was effective in preserving milk the methylglyoxal by itself was significantly better and was able to preserve the milk for over 14 days.

Conclusions

In previous experiments I was able to show that manuka honey can preserve raw unpasteurized milk for a much longer period compared to regular honey or agave nectar. This project looks at which substance in manuka honey was contributing to my previous results. The results of the experiment clearly show that methylglyoxal and hydrogen peroxide are the main contributors to manuka honey's antibacterial properties but after several trials it was methylglyoxal that was able to preserve the raw milk for a longer period than the manuka.

Summary Statement

I showed that methylglyoxal and hydrogen peroxide where two important substances in manuka honey which were responsible for its antibacterial properties and would help it preserve raw unrefrigerated milk.

Help Received

All the experiments and data were compiled by me, however the digital pH meter and methylglyoxal were borrowed from Glendale Community College head of science department, Dr. Sevada Chamras. ACCU Bio-Chem Lab analyzed my manuka honey sample to see how much hydrogen peroxide it contains.

Name(s)

Rithik Bhushan; Jonathan Vizcaya

Project Number

J1502

Project Title

Iron: A Solution to the Negative Effects of Increased Temperature on the Photosynthesis of Spirulina major

Abstract

Objectives

The purpose of this project is to use iron as a possible solution to the effects of an enduring problem, increasing temperatures in ocean waters, and its negative effects on the photosynthesis of cyanobacteria (Spirulina Major). The hypothesis for this project is if increased temperatures affect the photosynthesis and behavior of Spirulina Major, then iron will counteract these effects and produce more oxygen. It was decided to use iron because iron has proven effective in the past for Iron Fertilization.

Methods

The main materials used for this project was Spirulina major (30 milliliters), a microscope, a dissolved oxygen water test kit, and 2 portable heaters. Along with this, a portable milligram scale was used to measure various minerals. Most of the materials used came from Carolina.com, an online source to buy scientific equipment. For this experiment, the testing was done in two sets, Set 1 and Set 2 with an interval of five days each. Spirulina major samples (Sample A and Sample B) were set in three locations with three different temperatures (20?, 22.5?, 25?). The Sample A solution was made up of Spirulina major without iron and Sample B with iron. Each day, 25 milliliters of the solution was taken from each of the 6 samples using a pipette to a petri dish and was observed with a microscope. The dissolved oxygen was then tested using the dissolved oxygen test kit.

Results

After testing, it was found that there was less oxygen in the samples without iron at higher temperatures. It was also seen that there was a gradual increment of dissolved oxygen in the samples with iron at increased temperature locations. Another observation made was that the cyanobacteria in Sample B had more mobility than Sample A. Finally, it was seen that the color of the cyanobacteria changed greatly, especially in Location 3. While in Location 1 and Location 2, the color went from a dark green to almost a light green, the cyanobacteria at Location 3 changed from a dark green to transparent.

Conclusions

With the results from testing, it was found that there was a negative effect of increased temperature on the photosynthesis of Spirulina major. The results also showed that the iron did counteract this effect and helped the Spirulina major go back to its regular rate of photosynthesis. This could have been because of the chloroplasts in the cyanobacteria. Chloroplasts are small organelles in a cell that aid in the process of photosynthesis. Iron is a nutrient that is necessary for chloroplasts, and because chloroplasts are important to photosynthesis, the iron could have countered any effects that the increased temperature had on the

Summary Statement

This project addresses the issue of the effects of increased temperature on the photosynthesis of cyanobacteria and how iron can be applied to counter the negative effects.

Help Received

Dr. Arlene Haffa, a microbiologist at the California State University, Monterey Bay, gave us resources to help with the procedure and research of our project. Mr. Alex Hofsteen, our advisor led us through the process of the science fair. Our parents supported us and gave us guidance when needed.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Allen Bryan

Project Number

J1503

Project Title

Bacteria Invade Your Veggies

Abstract

Objectives

The purpose of this study is to find how many bacteria are present on a variety of fresh store-bought vegetables and mushrooms and to determine if disease causing organisms might be present.

