CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Muhammad Abd-Allah

Project Number

J0501

Project Title

The Impact of Vitamins in Negating Hydrogen Peroxide Oxidant Effects on Seed Germination

Abstract

Objectives/Goals

Which antioxidant vitamin (A, E or C) will negate the harmful oxidant effects of hydrogen peroxide (H202) in preventing seeds from germinating?

Methods/Materials

Using bean and radish seeds, eight groups in Petri dishes were set up: water only, water + Vitamin A, water + Vitamin C, water + Vitamin E, H202 only, H202 + Vitamin A, H202 + Vitamin C, and H202 + Vitamin E. There were 3 dishes in each group with 25 radish seeds in each dish for the radish category and 10 bean seeds in each dish for the bean category. 10 ml of water or H202 were placed in the dishes. Each dish sat under light for an average of 12 hours every day. 5 ml of water or H202 were added periodically to keep the seeds moist. After 4.5 days I counted how many radish seeds germinated, and after 6 days I counted how many bean seeds germinated since the bean seeds take longer to geminate.

Results

H202 had a negative effect on seed germination. Vitamins A and E negated the effects of the H202. Vitamin C harmed seed germination even more. Radish seeds were affected more than bean seeds.

Conclusions/Discussion

Vitamins A and E are antioxidants that can counter the oxidant effects of bean and radish seed germination irrigated with H202. The use of antioxidants can help block the free radical effects of oxidants in the environment such as disease in humans and crop yield in plants.

Summary Statement

My project examined how vitamins A, C, and E blocked the negative oxidant effects of H2O2 on seed germination.

Help Received

My father helped count the seeds that germinated and set up of the Petri dishes.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Jyothsna Bolleddula

Project Number

J0502

Project Title

Plant Based Lipase Inhibitors: A Potential Treatment for Obesity

Abstract

Objectives/Goals

Obesity is a global problem that affects 30% of the World's population. One of the approaches used to target obesity is to decrease the absorption of fatty acids from the digestive system. Lipase is an enzyme that converts triglycerides into free fatty acids in the GI tract. The FDA approved lipase inhibitor, Orlistat, is available for use as a treatment for obesity. However, patients taking Orlistat show severe side effects such as nausea, vomiting, hives, etc. Therefore, the objective of this study is to identify effective plant-based lipase inhibitor(s) from selective dietary supplements. The hypothesis states that, if the dietary supplement(s) are rich in polyphenols, then they will have the highest percent of lipase inhibition.

Methods/Materials

Dietary supplements (Grapeseed extract, Raspberry Ketone, Acai Berry extract and Green Tea extract) at 2.5 mg/mL and the positive control (Orlistat) at 10 µg/mL were incubated with pancreatic lipase enzyme in potassium phosphate buffer at room temperature. After the 10 minutes, the reaction was initiated by the addition of substrate, P-Nitrophenyl butyrate. The mixture was incubated for an additional 10 minutes and the optical density was read on a spectrophotometer at 405 nm. Each sample was analyzed in triplicates and the average was calculated. The percent inhibition for the supplements was calculated.

Results

The results revealed that Orlistat, Grapeseed extract, Raspberry Ketone, Acai Berry, and Green Tea inhibited lipase activity by 67%, 59%, 51%, 48%, and 22%, respectively. The grapeseed extract inhibited lipase the best out of all the tested extracts.

Conclusions/Discussion

Since three out of four dietary supplements rich in polyphenols inhibited lipase activity significantly, the hypothesis was supported. It was concluded that consuming diets and/or dietary supplements rich in polyphenols will have as equal beneficial effects as Orlistat, without any serious side effects.

Summary Statement

In this project, selective dietary supplements were identified for their lipase inhibitory activity, a potential treatment for obesity.

Help Received

My science teacher, Ms. Jana Nisbet provided valuable guidance. My parents purchased the materials. The management of Applied Immunology helped me get acquainted with the lab equipment such as spectrophotometer and centrifuge.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Benjamin N. Cheng

Project Number

J0503

Project Title

A More Efficient Screening Method for Biofuel Cellulases

Abstract

Objectives/Goals

This project#s objective is to develop an efficient method for identifying and screening cellulose-degrading enzymes used in biofuel production.

Methods/Materials

First, I made cellulose agar plates using carboxymethyl cellulose as the carbon source for bacteria growth and cellulase activity. Next, I determined the optimal conditions for the current Congo Red staining method, specifically staining time and dye concentration. Noticing limitations of this method, I attempted to improve it. I tried a new method by directly incorporating a dye into cellulose agar plates for three dyes, Congo Red, Trypan Blue, and AZO-CMC. Finding the most effective method, I proceeded to do further tests to confirm its sensitivity and reliability.

Results

I successfully established the Congo Red staining method currently used by scientists for biofuel cellulase screening. I found that the optimal Congo Red method was staining for 10 minutes with an 0.1% dye solution. However, this method consumes a lot of time, generates a lot of waste, and most importantly washes away the bacterial colonies. Instead of staining after culture, I directly incorporated dye into the cellulose agar plates. Out of the three dyes, using Trypan Blue at a concentration of 0.01% was most effective, while other two were either ineffective or uneconomical. Further tests showed that the Trypan Blue method was equally reliable as the Congo Red method, using both purified bacteria and soil samples.

