CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Isabella Allen; Caitlyn Giannini

Project Number

J1801

Project Title

How Do Different Fruit-Based Compost Solutions Affect the Growth of a Radish Plant?

Abstract

Objectives/Goals

Our objective was to determine how different fruit-based compost solutions affect the growth of a radish plant. We hypothesized that the Honeydew and Cantaloupe (Melon) compost solution would have the most positive effect on the growth of a radish, because Honeydew and Cantaloupe contain the highest concentration of potassium, magnesium, calcium, and phosphorus, which are four of the primary and secondary nutrients that soil needs in order for plants to be able to grow successfully.

Methods/Materials

First, we planted radish seeds in starter pot trays. After they had germinated, we re-planted five sets of eight different radish sprouts into larger pots containing soil mixed with different fruit-based compost solutions: Apples and Pears (Rosaceae), Bananas, Oranges and Lemons (Citrus), and Honeydew and Cantaloupe (Melon). We also mixed one of the five pots of soil with just water, and planted the radish sprouts within the control group in this pot. The radishes were watered every two days with tap water and we re-watered once during the growth period with diluted versions of the different compost solutions. After seven weeks, we harvested each of the radish plants and recorded the individual mass of each radish, and the total and average masses of the radishes within each group. We made a data table describing the visual appearance of each of the radishes each week.

Results

Our graphs and data table illustrate that the Honeydew and Cantaloupe compost had the most positive effect on the growth of a radish. The average radish mass within this group was 2.10 grams, the average radish mass in the control group was 1.97 g, the radishes in the Orange and Lemon group averaged a mass of 1.05 g, and finally, the average mass of the radishes in the Apple and Pear group was 0.47 g. The radishes within the banana compost group died within their first week of growth, causing a lack of significant data.

Conclusions/Discussion

Our hypothesis appears to be correct. Our data indicate that the radishes within the Honeydew and Cantaloupe compost group grew to have the greatest mass. We believe that this is because this fruit solution had the highest concentration of four of the primary and secondary macronutrients. We believe that the radishes within the Banana compost group may have died so quickly because they were receiving too much phosphorus and potassium, whereas they were not receiving enough of the other nutrients.

Summary Statement

Our project was conducted to determine which fruit-based compost solution had the greatest affect on the growth of a radish plant.

Help Received

Parents drove us to the store and bought the materials needed for our experiment.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Quintin J. Arretche

Project Number
J1802

Project Title
The Effect of Hydrogels on Water Conservation in Soil

Abstract

Objectives/Goals
The purpose of this project was to determine the effect of hydrogels on soil water retention in various potted plants.

Methods/Materials
Methods
In 42 pots of soil, incorporate 3 grams of hydrogels in 14 pots, 1 gram of hydrogels in 14 pots, and leave the other 14 pots as the control. In each of the groups plant 5 corn, 5 snap peas, and 4 sweet william. Water each pot and record initial mass. After one week, record the mass of all pots then re-water. Record the mass of all pots every 24 hours for four more days.

Materials
#Miracle-Gro Water storing Crystals (hydrogels)
#12 sweet william dianthus plants (Dianthus barbatus)
#15 snap peas plants (Pisum sativum var. macrocarpon)
#15 corn plants (Zea mays)
#Scale
#water
#Sta-green potting soil

Results
The data indicated the experimental group (pots with a higher amount of hydrogels in the soil) recorded higher masses than their initial masses: the 3 gram group with larger mass gain than the 1 gram group. The control group (pots with no hydrogels) recorded less mass than the their initial masses.

Conclusions/Discussion
Based on my data, my hypothesis was supported. The data indicated the groups with hydrogels conserved more water. Both experimental groups ended with a higher percentage of mass whereas the control group recorded less mass due to loss of water from the soil.

The data exhibited a trend that more hydrogels in soil results in an increase of mass in the soil. This demonstrates the hydrogels do absorb water thus conserving it in the soil.

Due to hydrogels ability to retain water, their use in soil could possibly provide a solution both

Summary Statement
My project was to determine the effect of hydrogels on water retention in soil using various plants.

Help Received
Besides my father purchasing necessary materials, none.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Madison T. Besnard

Project Number
J1803

Project Title
Water Efficiency

Abstract

Objectives/Goals
The purpose of my experiment was to determine the optimum amount of water that a bean plant needs in order to grow over the course of 30 days. I hypothesized that the plant receiving five drops of water would grow the tallest after 30 days because of my background research and further calculations.

Methods/Materials
-1 rectangular box (for germination)
-paper towels
-water
-eye dropper
-container to grow the plants in (I used 12 dairy jars)
-soil
-bean plants
In order to conduct this experiment, I germinated and planted the seeds, watered all plants daily with 1-12 drops(each plant receiving one more water droplet than the last), and analyzed the data.