Methods

Eight different fresh vegetables and mushrooms were purchased from the grocery store. The serial dilution method was used to determine the number of bacteria per gram of each sample. Coliform counts were used as an indicator of disease causing potential.

Results

Counts of total bacteria per gram of sample and coliform bacteria per gram of sample were done on unwashed vegetables and mushrooms. The lowest counts of bacteria were found on cauliflower (about 13000 per gram). The coliform count of the cauliflower was 2.1% of the total bacteria. The highest bacterial count was from enoki mushroom (about 2 billion per gram). The coliform count for the enoki mushrooms were 31.8% of the total bacteria. Bacteria counts for other samples tested were between these numbers.

Conclusions

There was a large range in the number of bacteria on the vegetables - from tens of thousands to billions per gram of sample. Some reasons for this big range were due to the cleanliness of the vegetables. In other cases, the higher bacteria numbers seemed to be due to greater vegetable surface area per gram. Coliforms were found on every sample tested. Coliforms are a group of bacteria that serve to indicate the presence of disease causing microbes. One encouraging result was that no E. coli were found on any vegetables tested. Some strains of E. coli have been linked to widespread illness caused by vegetables.

Summary Statement

A variety of fresh vegetables were tested and found to have large numbers of bacteria, as well as coliforms, which may indicate the presence of disease causing organisms.

Help Received

My brother helped me to understand serial dilutions and my Dad helped to use research materials safely.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Ryan De Guzman

Project Number

J1504

Project Title

School Makes Me Sick! Which School Areas Grow the Most Bacteria?

Abstract

Objectives

My experiment asks which commonly touched areas in my school have the most bacteria. I hypothesized that the water fountain would have the largest number of bacteria grown out of all of the places tested because the water fountain is not likely to be cleaned as much as other common areas & comes in contact with mouths, which is host to hundreds of types of bacteria. The bacteria could potentially transfer to the water fountain if the person using the water fountain is mouth to mouth with the spigot & is a moist area in which bacteria could thrive. I hypothesized that the teacher s podium would have the least amount of bacteria colonies due to the lack of moisture. My objective was to determine which school areas could potentially cause harm by exposing people to bacteria. Results would be determined by which areas grew the most bacteria or molds.

Methods

I first created a homemade incubator to store the petri dishes.The incubator was made out of an LED lightbulb and plug, foam cooler, battery thermometer, and duct tape.I tested several light bulbs to generate heat between 85-95 degrees F to incubate the dishes. With a sterile swab, I tested the water fountain, teacher podium & desk, student desk, lunch tables, bathroom door handle, computer keyboard, my hands, & stair railing. Then I smeared the contaminated swab across labeled petri dishes, placed the petri dishes inside the incubator & took notes every day for 4 days. After 4 days, we disposed of the dishes by spraying them with bleach and then sealed them in a biohazard bag.

Results

The lunch table petri dish had about 57 colonies of mold/bacteria of different shapes, sizes, and colors.The area with the least amount of mold/bacteria colonies was the hand railing. The computer keyboard grew 4 bacteria/mold colonies, the teacher's desk 4, the student desk 4, the teacher podium 3, my hands 2, & bathroom door handle 1.The data did not support my hypothesis that the water fountain would be the area that would grow the most bacteria.

Conclusions

My experiment asks which common areas in my school have the most bacteria.The results from my experiment show the lunch tables to have the most bacteria & mold colonies.This experiment could be useful for both students and staff at schools, especially for educational purposes and for encouraging hygiene habits. This experiment could be used to teach students about the importance of washing their hands.The staff could use this information to encourage students to thoroughly clean their most used areas.

Summary Statement

I swab tested the most commonly touched areas of my school and used a homemade incubator to see which areas grew the most bacteria

Help Received

My parents, Michael and Barbra De Guzman, both assisted me in designing and creating my homemade incubator, as well as made sure we were careful not to expose the incubator to too much heat to cause a fire.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Riley Delworth; Hanna Moradzadeh

Project Number

J1505

Project Title

Floor Food: How Long Is Too Long?