Conclusions/Discussion

I determined the optimal Congo Red staining method to be 0.1% for 10 minutes. I proceeded to find a better screening method by adding Trypan Blue dye directly into cellulose agar plates at a concentration of 0.01%. This method was confirmed for its sensitivity and reliability and also eliminates the downsides of the Congo Red staining. Therefore, I have developed a more efficient screening method for biofuel cellulases.

Summary Statement

I developed a more efficient method for the screening of biofuel cellulases by directly adding Trypan Blue dye at a concentration of 0.01% into cellulose agar plates.

Help Received

My teacher helped me plan out the project, instructed me on registration and filling out forms, and gave me feedback on my project. My dad helped me on some of the slightly dangerous parts of the experimentation, and my mom gave me advice on how to prepare a presentation.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sophie Colmignoli

Project Number
J0504

Project Title
Effects of Sugar on pH Levels of Fermented Meats

Abstract

Objectives/Goals
In my project, I will drop the pH using starter culture which I will feed with sugar to create lactic acid which will drop the pH. My goal is to reach a pH of 5.2 in 1100 Degree-Hours using a chamber temperature of 22 degrees Celsius. My variable is the amount of sugar I need to add to achieve the goal in the time defined by the 1100 Degree-Hours. The degree-hour formula as defined by the AMI is, chamber temperature in Fahrenheit minus 60 equals degrees, then degrees multiplied by hours of fermentation equals degree-hours.

Methods/Materials
Equipment Used:
1. Scale
2. PH meter
3. Thermometer
4. Vacuum Machine
5. Mixing Bowl
6. Grinder
7. Sous-Vide
8. disposable Gloves
9. goggles

Results
I tested a total of 40 meat samples in four separate trails. I varied the amount of sucrose for each sample and documented the effect on pH.

Conclusions/Discussion
I found that I needed only between 0.25% - 0.75% added sugar to the meat to consistently produce the safe pH range and desired flavor. According to my results, a safe dried meat product can be obtained by adding less than 1% sucrose to the meat mixture.

Summary Statement
Mt project tested the pH impacts of various amounts of sugar added to make cured dried meat product.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Joe K. Debruynkops

Project Number

J0505

Project Title

The Effects of Food Preservation Methods on the Enzyme Catalase

Abstract

Objectives/Goals

This project was to determine the effect of different food preservation methods on enzymes.

Methods/Materials

The experiment#s control was fresh potatoes. The 4 variables were frozen, dehydrated, blanched, and boiled potatoes. Each kind of potato was tested 4 times by blending the potato with water and then mixing it in a beaker filled with hydrogen peroxide (H2O2). When catalase reacts with hydrogen peroxide it creates oxygen gas, which was measured.

Results

On average, fresh potatoes produced 10 mL of oxygen gas per 10 seconds whereas frozen potatoes produced only about 3 mL of oxygen gas per 10 seconds and boiled, blanched, and dehydrated produced 0 mL of oxygen gas per 10 seconds.

Conclusions/Discussion

I also noticed some very interesting trends and connections. In conclusion my potato enzyme lab gave me lots of useful information.

Summary Statement

My project is about measuring the amount of catalase in blanched, boiled, frozen, dehydrated, and fresh potatoes.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Jake R. Johnson

Project Number

J0506

Project Title

How Will Chlorophyll a Concentrations React to Different Wavelengths of Light?

Abstract

Objectives/Goals

The objective of this experiment was to determine how some of the most common light sources exposed to aquatic life containing chlorophyll a would affect their concentrations of that substance.

Methods/Materials

The Diatoms samples in cuvettes were set out under three different light sources to be measured over a one week period of time. Over a one week observation period a spectrometer was used to determine the expelled green light from the Diatoms in each sample. The data from the spectrometer was substituted into a trichromatic equation to determine the concentrations of chlorophyll a in micrograms. Each of the samples was filled with 50mL of water containing the phytoplankton as well as 0.8 ounces of organic material. I took both qualitative measurements including color of the water. In addition I also took quantitative measurements which included results from the spectrometer, temperature, and visual observations.

Results

The spectrometer used to measure the amount of reflected green light from the Diatoms returned the results in a graph indicating the expelled light over different nanometer wavelengths. These measurements in the form of optical density or depth were then substituted into a trichromatic equation. The results calculated from the trichromatic equation were amount of chlorophyll a in each sample in micrograms. This data allowed me to see the growth of chlorophyll a in a living specimen therefore in their aquatic habitats these results are essential in indicating how the light being exposed to phytoplanton in aquatic habitats will affect their reproduction in numbers and production of chlorophyll a.

Conclusions/Discussion

After observing the growth of Diatoms and their chlorophyll a concentrations I can conclude that natural light provides all the necessary energy for the photosynthesis process to take place in the Diatoms. However, Ultra-violet light showed the least growth as it provides too much energy for the photosynthesis process to take place efficiently as it also threatens the longevity of this process. From observation day one, Diatom#s under natural light doubled their produced chlorophyll a. In conclusion, my valid results allowed me to prove my hypothesis correct because of my extensive research. The information from this project expands our knowledge of how different wavelengths of light can affect the production of chlorophyll a in critical aquatic life.