Results
The average number of inches plants 1-6 grew was about 7, while the average number of inches that plants 7-12 grew was about 7 ½. Final results proved my hypothesis wrong because plant 7 grew the tallest with a stem of 9 inches.

Conclusions/Discussion
People commonly think that the more water the better for plant growth. However, after conducting this experiment I have discovered that this is definitely not the case. To conclude, Californians could minimize their water usage and still have proper growth of their plants. My experiment could also have larger agricultural applications for farmers looking to optimize water usage.

Summary Statement
I conducted a water efficiency project to determine the optimum amount of water that a bean plant needs in order to thrive.

Help Received
While performing this project, I received help from my dad in determining the form of measurement of the plants and purchasing the materials.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Jaydev N. Bhateja

Project Number

J1804

Project Title

What Is the Effect of Dry Farming on the Sugar Content of Pisum sativum?

Abstract

Objectives/Goals

In a drought, it is important to save water. A way to do this is to give less water to plants. A common Californian crop is Pisum sativum, the sugar-snap pea plant. This project answers the question of how much water and at what frequency to give a plant for optimal sugar content.

Methods/Materials

A previous experiment found that 50 mL of water per 3 days was the optimal watering regimen for Pisum sativum. My hypothesis was that the highest sugar concentration would be in plants receiving this regimen. Saving water was the goal of this experiment, so this regimen was used as a maximum and applied to the control group. Another group was given 75% of the optimum, or 37.5 mL per 3 days, another 50% of it, or 25 per 3 days, and the last, 25% of it or 12.5 per 3 days. 4 more groups were created. Water was given to each of these at ½ the frequency, but twice the amount of water, keeping the total amount of water constant. Therefore, the 5th, 6th, 7th, and 8th groups were given 100, 75, 50, and 25 mL per 6 days. These groups were grown outside. The same groups were inside. There were 64 plants in all. The plants were grown for 9 weeks, then processed into extracts, and the glucose content of each was measured with a glucometer.

Results

Surprisingly, plants outside given the least water had an average glucose concentration (in mg/dL) of 7% more than plants given the most water. But plants given between 50-75 mL every 6 days and 25 mL every 3 days had glucose concentrations of 65% - 130% higher than those of the plants outside with the most water. Because the humidity inside is greater than it is outside, plants inside had more water, and therefore more glucose. They converted extra sugar to starch, while the plants outside did not. My glucometer could not detect the low levels of glucose left in the plants inside.

Conclusions/Discussion

My hypothesis was proven false. Glucose levels were not highest in the control group. They changed only with moderate amounts of water. Future improvements would be to add hydrochloric acid to extracts to break down starch into sugar. More accurate data on the sugar content of plants would be obtained.

Summary Statement

This project analyzes the effects of decreased water supply to the sugar-snap pea plant.

Help Received

My advisor, Dr. Anuradha Murthy, was very helpful in carrying out the experiment. My parents, Rajiv and Meera Bhateja, and my brother, Chet Bhateja, helped oversee the growth of the plants.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Anthony Castillo

Project Number

J1805

Project Title

Is Less More? The Effect of Fertilizer Microdosing on Non-GMO Diploid Yemeni Watermelon Seeds

Abstract

Objectives/Goals

This project was designed to test the effect of three different fertilizer microdosing application methods on the growth of Non-GMO diploid watermelon seeds.

Methods/Materials

First, I tested my soil for nutrient deficiencies. The results showed a nitrogen deficiency, adequate amounts of phosphorous, and a surplus in potassium. Blood meal (N=13.25% P=1.0% K=0.6%) was used to correct the nitrogen deficiency. I planted 20 seeds, 5 for each method. I brushed seeds with vegetable oil and rolled them in blood meal fertilizer, put a capful of fertilizer in the seed hole, and mixed a capful of fertilizer in the soil line. The control group had no fertilizer. I measured the stems from the soil line every week for 3 weeks. Depending on the dryness of the soil, I watered the plants nightly either 30 or 60 mL. A soil thermometer, heating mats, and kitchen oven were used to maintain optimal soil temperature. I recorded the soil temperature daily.

Results

The control group showed the most growth with an average of 11.1 cm. Seed coating had an average of 3.5 cm. The seed hole group average came in a tenth of a centimeter smaller at 3.4 cm. All of the plants in the soil line application group died after week one. The week one average of the soil line application group was 1.25 cm.

Conclusions/Discussion

My hypothesis was that the seed coating group would grow the most. My results disproved my hypothesis. I attribute this to the fact that watermelons don#t need much nitrogen, a random heat wave killed a few plants and caused stress for others, and my seeds were two years old. If I were to repeat this experiment, I would use newer seeds and a fertilizer with a lower nitrogen content, such as cottonseed meal or crab shell meal.