Abstract

Objectives

The objective of this project is to help you decide whether or not you want to continue eating food that has been on the floor for a period of time.

Methods

Our experiment took ham and laid it on the floor for different periods of time. We had one slice of meat not be exposed to the floor at all, one exposed for five seconds, one exposed for ten seconds, and one exposed for thirty seconds. After the varying periods of time, the meat was swabbed and put into a petri dish. After several days, bacteria colonies grew in the dishes, showing the results.

Results

The data averaged with no ground exposure having 3 bacterial colonies, five seconds with 4.5 colonies, ten seconds with 10 colonies, and thirty seconds with 63 colonies.

Conclusions

Our experiment proved that the more time food is exposed to a surface, the more bacteria is able to gather on it. Our experiment can help further develop understanding of bacteria transfer and how to lessen the transfer rate.

Summary Statement

We proved that the longer food stays on the floor, the more bacteria gathers on it.

Help Received

None. We performed the testing and analyzed the results ourselves.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Madison DiGiorgio; Kyndell Hendrix

Project Number

J1506

Project Title

Swimming in Fear

Abstract

Objectives

Within this group project, our objective is to allow families and civilians to be able to use a simple and inexpensive way to test the water they swim in. The bacteria of Eschestria Coli is harmful to humans and threatens some people's lives, so this device will help protect those people. The survey will test the knowledge people have about the harmful bacteria in waters, and if they will willingly use this device.

Methods

To begin with, we combined blotting paper and raw materials such as chemicals like red phenol (0.02% Aqueous Solution), maltose monohydrate, dextrose monohydrate, and hydrophonic wax to create our device. With these materials, we gathered typical swimming waters that were nearby San Bernadino County and tested the waters with the device. We then gathered information to create a survey of specific questions.

Results

As a result of our experiment, we were successful in inventing the device that is able to test the swimming waters with Eschestria Coli in the water. Clear percentages of Eschestria Coli were shown within the waters we tested, and the survey revealed how much people really knew about the dangerous bacteria and our helpful experiment. This device could be very useful to many people and many people showed that they would like to use a simple and inexpensive device for water safety.

Conclusions

In conclusion, we have invented a water test that is capable of detecting Eschestria Coli in swimming waters within three to five minutes. The survey revealed the feedback from the people about what they believe in when it came to bacteria pollution. The device could be very useful in the future as pollution continuously increases over the years.

Summary Statement

In summary, the environmental experiment succesfully tested the contamination in bodies of water using a newly developed device, and the informative survey revealed people's thoughts towards the pollution in their swimming waters.

Help Received

Wendi Rodriguez was our science teacher and helped us within this project; giving us advice, suggestions, and some of lab equipment.

Name(s)

Jasper Garrett

Project Number

J1507

Project Title

The Affinity of Boletus edulis to Tree Species

Abstract

Objectives

The study of which tree species hosts the highest density of the mushroom Boletus edulis in the Santa Cruz area.

Methods

1. Forest ecosystems
2. Boletus edulis fruit
3. Device for measuring
4. Device for recording data

Results

71% of Boletus edulis were found growing around Quercus agrifolia trees, as opposed to 28% growing near Pinus radiata with less than one percent near Sequoia sempervirens.

Conclusions

As current literature suggests, Boletus edulis can be found growing around a variety of tree species, but tend to favor conifers. From personal foraging experience, I have historically found many Boletus edulis growing around Quercus agrifolia, so I hypothesized these trees would host a higher density. The data from my experiment support my hypothesis because 71% of Boletus edulis were found growing around Quercus agrifolia trees, as opposed to 28% growing near Pinus radiata. This experiment could benefit from a longitudinal study, including more data and foraging sites.

Summary Statement

Boletus eludes appears to have had host tree affiliation density in the habitats I researched that differ from the published literature.

Help Received

My father drove me to different locations for data collection. My mother helped with organizing my board.

Name(s)

Nathan Gorzelanski

Project Number

J1508

Project Title

Differences between Common Fruits and Factors that Affect Their Rate of Mold Growth

Abstract

Objectives

The objective was to find out which fruit took longest to mold and why.