Summary Statement

I tested to see how chlorophyll a concentrations would react under the exposure of different light sources using phytoplankton to see this change.

Help Received

Feedback from an online community used to verify the accuracy of my data.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Elisha D. Johnston

Project Number

J0507

Project Title

Organic and Conventional Chicken Under the Microscope: A Pilot Study Comparing Protein Quality

Abstract

Objectives/Goals

My objective is to conduct a pilot study investigating if organic chicken has higher quality protein than conventional chicken. Food science research indicates that some organic veggies, cereals, and legumes have higher quality protein than their conventional counterparts. Drawing upon medical, food science, and protein chemistry research, I hypothesize that organic chicken has higher quality protein than conventional chicken. Higher quality protein has more essential amino acids.

Methods/Materials

I utilized a digital microscope to measure marinade penetration in cross-sections of organic and conventional chicken breasts. Using molecular biology and biochemistry research, I developed a new method of assessing protein quality: marinade penetration (less penetration indicates higher quality protein and more penetration mean lower quality protein). I applied several methods to improve data quality, including blinding, randomization, teacher review, and double data entry. To tentatively assess if marinade penetrates less deeply into organic chicken, I used a t-test (alpha=0.10).

Results

I carried out 3 trials with a sum of 46 samples (19 conventional and 27 organic chicken breasts). Combined across trials, the mean penetration of marinade into conventional chicken was 679 micrometers (compared to 601 for organic). The t-test is statistically significant (p-value=0.08).

Conclusions/Discussion

There is little research comparing organic to conventional chicken meat. One of the few findings is that organic chicken has a lower risk for contamination from antibiotic resistant bacteria. My pilot study provides new and suggestive scientific evidence showing that organic chicken may also have higher quality protein than conventional chicken. I discuss that nutritional theory suggests eating higher quality protein may be better for the human body.

Summary Statement

My project provides suggestive evidence that organic chicken has higher quality protein than conventional chicken.

Help Received

My science teacher, Mr. Paul Burns, helped design and conduct trials; Noe Marquez helped with graphic design; Sonia Khan and Rachel Padmanabhan provided tutoring in molecular biology and biochemestry; my dad helped with statistics.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Dominic C. Jones

Project Number

J0508

Project Title

What Effect Do Different Cooking Methods Have on the Vitamin C Level of Broccoli?

Abstract

Objectives/Goals

The object of this project is to determine which method of cooking will maintain the most vitamin C in broccoli. The reason I am doing this investigation is to find the healthiest way to prepare broccoli.

Methods/Materials

I will be using raw broccoli as my control. I will use a vitamin C testing kit to determine the level of vitamin C in raw broccoli, and record the results. First I will boil broccoli for 10 minutes on the stove top in a pot of water. Then I will test with vitamin C kit and record the results. Next I will steam broccoli for 10 minutes, I will then test it with vitamin C kit and record the results. After, I will stir-fry broccoli in skillet on stove, then I will test with vitamin C kit and record results. In addition, I will microwave broccoli for 10 minutes, then I will test with vitamin C kit and record results. Finally I will grill broccoli with BBQ for 10 minutes, then I will test with vitamin C kit and record the results. I will perform ten trials per cooking methods.

Results

Boiling broccoli for 10 minutes took an average of 13 drops of vitamin C testing solution to turn the clear water blue. Making this the least effective method of cooking.Steaming broccoli for 10 minutes took an average of 6.8 drops of vitamin C testing solution to turn the clear water blue. Steaming broccoli for 10 minutes was the most beneficial method of cooking. Making it the best choice for healthy eating.Stir-frying broccoli for 10 minutes took an average of 7.5 drops of vitamin C testing solution to turn the clear water blue.Microwaving broccoli for 10 minutes took an average of 7.3 drops of vitamin C testing solution to turn the clear water blue.Grilling broccoli for 10 minutes took an average of 7 drops of vitamin C testing solution to turn the clear water blue. Only slightly less successful at maintain vitamin C level as steaming.

Conclusions/Discussion

After completing this project, Steaming broccoli for only 10 minutes allowed the broccoli to supply the most vitamin C. Boiling was the least effective cooking method, containing the least amount of vitamin C. Stir-frying, grilling, and microwaving, were only slightly less successful at maintaining vitamin C level as steaming. In conclusion, I have learned to get the most nutritional benefits it is best to eat broccoli that has been steamed for 10 minutes. Although all vegetables provide nutrients to keep us healthy no matter how they are cooked.

Summary Statement

Picking the right vegetables prepared the right way will allow us to get the most nutritional benefits, if we are going to eat our vegetables to stay healthy we should prepare them in a way that will offer the most nutrients.

Help Received

My Mom helped with Photos and Board.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Daniel G. Kalfayan

Project Number

J0509

Project Title

Vitamin C in Foods: Can It Take the Heat?