Summary Statement

My project tested the effect of small (micro) fertilizer doses on the growth of a Non-GMO watermelon.

Help Received

Mother purchased materials; Grandfather obtained seeds; Hydroponics store owner offered suggestions and guidance in the planning of the project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Mira Chiruvolu; Molly Dillon

Project Number

J1806

Project Title

Soil Matters: A Study of Soil Components that Produce Nutrient Dense Plants for Our Health

Abstract

Objectives/Goals

Modern farming has allowed us to produce enough food to supply the world#s population. But at what cost? The nutrient value of the food we eat is being degraded due to soil erosion and poor soil management. Our goal was to understand the components of soil that contribute to the growth of nutrient dense plants. Our hypothesis is that soils with the right amount of nutrients and with more and diverse microorganisms will result in nutrient dense plants. We believe that 1) the soil mix that includes topsoil plus manure and rock dust and 2) soil from the forest will have the most nutrients and microorganisms and produce the more nutritious plants.

Methods/Materials

We grew swiss chard in 12 combinations of soil mixes. We used a LaMotte Soil Test kit to test soils for pH, macronutrients N, P, K, and planned to do plant tests for macro- and micronutrients. We used the Case Protocol for growing and counting soil bacterial colonies.

Results

From our LaMotte Soil Testing, we observed that plants in the topsoil plus compost plus chicken manure were taller and looked healthier and the soil was high in nutrients and microorganisms. Our Case Protocol testing showed little relationship between the number of bacterial colonies and any of the nutrients. Our plant material did not grow sufficient enough to be able to test for plant nutrients.

Conclusions/Discussion

We set out to find whether high macronutrients and microorganism counts in the soil produced the most nutritious plants. Our results were inconclusive. Limitations included: (1) Our plants did not grow well enough to test. What we could do was compare soil nutrients between different soils. This was also inconclusive. (2) The testing was challenging. When we compared soils, the LaMotte Test Kit produced very few results for nitrogen even though the plants were green. Plus, sometimes it was hard to tell if we had medium potassium or high potassium. (3) The test kits we used provided data for high yield farming not nutrient dense plants. Future research would involve developing a new kind of test kit incorporating important elements of the soil food web, including minerals, fungi, protozoa, anthropods and nematodes available.

Summary Statement

Our project studies how different combinations of organic matter, minerals, and microorganisms lead to the production of nutrient dense plants.

Help Received

Daniel Chiemlewski of Hidden Villa provided us with information about building healthy soils and provided soil samples; Leila Shahidi lent her microscope which let us look at the bacteria more closely; and our parents helped us get supplies and taught us the tests and sterile technique.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Mariah G. Cox

Project Number
J1807

Project Title
How Low Can You Sow?

Abstract

Objectives/Goals
My objective was to see if vegetable seeds would sprout if planted at depths other than the depth recommended on the package. I also wanted to see if seeds planted on the surface, as in nature, would sprout and be successful.

Methods/Materials
I divided a 10 gallon aquarium into quadrants. I divided each quadrant into 12 sections. I planted a different vegetable(radish, cabbage, lettuce, peas) in each quadrant at 4 different depths. I planted three rows thus the 12 sections. I planted 5 seeds of each vegetable except peas(only 3) in the bottom of each measured hole of the section. I used a flashlight to look and make sure that the seeds were at the bottom of the hole. I planted on the surface, at the recommended package depth, 2.5cm below the package depth, and 5cm below the package depth. I watered and observed daily and recorded data.

Results
The radishes and peas did not seem to mind the extra depth, they sprouted just fine. The lettuce and cabbage did mind the extra depth. They did not sprout well at the 5cm depth. The seeds all sprouted at the surface depth, but as they grew taller they tipped over and did not do well.

Conclusions/Discussion
The smaller the seed the more attention we should pay to the recommended depth on the package. The seeds only hold so much energy to get to the surface. The recommended depth is just that, it is recommended but not exact. No need to go to the garden with your ruler, just be reasonable.
One reason we do not find vegetables sprouting everywhere on the ground would be that they are not successful in establishing a strong enough root system.

Summary Statement
Will vegetable seeds sprout at depths other than what is recommended on the package, including on the surface of the ground?

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Cecelia M. Eggleston

Project Number
J1808

Project Title
The Effect of the Color of Light on Plant Growth

Abstract

Objectives/Goals
The purpose of my experiment was to investigate the effect of the color of light on plant growth. I chose this because I wanted to find a way to increase plant growth without using fertilizers.

Methods/Materials
I set up this experiment by using four different colors of light, with white as a control, to test which color would have the greatest effect on the growth of radish seedlings. I put eight plants in a cardboard box with a hole in the top and colored light gels on the light bulbs. The constants were: soil type and quantity, water amount, seed type, duration of light, and container size.