Methods

Oranges, strawberries, blueberries, and grapes were tested throughout their aging process until mold growth was detected. Sugar content, pH, and skin thickness were the primary characteristics tested and evaluated using a refractometer, pH test strips, and a caliper. All the fruits were kept in lidded containers at room temperature.

Results

Sugar content, pH, and skin thickness were recorded on all fruits throughout the three trials. The oranges had the thickest skin (2mm), while the strawberries had the thinnest/no skin, the grapes had the highest sugar content (20.5% Brix), and the blueberries had the lowest pH (2.8). Out of the four fruits, oranges lasted the longest by far, as no mold growth was seen even up to Day 15 vs. mold growth at Day 3 to 5 for the other fruits.

Conclusions

My conclusion is that the oranges lasted the longest without molding due to it having the thickest skin. Of all the properties tested (pH, sugars, skin), the skin thickness appeared to play the greatest role as there was a direct correlation with the rate of mold growth. The order of thickest skin to thinnest was oranges, grapes, blueberries, and strawberries which was also the order of which the fruits lasted the longest before mold developed. Understanding this type of information can help a consumer decide which of their fruits to consume first and hopefully reduce waste.

Summary Statement

Characteristics of common fruits and the factors that affect mold growth.

Help Received

My mom helped me with the data organization, and the Jack in the Box Corporate Research and Development Department provided me with materials that I used during my project.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Mellany Henriques

Project Number

J1509

Project Title

The Five Second Rule: Fact or Fiction?

Abstract

Objectives

The goal was to see if a substance world be dirtier if it stayed on the ground longer.

Methods

Bananas, saltine crackers, petri dishes, swabs, and a heat lamp. I put a banana on the ground for five seconds and another banana on the ground for 20 seconds. I swabbed both bananas and repeated this process with the Saltine crackers. I then put them under a heat lamp for two weeks.

Results

The test subjects that were on the ground for only 5 seconds had less bacterial colonies grown then the test subjects that were on the ground for 20 seconds.

Conclusions

After 2 weeks of watching the growing Petri dishes I have found my conclusion. The Petri dishes that contained the 5 second test subjects had less bacterial colonies growing than the 20 second test subjects.

Summary Statement

I showed that food that is on the ground for 5 seconds has less germs than food that is on the ground for 20 seconds.

Help Received

My teacher explained that there are germs everywhere in the world and that germs attach to food instantly.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Annabelle Hsieh

Project Number

J1510

Project Title

How Temperature Stressors Affect Organelle Movement during the Light to Dark Cycle of Pyrocystis fusiformis

Abstract

Objectives

To study the effect of temperature on organelle movements in Pyrocystis fusiformis during light (peripheral organelles) to dark (central) transition.

Methods

The Pyrocystis fusiformis control group was maintained at room temperature, whereas two experimental groups were exposed to 15 C and at 30 C respectively. The organisms were photographed with an inverted microscope at 30-minute intervals for up to 2 hours. Pyrocystis cells were categorized in stages of organelle retraction from a peripheral (A), intermediate (B,C) to a central position (D). The percentage of each group relative to the total cells observed was calculated

Results

Cold temperature (15 C) slowed down the movement of organelles. At the final time point only 20% of Pyrocystis were in Group D, compared to 37% in the control. High temperature (30 C) sped up the transition, by the second time point 61% were in Group C vs. 20% in the control. No increase in dead or damaged cells (Group X) was observed.

Conclusions

Cold temperatures (15 C) decreased the movement of organelles toward the nucleus whereas warm temperatures (30 C) increased it. This is likely due to the effect of temperature on the metabolism. Thus, low temperatures slow down the light to dark cycle transition and delay bioluminescence. At high temperatures (30 C) faster movement of the organelles promotes bioluminescence. The shifts in temperature did not cause cell death in the observed time frame, suggesting that pyrocystis can survive brief temperature shifts to 15 and 30 C.