Abstract

Objectives/Goals

Reports published by the U.S. National Institute of Health indicate a food's vitamin C oxidizes and denatures at 70° C (or 158° F). I set out to learn if vitamin C could be completely oxidized at normal cooking temperatures. How much vitamin C is lost when fruits such as oranges and tomatoes, and vegetables such as bell peppers and broccoli are cooked at different temperatures? I believed the higher the temperature, the more vitamin C will be lost. If vitamin C is denatured at 158° F, then I thought 50% of the vitamin C would be lost when the food temperature reached 79° F (or 50% of 158° F). I also believed 75% of the vitamin C would be lost when the food temperature reached 119° F (or 75% of 158° F). Finally, I thought all of the food's vitamin C would be denatured when the food's temperature reached 158° F.

Methods/Materials

I cooked oranges, tomatoes, bell peppers and broccoli at various temperatures in order to test my hypothesis. The effect of heat on the vitamin C for these four foods was determined by redox titration, using household iodine and a starch indicator solution.

Results

According to my redox titration, the concentration of vitamin C in each of the four foods was not significantly affected (by more than 5%) until the temperature of the cooked foods reached a minimum 158° F. Virtually no vitamin C was lost at an average 79° and 119° F for any of the foods.

Conclusions/Discussion

Based on my research, I proved the higher the temperature, the more the denaturing of vitamin C but I also proved that vitamin C begins denaturing (not finishes denaturing) when a food reaches 158° F. Therefore, my research disproved the second part of my hypothesis that the vitamin C in foods would be 50% and 75% denatured at 79° and 119° F, respectively. Vitamin C will not significantly begin the denaturing and oxidization process until the average temperature of the food reaches at least 158° F. I learned that in order to maximize the natural vitamin C in raw foods, it's important to cook them as quickly as possible with the lowest amount of heat.

Summary Statement

My science project was dedicated to understanding the healthiest way to eat and cook fruits and vegetables.

Help Received

My mother helped me perform redox titration with iodine.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Talya Kass; Liah Nudell

Project Number
J0510

Project Title
Bread Rising

Abstract

Objectives/Goals
We wanted to determine how altering or omitting some of the usual components involved in the chemistry of bread making affected the outcome and composition of the bread.

Methods/Materials
Under the same conditions, we baked challah (braided bread) of four different chemical compositions:
1. Control - sucrose (table sugar), yeast, flour
2. No yeast - sucrose, flour
3. No sugar - flour, yeast
4. Alternate sugar - dextrose, yeast, flour

3 challot were baked in each of the above categories

Results
We measured the length, width and height of the challah both before and after baking. We found that in all three challot missing yeast there was no significant change in the size characteristics when comparing the pre- and post-baked products. The other three compositions all led to significant rise in the bread with small changes in length and width.

Conclusions/Discussion
Altering chemical composition of challah greatly affects its eventual size and consistency after baking. We discovered yeast are able to feed on both sucrose and dextrose in a similar fashion, causing a similar rise in the bread. We also learned that yeast can function in the absence of sugar most likely metabolizing the carbohydrate in the flour. In bread without any yeast, there was no great change in its size or height before or after baking.

Summary Statement
We determined the importance of 3 critical components in bread for its eventual outcome after baking.

Help Received
None

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Safiyah A. Lakhany

Project Number
J0511

Project Title
Holy Spinach! The Effect of Varying Sodium Bicarbonate Concentrations on the Rate of Photosynthesis in Spinach Leaves

Abstract

Objectives/Goals
This experiment aims to evaluate how different concentrations of sodium bicarbonate solutions affect the rate of photosynthesis in spinach leaves.

Methods/Materials
In a series of 25 trials, five different sodium bicarbonate solution concentrations were prepared, using distilled water at room temperature along with baking soda. Next, 100 mL of each respective solution was prepared. Subsequently, spinach leaf disks of equal size were perforated using a single hole puncher. Ten of the spinach leaf disks were placed in the syringe along with 3 mL of each solution and the excess air was removed by creating a vacuum which was accomplished by placing a thumb along the opening of the syringe whilst pulling the plunger. This extracted existing air in the disks which removed their existing buoyancy to eliminate any preexisting variables such as the existing oxygen concentration within the spinach leaves. After all the disks had sunk, they were quickly transferred to the rest of the sodium bicarbonate solution which was placed four inches under a light source (70 watt lamp). A timer was initiated as soon as the disks made contact with the solution. The amount of time each disk exhausted to float to the top was recorded. The variation in required time to float to the surface of the solution indicated oxygen release as a product of the rate of photosynthesis. The experiment was repeated using each increasing concentration of the prepared sodium bicarbonate solutions, and analyzing the resulting data.

Results
The rate of photosynthesis steadily increased as the concentration of carbon dioxide present (sodium bicarbonate solution concentration) increased (directly proportional relationship). The leaf disks which were not exposed to any carbon dioxide source (control trials) averaged the lowest rates of photosynthesis by requiring an average of 20.54 minutes for all 10 leaf disks to rise. In contrast, the leaf disks which were submerged in the highest concentration (0.8% sodium bicarbonate solution) all rose within 4.91 minutes on average.