Results
The major findings were: plant growth rate was highest under blue light at an average of .52 cm per day and lowest under green light at an average of .42 cm per day. Red light had an average of .43 cm per day which did not support my hypothesis.

Conclusions/Discussion
The plants' growth was the highest under blue light and the plants under green light had the least amount of growth. The hypothesis that plants growth would be greatest under red light and least under green light was partially supported. I did not expect that red light would not have a greater effect on plant growth. I can explain this because at first red light had the greatest height however it grew so fast the stems were weaker and they broke. In the real world this could be useful because it would increase the growth of plants without using fertilizers.

Summary Statement
The purpose of my expirement was to test the effect of the color of light (wavelength) on plant growth.

Help Received
My father helped me use excel for data analysis and purchased materials.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Gwyneth C. Elliott

Project Number

J1809

Project Title

Dissolved Oxygen

Abstract

Objectives/Goals

To study dissolved oxygen levels in water studying if aquatic plants make more dissolved oxygen than the mechanical stage of a filter, or an aquarium with just water. The dissolved oxygen levels in three different aquarium tanks were measured using dissolved oxygen tablets from a water testing kit. The hypothesis was that the aquarium containing aquatic plants would have a higher dissolved oxygen level than the aquarium with a filter or an aquarium with just water. The manipulated variable was the water and the oxygen testing tablets. The responding variable was the water.The controls are the filter, plant, and water.

Methods/Materials

Using dissolved oxygen tablets, test tubes and water vessel sampled water from one of three aquariums to test the level of dissolved oxygen. One aquarium had a filer, one aquarium had just water, and the third aquarium had plants. There were 3 trials done over 6 weeks 18 days of testing. Testing was done every other day. After each trial period the water in each aquarium the water was changed. Materials important to understanding the project consist of : Aquatic plants, filter, water,dissolved oxygen kit,

Results

The results after testing showed that the hypothesis was proven. That the aquarium with plants had a higher level of dissolved oxygen, than an aquarium with a filter or water.

Conclusions/Discussion

I learned from this experiment that aquatic plants put a higher amount of dissolved oxygen in an aquarium. Water temperature does have an effect on dissolved oxygen levels. The colder the water the higher the dissolved oxygen levels where. The data numbers showed the hypothesis was correct, an aquarium with just plants will have a higher rating of dissolved oxygen than a filter with a mechanical stage or a aquarium of water. I don't want just a cleaner tank for fish to live, but a healthier tank with enough dissolved oxygen for fish to live longer.

Summary Statement

To study the difference in dissolved oxygen levels in three different aquarium's one with just water, one with a filter and one with plants.

Help Received

Science teacher helped with how to set up the project testing correctly. Mom helped with the typing and correcting the paper portion. Dad helped with the charts in my paper.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Madison A. Elliott

Project Number
J1810

Project Title
Calling the Right Shots

Abstract

Objectives/Goals
The purpose of my project was to find out if there was a difference in vitamin C levels when growing wheatgrass in aquaponics compared with a soil medium.

Methods/Materials
To complete this project, I used an aquaponics system, soil, wheat berries (to grow the wheatgrass), and starch and iodine to complete the various titration tests. I began my project by growing the wheatgrass in both systems for about two weeks. Then, by using titration, I tested the wheatgrass' vitamin C concentration once a week for a total of four weeks to obtain my final results.

Results
By averaging the number of iodine drops it took to react to the vitamin C in the wheatgrass solution, I found that there is a fifty-seven percent increase in vitamin C levels when growing wheatgrass in soil.

Conclusions/Discussion
Even though the wheatgrass grown in aquaponics may have a faster growth rate, and a healthier and greener appearance, the wheatgrass grown in soil had a substantial increase in vitamin C levels. While many people in areas lacking soil turn to aquaponics to grow their fresh fruits and vegetables, they should rethink their choices, and consider sticking with soil to get a more vitamin rich plant.

Summary Statement
Is there a difference in vitamin C levels when growing wheatgrass in aquaponics compared with a soil medium?

Help Received
Dad helped me understand titration and guided me through the first test; English teacher helped explain how to write research paper; Science teacher helped me understand the scientific method

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Daniel W. Feng

Project Number

J1811

Project Title

Spinning Seeds: How Centrifugal Force Affects the Growth of Plant Roots

Abstract

Objectives/Goals

In this science fair project, I investigated how plants know how to send their roots down, and how to change the direction that their roots will grow. My research question was: "How does centrifugal force affect the direction of growth of a plant's roots?" After doing background research, I predicted that the angle of the plants' roots relative to vertical would increase when the centrifugal force increases, because the plant will feel an additional force besides gravity and the roots will then grow in a direction closer to horizontal. Quantitatively, I predicted that the angle will be determined by the sum of the two forces.