Summary Statement

I showed that cold temperatures slowed down organelle movement and hot temperatures sped up organelle movement during the light to dark cycle transition in Pyrocystis fusiformis, therefore delaying or speeding up bioluminescence.

Help Received

Dr. Chris Buser, PhD provided the materials and the laboratory space needed to carry out my experiment. He also taught me how to use the microscopes and camera.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Ella Ivan

Project Number

J1511

Project Title

How Mid-Winter Storms Affect Bacteria Levels in Major Waterways of Northern California

Abstract

Objectives

The objective of this project was to test the levels of bacteria in water samples collected before and after a storm in mid-winter from major waterways of Northern California.

Methods

Materials: Petri dishes, Water samples, Pipette, Incubator, Two kinds of plastic bags- gallon and quart size, Water thermometer, Cooler, Candle, Tape, Metal rod, Rubbing alcohol.

Water samples were collected, plated on petri dishes and incubated to grow out bacteria in the sample. The number of bacterial colonies were counted. The levels were compared between the sites and repeated. Once before a storm and again after a storm had started.

Results

I learned that the Mad River had the most bacteria before the rain and that Redwood Creek had the second most bacteria before the rain. The Klamath River, the Little River and the Eel River all had the least amount of bacteria before the rain, besides the control. In the results from the second round of sample collecting, after the rain, Redwood Creek had the most bacteria, then the Little River, next was the Klamath River, the Eel River, and last was the Mad River, besides the control. All the samples collected after the rain had less bacteria than the samples collected before the rain. While both collections had lots of bacteria in them, some of the ones I could count, like the control and the Mad River, in the after it rained samples, but all the other samples I had to estimate.

Conclusions

For my project I wanted to find out if there was going to be more bacteria in the water before it rained or after it rained from major waterways in northern California. I collected samples from the Klamath River, Redwood Creek, Little River, Mad River, Eel River and my tap water as the control. My hypothesis was that if bacteria levels become more concentrated in drier months, when water flow is low and runoff is limited from lack of rain, then when the rainy seasons starts bacteria levels at the mouth of a river should be lower before a rainstorm and higher right after a rainstorm. The runoff would be adding more bacteria into the water. Had I done my water sample collections at the beginning of the rainy season, I may have found my hypothesis to be true. I did my sampling in December after we had already had several rainstorms to flush concentrated bacteria levels from pooled areas in waterways and from runoff from areas that drain into rivers. My results showed that bacteria levels were actually less concentrated after a storm and that the rain acted as a dilluter of bacteria.

Summary Statement

This experiment was about how bacteria levels change in waterways during a storm.

Help Received

I conducted my experiment independently this year. Last year, I was taught how to conduct my procedure by Briggitte Blackman, a biology professor at HSU. My science teacher, Nick Dedini, was helpful in making sure my experiment was thorough and clearly presented.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Sai Rithvik Kotla

Project Number

J1512

Project Title

The Hardiest of the Hardy: Assessing the Endurance Limit of Some Extremotolerant Microbial Life Forms

Abstract

Objectives

Several organisms exhibit survival and adaptation to a harsh environment. Selection of candidates that has the potential to withstand and adapt to a diverse set of harsh conditions is a key requirement for an interstellar space mission. I discovered certain microbial life forms that co-exist in the domestic environment also adapt and grow in a diverse set of harsh conditions acidic, alkaline, oxidizer, detergents, temperature, UV exposure, etc. This result will prompt the research community to relook for microbial life forms as alternatives to tardigrades for exploring the possibility of life in the interstellar space.

Methods

Established molecular biology approaches were used for growing microbes on agar plates. These microbes were treated with various chemical (detergents, acetic acid, hydrogen peroxide, brine) and physical agents (high temperature, UV radiation) to determine their ability to endure harsh conditions. The viability of the microbes under various treated conditions was assessed by morphological examination using optical imaging methods.

Results

A small population of microbes survived in all treated conditions - Acetic acid, Hydrogen Peroxide, and brine solution. A gradation in survival population proportionately varying with the treatment variables was observed. Repeated trials were run to determine if the microbes survive harsh conditions.