Conclusions/Discussion
This experiment demonstrates the fact that an increase in the amount of carbon dioxide present can increase the rate of photosynthesis. An increase in the rate of photosynthesis is indicated by the speed by which leaf disks rise which is due to higher rates of released oxygen, the primary product of photosynthesis.

Summary Statement
How do varying sodium bicarbonate concentrations (CO2 levels) affect the rate of photosynthesis in spinach leaves?

Help Received
Mom purchased materials needed to perform this experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Noah T. Leighton

Project Number
J0512

Project Title
Sip All Day for Tooth Decay

Abstract

Objectives/Goals
How does the type of liquid you drink affect the amount of decay on your teeth?

Methods/Materials
18 teeth were obtained from a dentist. Each of the 6 types of liquid were assigned 3 teeth. A starting mass was measured for each tooth, and it was then placed in a beaker of the assigned liquid. The mass of each tooth was measured using a digital balance and recorded.

Results
To analyze the data I added the total mass of the 3 teeth for each liquid. Then I figured out the total mass lost by liquid and calculated the percent mass lost by liquid. Coke was the liquid with the highest percent mass lost at 6.4%. Lemonade teeth lost 2.6% mass. Teeth in apple juice lost 2.4%. Sprite caused 1.96% loss. Black tea caused .46% loss. Teeth in water, (my control) lost the least mass with only .15% lost.

Conclusions/Discussion
Coke caused the most teeth enamel loss. I believe this is due to the high levels of acid in Coke. For many teeth, the mass actually went up from the day before. This was a surprise. I hypothesize it may be due to the dyes in the drinks sticking to the teeth. Some sources of error include the teeth coming to me with previous enamel decay. Also, the fine differences in mass are sometimes difficult to detect using a digital balance. This could have skewed the results slightly. The data suggest one should avoid drinking beverages with high acid content, especially sodas like Coke.

Summary Statement
I wanted to find out which drinks most affected the enamel of teeth by causing decay.

Help Received
Borrowed digital balance from Burrough's High School

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Qianyun Lin

Project Number
J0513

Project Title
Enzyme Catalase: The Key to Hydrogen Peroxide

Abstract

Objectives/Goals
In my science fair project, I want to determine whether the change in temperature will have a positive or negative effect in the decomposition reaction between hydrogen peroxide in the presence of the enzyme catalase. Both animal and plant enzymes will be tested and compared.

Methods/Materials
Distilled water, refrigerator, coffee filters, ice chest, ice cubes, hammer, raw potatoes, graduated cylinder, scale, blender, thermometer, hydrogen peroxide 3%, pork liver, test tubes

Results
Testing was done at the following temperatures: 5°C, 19°C, 23°C, 38°C, 44°C and 55°C. Three trials were completed at each temperature for both animal and plant enzymes. I conclude that the enzyme catalase works the best at 38 degrees C. The graphs on my board will indicate my results for all the temperatures that were tested along with the averages for each.

Conclusions/Discussion
From my testing, I concluded that my hypothesis is partially correct. The time that it takes for catalase to break down hydrogen peroxide does decrease when the temperature rises, but the act of decreasing stops when the hydrogen peroxide reaches a certain temperature. The reaction time will differ as the temperature is changed, but the best result for both the plant and animal enzyme was close to the human body temperature of 38°C. The chemical formula for the whole reaction is 2H2O2 + catalase -> 2H2O + O2. Hydrogen peroxide is the substrate that fits with catalase and catalase breaks the molecule apart then releases water and oxygen.

Summary Statement
My project is to find out whether the changing in temperature will have a postive or negative effect on the decomposition reaction between the enzyme catalase and hydrogen peroxide.

Help Received
My science teacher provided all the lab equipment need for my testing.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Clara E. Luisetti

Project Number
J0514

Project Title
The Effects of Household Drinks on Teeth

Abstract

Objectives/Goals
The purpose was to see which beverage would cause the most enamel to break down and staining on a human tooth. It was assumed that weight loss of the tooth directly correlated with the amount of enamel loss. The hypothesis was that the tooth immersed in Diet Pepsi would have the greatest percentage weight loss and change in color.

Methods/Materials
Baby teeth were collected from one subject. The teeth were from a 41 year old who lost her teeth between the ages of 6 and 16. The teeth were selected based on weight, size, and similarity. Ten of the teeth were chosen as samples for the experiment. Two tablespoons of Gatorade, Diet Pepsi, orange juice, milk, and water were measured into five different containers labeled Owls. This process was repeated for five different containers labeled Teenage Mutant Ninja Turtles. Then the ten sample teeth were paired according to size and weight. The pH of each liquid was recorded. The pairs were then placed in the same beverage. The weight of each tooth was recorded and observations of color change and visible tooth decay were recorded.

Results
The results of data collected showed that milk and Gatorade caused the most percentage weight loss. The Gatorade had an average weight loss of 12.5% and the milk average weight loss was 14.4%. The water and Diet Pepsi caused no measurable percentage of weight loss. It was thought that the tooth in orange juice gained weight from the pulp sticking to the teeth. The Gatorade and Diet Pepsi caused significant staining on the teeth.