Methods/Materials

My experiment used a record player, petri dishes, soil, water, radish seeds, and wooden planks. Soil, water, and seeds were put in the petri dishes, and the seeds began to grow. The petri dishes were then put on the wooden planks on top of the record player at 0, 22, 44, and 74 cm from the center, and then spun to make the radish seeds feel centrifugal force. After 24 hours, the dishes were taken off and the angle of the plant roots (relative to vertical) was measured. This was repeated so there were 6 trials at each of the 4 distances from the center.

Results

I compared these angles to the predicted angle I calculated with the formula: a = arctan(Fc/Fg), where Fc is centrifugal force and Fg is gravitational force. Here are the results for the 4 distances (experimental data vs. prediction in degrees): 0 cm: 2 vs. 0; 22 cm: 7 vs. 16; 44 cm: 25 vs. 30; 74 cm: 40 vs. 44. The experimental data followed the predicted values pretty closely. Clearly, the farther away the seeds were placed from the center, the bigger the angle was, and since there is a strong correlation between the experimental and predicted, we can conclude the angle was determined by the sum of the two forces.

Conclusions/Discussion

The results match my hypothesis. Qualitatively, the root angles increase when the centrifugal force increases. Quantitatively, the angle is determined by the sum of the two forces. By adding another force beside gravity to the plant, I now know it is possible to make a plants' roots grow in the direction of the two forces combined. My results could have beneficial applications to space travel. By adding centrifugal force to a plant in space, we can give it a false sense of gravity, which can make the plant root grow straighter and in turn make the plant stronger.

Summary Statement

By adding centrifugal force to plants, I investigated how they would react when they were subjected to a force beside gravity.

Help Received

I would like to thank Ms. Bennett, my advisor, who taught me the basics of how to make a science fair project, a neighbor who gave me the record player, the Home Depot lady who gave me materials at a discounted price, and my mother and father who gave me advice and helped me assemble the backboard.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Delaney E. Fritz

Project Number
J1812

Project Title
The Effects of Water Quality on Alfalfa Growth

Abstract

Objectives/Goals
I have always been interested in the propagation of plants because my parents own nurseries where they grow palms, tropical, and hanging flower baskets. We have a well on our property, and I wondered what the effects of different water sources are on plants. My goals were to find the best source of water for growing alfalfa. I chose to grow alfalfa because it grows quickly, and I could easily observe changes over a short period of time. My hypothesis is that the well water will grow healthier plants because it may contain more trace minerals.

Methods/Materials
I tested three samples of well water and three samples of tap water for water quality. I planted six trays of fifty cells each with alfalfa seeds. I started testing after three days of growth when the seedlings first emerged. Next I watered the three trays of tap water and three trays of plants with well water. I observed and measured the plants daily. I recorded the results for the height, soil moisture, light levels, temperature, and humidity. My materials included test tubes, a digital stopwatch, and LaMotte Testabs for the water quality testing. My other materials were a light and moisture meter, a temperature and humidity meter, and a metric ruler for measuring alfalfa heights.

Results
My total number of samples was 42 samples tested for water quality and 300 alfalfa plants observed. I tested the alfalfa plants a minimum of 10 days and on average the alfalfa plants that were watered with well water consistently grew taller than the alfalfa watered with tap water. The moisture and light conditions were consistent and equal. The humidity and temperature were maintained at the same level for all plants. The average plant heights for the alfalfa plants were 31.9 cm for those watered with well water and 21.6 cm for those watered with tap water.

Conclusions/Discussion
My conclusions were that the plants watered with well water grew more rapidly and appeared more robust than the plants watered with tap water. The height of the alfalfa plants watered with well water changed significantly each day. The alfalfa plants watered with well water were on average 33% taller than the plants watered with tap water. I would recommend also testing different plants to see if the results are the same, and also testing for trace minerals in the water.

Summary Statement
My project tested the differnces between well water and tap water on alfalfa growth.

Help Received
My science teacher shared her testing material; my father let me use his greenhouse facicility.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Ella D. Grabenheinrich

Project Number
J1813

Project Title
Germination and Growth of Fava Bean Plants

Abstract

Objectives/Goals
To determine the most suitable germination and growth conditions for fava bean plants.

Methods/Materials
Planted fava bean seeds in different soils, lighting conditions, and water to measure the speed of germination and growth in each setting.

Results
Fava bean plants grew faster in less sunlight but were a light green color and had less leaves than the other plants.