Conclusions

Preliminary experiments support that a small percentage of microbes in the domestic environment sustain harsh conditions. This finding forms the basis for the candidate species selection for interstellar space mission.

Summary Statement

Certain microbial life forms have potential to withstand harsh conditions and can be an excellent model system for studying the mechanisms underpinning the extremotolerent conditions and their underlying molecular basis.

Help Received

I conducted and analyzed all my experiments myself. Mr.Prasanna Srinivasan from University of California Santa Barbara advised me on analyzing data. Experiment requiring UV source were performed at UCSB by experienced personnel for safety reasons.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Jack Nelson

Project Number

J1513

Project Title

Does Nitrogen Affect the Oil Production Rate in Cyanobacteria?

Abstract

Objectives

The objective of this study is to determine the effects of varying amounts of nitrogen on cyanobacteria oil production.

Methods

Tested the the affect of nitrogen on cyanobacteria by growing the cyanobacteria, then extracting the crude oil. Used cyanobacteria and varying amounts of nitrogen. Used a mortar and pestle to break the cell wall and release the lipids, and used a filtered the lipids.

Results

The oil produced was compared after growing and extracting the lipids from the cyanobacteria. The nitrogen showed to be unhelpful in the production of oil in cyanobacteria.

Conclusions

The nitrogen reduced growth, and oil production. This means that the nitrogen is harmful against cyanobacteria.

Summary Statement

I tested the effect of varying amounts of nitrogen on cyanobacteria oil production.

Help Received

None. I tested, and performed the experiments myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Shukriya Osman

Project Number

J1514

Project Title

Do Antioxidants Prevent Chemotherapy Cell Toxicity?

Abstract

Objectives

The purpose of this project is to find the best way to treat cancer without causing harm to healthy cells. After reading more in depth about cancer and chemotherapy, I learned that the medication that cancer patients use (any type) can kill a person by destroying healthy cells. The hypothesis of this project is that imatinib mesylate (an anti-cancer medication) is better with the most effective antioxidants rather than using imatinib mesylate by itself. Based on that hypothesis, the most effect antioxidant would be the garlic extract in the higher concentrations of the medicine.

Methods

To conduct the experiment, I tested 3 antioxidants (green tea, vitamin D, and garlic extracts) in combination with the chemotherapy drug imatinib mesylate. Ten samples of both high (200mg) and low (100mg) concentrations of the drug combined with 0.5 mL and 1 mL of each of the antioxidants were placed on the YPD agar petri dishes and incubated for 24 hours. I also tested the efficacy of the drug on its own without the antioxidants. Yeast colonies were counted and recorded to determine which of the antioxidants had the best effect on healthy cells.

Results

A high concentration of garlic combined with a low concentration of the medicine had the best results and increased the number of yeast colonies by 15.53% as opposed to the higher concentration, which decreased it by 1.5%. The medicine alone, in both concentrations, killed off about 30% of the colonies. Both concentrations of Vitamin D combined with each of the medicine concentrations had the most detrimental effects by reducing the colonies from about 48% to 73% compared to the control group. The remaining antioxidants, green tea in both medicine concentrations and the garlic in the high medicine concentration, all decreased the number of colonies at a lower rate, ranging from 5.26% to 20% compared to the control.

Conclusions

In conclusion, my hypothesis was proven partially correct. Turns out a high concentration of garlic combined with a low concentration of the medicine was the best combination of the antioxidants and concentrations. If I were to improve my project, I would like to test with more different types of antioxidants and chemotherapy medicines.

Summary Statement

I tested if antioxidants will prevent chemotherapy cell toxicity after cancer patients are treated with chemotherapy.

Help Received

I'm thanking Najwan Nasereddin for guiding me throughout my project and being there for me every step of the way. I would also like to thank my school, Bright Horizon Academy, for letting me participate in the science fair competition and our lab mentor who helped me with the medicine

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Pola Pietrzkowski

Project Number

J1515

Project Title

Increasing Amount of Proteins in Edible Plant Cells to Improve Plant-Based Food

Abstract

Objectives

To find a method to enrich plant cells in proteins and obtain and protein-rich food.