Conclusions/Discussion
In conclusion, the drink that caused the greatest percentage weight loss and dental erosion was milk. The data results disagreed with the hypothesis, but the observational results supported it. Based on the results, teeth are better off with water during and after events such as meals, sporting events, and parties. If acidic, sugary and colored drinks such as Gatorade, milk, and Diet Pepsi are consumed, teeth should be brushed really well afterward to keep them white and free from erosion.

Summary Statement
This project is about the negtive effects of household drinks on teeth.

Help Received
My mom helped me take pictures and enter them into the lab journal that I created. She also showed me how to graph results on a computer.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Katya M. Marchetti

Project Number

J0515

Project Title

Toxic Light Exposure on Yeast

Abstract

Objectives/Goals

THE OBJECTIVE OF THE PROJECT IS TO FIND OUT IF EXPOSURE TO ULTRA VIOLET LIGHT AFFECT YEAST FERMENTATION RATE AND/OR ALTER PROTEINS IN YEAST, THUS INDICATING THAT LIGHT EXPOSURE CAN BE TOXIC TO CELLS.

Methods/Materials

THREE TESTS OF 6 JARS OF YEAST AND SUGAR EACH WERE EXPOSED TO UV LIGHTS. EACH TEST HAD 2 CONTROLS PROTECTED FROM EXPOSURE. FERMENTATION RATES WERE OBTAINED WITH A REFRACTOMETER, AND TEMPERATURES WERE RECORDED USING THERMOMETER READINGS. DATA WAS COMPARED TO SEE IF FERMENTATION RATES DIFFERED COMPARED TO CONTROL. PAPER CHROMATOGRAPHY WAS USED TO EXAMINE AND COMPARE PROTEINS IN SAMPLES EXPOSED TO LIGHT VERSUS THE CONTROLS.

Results

THE SUGAR FERMENTED SLIGHTLY FASTER IN THE EXPOSED SAMPLES OF YEAST OVER TIME. HOWEVER, IN THE BEGINNING OF EXPOSURE, THE CONTROLS WERE FERMENTING FASTER. IN THE PAPER CHROMATOGRAPHY TESTS, THERE WAS A VISIBLE DIFFERENCE IN THE PROTEIN PATTERS BETWEEN THE EXPOSED SAMPLES VS THE CONTROL.

Conclusions/Discussion

EXPOSURE TO UV LIGHT DID AFFECT YEAST FERMENTATION RATES. THE NON-EXPOSED CONTROLS ENDED UP REACHING ITS FINAL FERMENTATION GRAVITY POINT FASTER THAN THE EXPOSED TEST SAMPLES. THE PROTEIN ALTERATION TESTS DID SHOW A DIFFERENCE IN PROTEINS WHEN EXPOSED TO LIGHT. THE RESULTS DID SHOW A DIFFERENCE CAUSED BY LIGHT EXPOSURE, BUT NOT WHAT TYPE OF PROTEIN CHANGE OCCURRED.

Summary Statement

THE EFFECT OF UV LIGHT EXPOSURE ON YEAST FERMENTATION RATES AND YEAST CELL PROTEINS.

Help Received

REVIEW OF PROCEDURES AND RESULTS BY CLINICAL LABORATORY SCIENTIST

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Erik W. Mercado

Project Number
J0516

Project Title
You Have to "C" It to Believe It: How Does Time Affect the Amount of Vitamin C in an Orange?

Abstract

Objectives/Goals
My objective was to use titration of orange juice with iodine to find when an orange contains the highest amount of Vitamin C after being picked, so that it would be the healthiest possible.

Methods/Materials
I started out by creating a starch indicator solution by heating water and adding souble starch. I also diluted Lugol#s 2% iodine solution so I could accurately measure the amount of Vitamin C in an orange. Periodically I would juice the oranges picked on day one and measure the amount Vitamin C they contained by titrating them with the diluted Lugol#s solution I made. All oranges were picked on the same day but juiced on different days. I repeated this process in three trials and used store bought oranges as a control group.

Results
The amount of Vitamin C in the oranges actually increased the first week from an average of 16.10 mg of Vitamin C on day one to 16.97 mg on day three and 17.80 mg on day seven. However, in the weeks following, the Vitamin C dropped to 14.27 mg on day fourteen and 11.97 mg on day twenty-one.

Conclusions/Discussion
My hypothesis that using an orange picked recently is going to have more Vitamin C than an orange picked a while ago was supported by my results. While it might be a good idea to not eat your orange right away after it is picked, make sure you don#t wait too long to eat it. Next time I might measure oranges of different sizes, and see if that affects the Vitamin C content.

Summary Statement
The purpose of my project is to find when the optimal time is to eat an orange to get the highest amount of Vitamin C from it.

Help Received
My mom used her credit card to buy my materials online.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Luke R. Merickel

Project Number
J0517

Project Title
Going Nuts! The Energy Inside an Almond

Abstract

Objectives/Goals

Just about everything has potential energy stored in it. The problem is releasing that energy to be able to do some work. A tiny almond contains stored chemical energy. When we eat them, the stored energy is converted by our bodies so we can do work. I am asking: what type of almond (raw, raw organic, dry-roasted unsalted or dry-roasted salted) contains the most stored energy (calories)?