Conclusions/Discussion
Etiolation occurred when the fava bean plants were grown without sunlight. The stem of the plant elongated quickly and without many leaves to increase the chance to find light. The energy for photosynthesis comes from sunlight. Without sunlight, the chlorophyl in the plant is slowly destroyed. Therefore, the plants were a light green.

Summary Statement
Conditions to increase the speed of fava bean plant germination and growth

Help Received
My science teacher, Mr Penkala, taught me how to create charts in Excel. Thank you Mr Penkala!

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Xavier E. Guaracha

Project Number
J1814

Project Title
Hydroponics vs. Soil

Abstract

Objectives/Goals
I wanted to test two types of growing methods. I used hydroponic systems and planting pots because they are commonly used.

Methods/Materials
Hydroponic system(raft), 2 gallons of distilled, Planting pots, Planting soil, 2 daylily bulbs, 2 sunflower seeds,2 radish seeds.
Plant 1 of every plant in each growing system. Add 1/2 of a gallon to the hydroponic system. Give the plants 1 cup of water each day. Measure for 21 days.

Results
The hydroponic plants grew overall taller than the soil plants. I found this out by adding the inches of one group of plants and compare the total height of the other growing group. the results were 7 inches compared to 6.1 inches.

Conclusions/Discussion
In my conclusion, I think that growing hydroponically is more successful. You can get taller plants. However, some plants may grow better in soil than water. Even though the overall height of the was higher than the soil plants height, the soil-grown radish grew taller than the hydroponically grown radish.

Summary Statement
To compare plants grown hydroponicaly to plants grown in soil.

Help Received
Dad helped make hydroponic system.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Arham Habib; Annie Zhang

Project Number

J1815

Project Title

Variation of Growth between Genetically Modified and Non-Modified Plants

Abstract

Objectives/Goals

The purpose of this project is to contrast the growth of organic, inorganic, and genetically modified plants in different soil types. This includes finding which group of plants (modified or non-modified) grows most consistently and which group of plants matures the fastest, as well as measurement of growth.

Methods/Materials

The materials required for this project are a supply of Organic, Inorganic, and Genetically Modified (Roundup Ready) soybean seeds along with three different soils of a varying nutrient contents.

Results

In this experiment, the inorganic seeds were shown to sprout after organic seeds. After this, they were shown to grow faster, regardless of the soil nutrient content. Due to the lag time in obtaining Roundup Ready seeds, a similar trend of growth can be drawn for the genetically modified seeds, but not much other information as they have not yet had a chance to mature.

Conclusions/Discussion

In this project, it is shown that inorganic and genetically modified seeds follow the trend of sprouting after the organic seeds, but growing at a faster rate. After a period of 9 weeks, it was also shown that inorganic plants mature faster, as they have started to bud while the organic plants have not.

Summary Statement

This project is based on comparing the growth of genetically-modified and non-modified soybean seeds in different soils with varying nutrient contents to see which group generally grows and matures faster.

Help Received

Monsanto gifted their Roundup Ready soybean seeds for experiment; parents helped in purchasing organic and inorganic seeds and soils.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Jamie A. Hau-Riege

Project Number
J1816

Project Title
Jamie and the Beanstalk

Abstract

Objectives/Goals
The purpose of my project, Jamie And The Beanstalk, was to find out how different gases affect the germination and growth of lima beans. I wanted to test my hypothesis that more CO(2) is beneficial for plants since it is needed for photosynthesis.

Methods/Materials
I created two air environments: one in an open container (C), and one in a closed container (A). I also created five environments in closed containers with different amounts of CO(2): 100% CO(2) (B), 50% CO(2) / 50% air (D), 17% CO(2) / 83% air (B2), 0.44% CO(2) / 99.56% (A2) and 0.22% CO(2) / 99.78% (B21). Each container had about a dozen potted plants with extra water on the bottom of the container. Over time, I recorded the height of each plant.

Results
Plants with CO(2) did not exceed the height of plants in air. Plants (B21) with the smallest amount of CO(2) grew to the same height as plants in air (A), while an increased amount of CO(2) led to shorter plants (A2). Plants with the highest amount of CO(2) (D and B) did not sprout at all. Also, plants in closed containers (air and CO(2)) began growing about 100 hours sooner than the open container C.

Conclusions/Discussion
I conclude that plants can still thrive in some CO(2), but too much is like a medication overdose, leading to death. Also my experiments show that plants grow better in greenhouses than open air.

Summary Statement
This work investigates the effect of different gas concentrations and environments on Lima bean plant growth.

Help Received
My dad helped drilling the holes in the containers.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Sadie B. Huntley

Project Number
J1817

Project Title
Water from Its Roots

Abstract

Objectives/Goals
My goal was to compare lake water vs. tap water from both Riverside County and Los Angeles County to see if it affected plant growth.