Methods

Used algae cells grown in test tubes under different conditions, a rotating culture and a stationary culture, and different concentrations of trace minerals. All cells grown in laboratory in sterile conditions. Collected data for cell count and growth as well as protein content using Lowry method. Grown for 12 days.

Results

Results collected were optical density (OD), cell count using hematocytometers, protein content using Lowry method, and protein content per cell, calculated using cell count and total protein content results. Overall, rotation had beneficial effect on amount of cells and protein content comparing to stationary. Higher concentration of trace minerals (0.1%) created significantly more cells that were richer in protein in the case of the algae Chlorella Vulgaris. For the other algae used in this experiment, Arthrospira Platensis, the lower concentration (0.01%) created the best results in cell count and protein, while the higher concentration proved to be harmful. Overall, project achieved being able to increase the amount of proteins using added trace minerals and different culture conditions.

Conclusions

The methods used in this experiment succeeded in significantly increasing the protein content of algae cells, as well as the amount of cells grown when comparing to control groups. Higher and lower concentrations of trace minerals for different algae combined with rotary culture condition led to impactful increases in results measured. Applications of the project include food industry, since both algae used in the experiment are already used as food or supplements, and further study.

Summary Statement

In this project, I was able to increase the amount if proteins in algae by adding trace minerals and by using a rotatsing culture.

Help Received

My science teacher, Mrs. Afsaneh Miller, helped me by reviewing my work and answering my questions. My supervising scientist, Dr. Tania Reyes, supervised me while working under laboratory conditions and helped with collecting and analyzing data. I worked at a lab owned by private company FutureCeuticals.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Bethany Ray

Project Number

J1516

Project Title

Does the Amount of Time Food Is on a Surface Affect Its Bacterial Growth?

Abstract

Objectives

My project aims to discover if the amount of time food is in contact with various surfaces affect the amount of bacteria it collects.

Methods

I used many materials to conduct my study including petri dishes, nutrient agar gel, cotton swabs, plastic bags, safety equipment, an autoclave, food, and an incubator. Before you do anything you want to sterilize your equipment and prep your petri dishes. Next, label your bags and petri dishes with all the variables. Drop the food on the surface for a given amount of time then rub a cotton swab on the food. Put your cotton swab inside of a plastic bag and do so with the rest of the cotton swabs, testing all surfaces, foods, and times. Rub the cotton swabs onto the agar in the petri dishes. Let the bacteria grow for two days in an incubator and once all of the bacteria has had time to grow, count the colonies the samples grew.

Results

The apple samples showed no connection to time when it came to the quantity of bacteria colonies. When testing the apples, only one surface showed the bacteria colonies following the time. This is more than likely due to the pH and acidity levels inside of an apple. The bologna, however, has showed a clear correlation to time in all but one of the surfaces. Counting bacteria carpets was a difficult situation because it was still technically only one colony but it was much larger than any others. I still counted them as only one colony so it wouldn't disrupt my results. One of the graduate students at the university warned me that in two of my grass samples he found what appeared to be anthrax relatives.

Conclusions

The results show that in the bologna samples there was a clear connection to time but the apples showed none. With the appearance of an anthrax relative, a potentially deadly disease, it shows the importance of raising awareness of the damage contaminated food could do to a human. Having clarification that in some cases time will affect the amount of bacteria that is transferred to the food, people can be more alert about whether it is worth eating food off the ground. I hope this project can also publicize the importance of advancements in our knowledge of microbiology.

Summary Statement

My project aims to determine if the amount of time food is on a surface affects the amount of bacteria it collects and the results prove that for bologna that is true, but for apples it appears to show no correlation.