Methods/Materials

almonds
cork & needle
two, rinsed metal cans, one large & one small
hammer & drill
large nail & large drill bit
bbq skewer, water, & a thermometer
matches, tin foil, & fire proof surface (baking sheet)

Remove both ends of the large can and punch holes around the bottom. Remove top of small can. Punch 2 holes at the top, across from each other. Slide skewer through the holes. Pour room temp. water into the small can. Push 1 end of the needle into the cork and the other end into the almond. place cork and almond on baking sheet. Light almond on fire. Immediately lower the large can around the nut with small can balanced on top of the large can. Allow the nut to burn until it goes out. Record the temperature of the heated water. Repeat five times for each type of almond.

Results

The chemical energy stored in the almond was released and converted into heat energy. The heat energy raised the temperature of the water in the small metal can. Heat energy can be converted to caloric value. I discovered that raw organic almonds contain the most calories. A 1g, organic almond contained 13.9 calories. A 1g, raw almond contained 12.7 calories. A 1g, dry-roasted & unsalted almond contained 10.1 calories. A 1g, dry-roasted & salted almond contained 8.2 calories. The organic raw almond contain the most calories (energy) of the four almonds tested.

Conclusions/Discussion

My hypothesis was that the raw almond would have the most heat energy (calories) was incorrect. It turned out that organic raw almonds contain the most calories. These two almonds were close in calorie content with a difference of 1.2 calories per gram of almond. I believe the two dry-roasted almonds

Summary Statement

Organic raw almonds contained the most caloric energy of the four almonds I tested.

Help Received

My dad helped to drill the holes in the cans. He also helped supervise the lighting of the almonds on fire.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Baani Minhas

Project Number

J0518

Project Title

Effect of Temperature on Vitamin C Content of Fruits and Vegetables

Abstract

Objectives/Goals

To test the impact of temperature on vitamin C concentration levels in different fruits and vegetables and find the most beneficial and idealistic way of increasing daily vitamin C consumption by making simple and small changes to the average diet.

Methods/Materials

700ml of fresh extract was strained from lemon, pineapple, and grapefruit and was stored in different environments. The samples were refrigerated for 4 hours at 2.78°C, cooked until reaching 90°C for 5 minutes, and tested raw at room temperature. The vitamin C levels were then tested using the redox titration method. The extract was titrated with a prepared starch indicator solution and iodine tincture. As the iodine was added, the vitamin C was oxidized and the excess iodine reacted with the indicator to create a blue-black color in the liquid. The amount of iodine needed to complete the reaction was recorded. A 250mg vitamin C tablet was tested and used as a proportion to determine concentration levels of other samples. The procedure was repeated with onions, tomatoes, and daikon, but the extracts were diluted to the ratio of 75ml water to 100ml extract.

Results

9 trials each were completed for 6 fruits and vegetables. It was consistently found that the raw extracts contained the most vitamin C, while the cooked and chilled samples were depleted of vitamin C in all trials. Tomatoes and grapefruit had the least average presence of vitamin C when chilled. The onions, daikon, lemons, and pineapple lost the most vitamin C after being cooked. The chilled and cooked sample data was very similar.

Conclusions/Discussion

Exposure to different temperatures demonstrated a significant impact on the vitamin C concentration of the fruit and vegetables. Raw extracts at room temperature were found to contain the most Vitamin C. Boiling and chilling the extract samples caused decline in Vitamin C levels. This data contradicts my hypothesis of the chilled condition aiding in the preservation of vitamin levels. It was found that the most beneficial and idealistic way of increasing vitamin C consumption is by eating vitamin C rich fruits and vegetables raw and storing them outside, not in the fridge or cooking them.

Summary Statement

The titration method was applied to measure vitamin C concentration levels of different fruits and vegetables after being exposed to different environments and temperatures.

Help Received

Science teacher lent graduated cylinders

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Tyler S. Onciano

Project Number
J0519

Project Title
Does Green Tea Affect Oral Health?

Abstract

Objectives/Goals
The objective of the project was to see if green tea inhibit the growth of oral bacteria and therefore have a positive impact of oral health. Does green tea inhibit the growth of oral bacteria? This topic is important because many cultures around the world drink teas. Green tea is one of the most popular teas consumed. If Green tea can inhibit the growth of oral bacteria it may be used to impact oral health on a global scale.

Methods/Materials
Three test subjects; Nine Petri dishes; Two -125ml bottle of sterile nutrient Agar; One Silicon glove (heat resistant); Nine thin clear flat Velcro fasteners; 11 -2/pack sterile cotton Swab applicators; Straight edge; 1/8in black Formaline Charting& Graphic Art Tape; One Foam core board cut to 31.5cm x 39.5cm; Three Green Tea bags; One plastic bottle; One .85oz (24g) tube of toothpaste; Three new Tooth brushes; Three 6oz Dixie cups; Water; Three pairs of latex gloves; One Microwave.