Methods/Materials
I collected water from a Riverside County lake, a Los Angeles County lake, a Riverside sink, and a Los Angeles sink. I divided 60 black bean into four groups. Each group was germinated using one of my water samples. Once the seeds began to grow, I transferred them into pots and continued watering them with the same type of water. In all, I grew five plants with each type of water. I watered the plants every other day and recorded the plant#s height every other day for 30 days.

Results
The plants watered using Los Angeles lake water grew the tallest with a mean height of 2.9 inches after 30 days. Plants watered with Los Angeles tap water had a mean height of 2.75 inches. The plants grown with Riverside tap water grew a mean height of 2.4 inches and the plants gown in Riverside lake water also had a mean height of 2.4 inches after 30 days.

Conclusions/Discussion
My hypothesis was that LA lake water would help the plants grow tallest. In the end of my experiment, results show that my hypothesis was correct. It would be interesting to repeat this experiment using water from a variety of lakes in both counties to see if Los Angeles lake water consistently helps plants grow taller than water from Riverside County.

Summary Statement
To see if different types of water affect a plants growth.

Help Received
Mom helped me collect water.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Maya Y. Jaffe

Project Number
J1818

Project Title
The Addition of Lysine to Strawberry Plants and the Effect on Drought Resistance

Abstract

Objectives/Goals
The purpose of this experimental research is to determine whether adding lysine to strawberry plants will increase drought tolerance.

Methods/Materials
Materials used for this project: 12 strawberry plants, soil, 12 pots, saucers, lysine tablets, a growing light, oxygen monitor, pH meter, and a ruler. Plants were watered Monday and Thursday with and without lysine. Every Sunday, plant measurements were taken including: plant height, number of fruits, number of leaves, number of dead leaves, number of stems, other qualitative observations, and pictures were taken. Oxygen monitors were used to measure the output of oxygen, but differentiation was not detected. Soil pH was measured, but the pH of the water altered the results.

Results
The most notable results were the plants that were watered the same amount as the control plants but had 1000 milligrams (mg) of lysine thrived. Average plant growth for plants watered with six ounces and 1000 mg was 1.25 centimeters, and average leaf growth of 18 leaves. Average stem growths for these plants were 5.5 stems and average dead leaves over the five weeks were 1.5 leaves. These plants thrived and were close to bearing fruit. Plants watered with 2000 mg of lysine did not thrive, by week 5 the plants died. Plants watered with 1000 mg and less water thrived for three weeks and began to die. Results of this experiment were inconclusive.

Conclusions/Discussion
Addition of lysine, a hydrophilic essential amino acid, to strawberry plants did not definitively demonstrate increase drought resistance but plants that were watered properly with 1000 mg of lysine thrived and were at the point of bearing fruit. A possible theory for why these plants thrived is due to the fact that strawberries are more alkaline and lysine is alkaline. Adding additional water served to dilute the alkalinity of the plant. Additionally, the plants that are watered less but had no lysine added thrived. This brings up many questions as to how the lysine was affecting certain plants and interacting with the water, indicating that the plants watered with 6 ounces and 1000 mg tolerate lysine. Conversely, increased lysine appears to be toxic. Possibly, lysine is keeping the moisture in the soil. Further areas for investigation would be to examine drought resistance with: 1) a reduced amount of lysine, 2) different amino acids, 3) more acidic amino acids, or 4) different plants.

Summary Statement
Lysine was added to strawberry plants to discover the possibility of creating drought resistant crops.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Raquel Rei Kaufman

Project Number
J1819

Project Title
A Grass' Biomass

Abstract

Objectives/Goals
My objective was to test which type of grass has the largest amount of biomass by using their fresh and dry weight. I believed the Corn plant would have the largest amount of biomass.

Methods/Materials
I planted Oat, Wheat, and Corn plants in 9 different pots labeling each plant and there were 30 seeds per pot. Then I spent three weeks letting the plants grow. I then took the plants out of each pot washed and weighed them. Then I baked the plants and then weighed them again. Then did an equation for each plants percentage change in weight and the equation used the fresh weight and dry weight of each plant.

Results
After finding the percentage change in weight I started to compare each one. The percentage changes in weight for trial one were Oat :90.9%, Wheat :92.3%, and Corn: 70% For trial two the percentage changes were Wheat :91.6%, Oat :66.67, and Corn :75%. The percentage changes in weight for trial three were very different. They were very low percentage changes. The percentages changes in weight for trial three were Wheat :75%, Oat :70%, and Corn :77.78%.

Conclusions/Discussion
After looking at my results I found that Wheat Trial 1 had the largest percentage change in weight. This means that my hypothesis was incorrect. Next time I would do this experiment with different types of plants. Not just grasses. This could tell me more about what types of plants are good suppliers of biomass not just which grass is the best.