Help Received

Dr. Tricia Van Laar, Erik Arteaga, Manny Flores, Mike Ray, CSU Fresno

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Alondra Ruiz

Project Number

J1517

Project Title

Pressuring Microalgae

Abstract

Objectives

The purpose of this experiment is to figure out in what air pressure will the microalgae grow or reproduce. I hypothesize that if I increase the air pressure then the microalgae will significantly reproduce. My independent variable is the air pressure, while my dependent variable is how many cells reproduced. I added about 4ml of microalgae into a falcon tube and then added 1 ml of ethanol do kill the cells in order to count then. Take a sample and place in on a hemocytometer. My results states that when I decreased the air pressure the microalgae reproduced significantly than when I increase the air pressure. On my first trial I forgot to add micronutrients, which could have affected my results. Also, on my second trial I dropped some of my microalgae, which could have affected my counting. My hypothesis was rejected because the microalgae reproduced significantly when I decreased the air pressure. If I wanted to do further research I could do more trials, I can also conduct this experiment with a different microalgae.

Methods

Materials:

1. 500 ml flasks
2. Airline
3. Compound Microscope
4. Microalgae (Isochrysis Galbana)
5. Hemocytometer

Procedures:

1. In a 15 ml, falcon tube, add 4 ml of isochrysis and a 1 ml of ethanol using transfer pipettes (adding ethanol will keep the algae cells from moving, your killing them) and let it sit for about a minute to make sure its mixed.
2. Get a glass pipette and carefully take up some volume and load it onto one side of the hemocytometer.
3. When you place the hemocytometer onto the microscope and adjust it to your liking you will see something as depicted below.

Results

My data states that when I decreased the air pressure I got a higher average, which means the microalgae reproduced significantly. Their were factors that could have affected my results. On my first trial I forgot to add micronutrients which could have affected my results. As I was setting my second culture I accidentally

Summary Statement

I showed their will be no increase to reproduction rate of microalgae when air is decreased nor increased.

Help Received

The Cabrillo Marine Aquarium Nursery provided the materials, and helped sponsor my project.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Tyler Simerson

Project Number

J1518

Project Title

Use and Reuse, But Is Your Straw Clean?

Abstract

Objectives

My object was to determine if there was microbial growth in a stainless steel straw after it was used and washed correctly. My goal was that if proper washing instructions were used the straws would stay clean of any bacteria.

Methods

After determining an effective cleaning method I distributed, and then collected fifty straws, along with cleaning instructions, and tested them for bacteria growth.

Results

The data collected from my project showed that the majority of straws, when used and washed correctly, were clean.

Conclusions

My conclusion is that bacteria can grow in straws if you do not wash them correctly, but you can safely use and reuse straws if you follow simple cleaning instructions.

Summary Statement

In my project I tested to see if reusable straws were clean of microbial growth after using an effective cleaning method.

Help Received

My parents helped me order my supplies and my science teacher loaned me equipment to make an incubator.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Brett Swertfager

Project Number

J1519

Project Title

Phytoplankton Growth: Are Terrestrial Fertilizers the Answer?

Abstract

Objectives

The objective is to determine which nutrient or terrestrial fertilizer will have the most phytoplankton growth.

Methods

Phytoplankton (Nannochloropsis oculata), iron sulfate, used coffee grounds, Kelp meal, Miracle Gro, Viridis Mix, Petri Dishes, Microscope 400x, digital camera, PH strips. Two samples of every nutrient/fertilizer (control, used coffee grounds, iron sulfate + used coffee grounds, Viridis Mix, Kelp Meal, Miracle Gro), which I counted for growth of phytoplankton daily for 8 days.

Results

All nutrients/fertilizers increased phytoplankton growth more than my control, with iron sulfate+used coffee grounds resulting the highest growth.

Conclusions

The iron sulfate + used coffee grounds mixture resulted in the highest phytoplankton growth. With iron sulfate and used coffee grounds being inexpensive and plentiful resources, this combination could be a viable option in increasing diminishing phytoplankton populations as ocean water temperatures rise due to climate change.

Summary Statement

My project is about determining the best nutrient or fertilizer to increase phytoplankton growth to counter the impact of rising ocean temperatures.

Help Received

I planned and executed the samples and testing. I conducted the daily microscopic sample review, counting, and averaging.