Starting with the subject A, take one sterile cotton swab applicator and rub the tip on the tongue and cheek apply saliva to petri dish labeled A1 and swipe the agar in a zig-zag motion. Next,take a clean tooth brush and toothpaste and have them brush, take a sterile cotton swab applicator and rub the tip on the tongue and cheek apply to the petri dish labeled A2 and swipe the agar in a zig-zag motion. Finally, pour green tea into a Dixie cup and have the subject rinse with the Green tea for 10 to 15 seconds, take a third sterile cotton swab applicator and rub the tip on the tongue and cheek apply to petri dish labeled A3 and swipe the agar in a zig-zag motion. The above procedure should be repeated on subjects B and C.

Results
The result of the experiment was that the green tea rinse petri dish appeared to have less bacteria growth than the control, the brushing petri dishes contained less signs of bacteria growth than the control and appeared less than the green tea. However, green tea does effect growth of bacteria.

Conclusions/Discussion
The conclusion of the experiment was green tea did effect the growth of bacteria. But the brushing petri dishes contained less bacteria than the control and green tea petri dishes. Brushing is better overall.

Summary Statement
The affects of Green Tea on oral health.

Help Received
Dr. Light, Family Dentist suggested types of materials to use in the experiment; Mr. Hofsteen helped with experiment/test set-up; Mother assisted in typing and board layout; Mr. Chipley, math teacher helped refine procedure.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Ethan M. Ross

Project Number
J0520

Project Title
Hydrogenated Fat Content Contrariety between Oven Baked and Regular Potato Chips

Abstract

Objectives/Goals
The objective is to determine if oven-baked chips are significantly more beneficial to your health by comparing the saturated fat content of oven-baked chips versus fried potato chips.

Methods/Materials
Selected four styles of chips: Classic Lays, Oven-baked Lays, Ruffles, and Oven-baked Ruffles. Created a fatty solution by soaking proportional amount of chips in water for coextensive duration of time. Then strained and extracted remnants from the mixture leaving a liquid solution for sampling. Using droplets of iodine with constant agitation, I generated a chemical reaction that made the solution purple. Measured and compared increments of time indicating molecular breakdown of the saturated fats until the purplish solution dissipated from the sample.

Results
The iodine significantly took longer to dissipate in the two oven-baked samples because the regular chip samples contain more saturated fats than their counterparts. Saturated fats do not contain double bonds like unsaturated fats do. Therefore, it takes longer for the iodine to break down the fatty bonds indicating that the chips have less amounts of saturated fats.

Conclusions/Discussion
What I learned from this experiment is that oven-baked chips are indeed a healthier choice than regular chips. However, the manufacturers make the labels somewhat confusing to easily detect which brand of chips contains less saturated fats by changing the amount of chips in each bag, along with the serving size. Initially, I thought that the Oven-baked Lays would contain more saturated fats than the Oven-baked Ruffles because the total grams were less on the packaging. However, the amount of ounces contained in the bags were less and the amount consumable per serving size was fewer than the Oven-baked Lays, making it actually more saturated with fat than first expected.

Summary Statement
Testing the hydrogenated fat content in proportional amounts of oven baked and regular potato chips to determine if the consumption of baked chips are significantly more to beneficial your health.

Help Received
Mrs. Ducharme guidance in how to test my theory for saturated fats and vile of iodine to create my mixture; Parents for assistance with timer during the experiment, photography of my steps and results, and purchasing the needed supplies to complete the experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Addison D. Williams

Project Number
J0521

Project Title
Comparing the Effects of Cobalamin and alpha-Tocopherol on the Reproduction Rate and Longevity of Caenorhabditis elegans

Abstract

Objectives/Goals
This project was conducted to determine if specific vitamins fed to C. elegans would effect their reproduction rate and longevity.

Methods/Materials
Melted Nematode Growth Agar was placed in ten petri dishes that were each divided into three sections. Once the melted growth agar set, a half inch cube of C. elegans was placed in each section of the 10 divided petri dishes. The first group was fed 5 drops of the alpha-Tocopherol oil with 5 ml of water. The second group was fed 5 Cobalamin tablets crushed with a mortar and pestle and mixed with 5 ml of water. The third section was fed no vitamins at all and fed on just the agar itself.
This procedure was done 3 times for a total of 30 trials each.

Results
It was discovered that the alpha-Tocopherol water-based mixture fed to the C. Elegans sped up their reproduction rate. The C. elegans that were fed the Cobalamin water-based mixture had a slower reproduction rate but outlived the other two groups.

Conclusions/Discussion
The hypothesis that stated Cobalamin fed C. elegans will live longer and reproduce more than the control group was incorrect. They did live longer but had a slower reproduction rate than the control group. The hypothesis that stated alpha-Tocopherol fed C. elegans will live longer and reproduce more was incorrect also. Their reproduction rate increased as compared to the control group, but their longevity decreased.

The C. elegans that were fed Cobalamin did not have the fastest reproduction rate but lived longer than control group and the C. elegans that were fed alpha-Tocopherol.

Summary Statement
This project is about feeding C. elegans two different kinds of vitamins and observing what happens with their reproduction rate and lifespan.

Help Received