Summary Statement
In my project I tested the three plants Corn, Wheat, and Oat to see which has the largest amount of biomass.

Help Received
My mother helped me to put the plants in the oven during the process of measuring the dry weight of each plant.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Megan R. Kohanarieh

Project Number

J1820

Project Title

Germinating a Mixture of Lolium perenne and Poa pratensis L.: Grey Water vs. Tap Water

Abstract

Objectives/Goals

I tried to germinate a mixture of two different types of grass seeds in a container with tap water and germinate a mixture of two different types of grass seeds in a container with grey water.

Methods/Materials

I had two trials; the first I germinated the seeds using soil with grey water and tap water, and the second I germinated without soil using grey water and tap water.

Results

After four weeks of testing, the first trial did not have one seed that germinated for tap water seeds or grey water seeds. Trial 2, however, did have seeds that germinated; twenty three germinated in tap water, and three germinated in grey water. As the seeds germinated, they began to sink below the surface in the cup for both grey water and tap water in Trial 2.

Conclusions/Discussion

The first trial did not have one seed that germinated for both tap water and grey water because of rain, low temperature conditions, and chemicals that got in the way of the seed getting its proper nutrients to germinate. Trial 2, however, did have seeds that germinated; 23 germinated in tap water, 3 germinated in grey water. As the seeds germinated and grew, the density increased, making the seeds sink. In the future, I can do this at a different time during the year, preferably summer, so the temperature is correct to water the grass and so there is no rain to affect my results.

Summary Statement

My project is about seeing if grey water can be used as an alternative for tap water when watering grass.

Help Received

I did not receive any help in doing this project.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Arvind Krishnan

Project Number
J1821

Project Title
Effect of Different Light Sources on Photosynthesis of Plants

Abstract

Objectives/Goals
It is a well known fact that the rate of photosynthesis is dependent on the type and intensity of the light source. My goal was to determine the best source of artificial light using different types of light sources such as incandescent, florescent and LED lights that give out different wave lengths of light that would directly impact the rate of photosynthesis in plants.

Methods/Materials
The most critical components for my experiment were the different types of lamps used such as incandescent, florescent and LED lights. To keep the distance between the lamps and plants constant, I used a lamp holder mounted on a glass enclosure. The only variable in the experiment was the types of lamps used that produced different wave lengths of light. To monitor the rate of photosynthesis, I counted the rate of bubbles produced in the test tube by the Elodea plants at 60, 120 and 300 seconds fixed intervals of time using different light sources. Results were tabulated and graphed regularly.

Results
From the analysis of the data tables in my experimental results, I found that the incandescent lamp had the least impact of 15% on the overall rate of photosynthesis of elodea plants. The florescent light source had an average rate of 35% in the rate of photosynthesis which was 20% over the incandescent light source but was 35% below the rate of photosynthesis from the LED light source. Overall, the LED light source proved to have the greatest impact and contributed 70% on the rate of increased photosynthesis. This trend was confirmed by the data collected at 60, 120 and 300 seconds interval data points.

Conclusions/Discussion
I conclude from my experiments that the LED light source had the greatest impact on the rate of photosynthesis in Elodea plants. With increased light exposure over extended periods of time, the results were amplified to reflect this trend of LED lights being the best source for increased photosynthesis. This is encouraging data because the LED light sources consumes less electrical energy compared to incandescent and florescent lamps. Additionally, the cost and life span of the LED lights make it an attractive solution for commercial applications to increase food production in plants.

Summary Statement
To determine the best artificial light source to increase photosynthesis of plants

Help Received
Glassware given by Poway School district.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Karunya Krishnan; Ishanee Mitra

Project Number

J1822

Project Title

Do Fertilizers Extend Plant Life during Drought, and if so, What Types of Fertilizers Extend Plant Life during Drought?

Abstract

Objectives/Goals

We want to see if fertilizers can help a plant live longer during drought and if it can live longer during drought, we want to find out why.

Methods/Materials

Pea plants, Ironite fertilizer, Kellogg fertilizer, Alaska fertilizer, Hyponex fertilizer

Results

We found out that Ironite works the best. Alaska can work but is not very reliable.Hyponex and Kellogg didn't sprout.

Conclusions/Discussion

Ironite worked the best as its job was to replenish the soil with nutrients. Hyponex was a lawn fertilizer which is used to make soils stiff.

Summary Statement

Our project is about finding a fertilizer which can help a plant live longer during a drought.

Help Received

Mr. Gobi Sundharraj and Mr. Rebanta helped buy the materials. Mrs. Swati Mitra and Mr. Sid Rasberry helped with teaching us excel and powerpoint (Graph Making).

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Amelia A. Kyle

Project Number
J1823

Project Title
Super Soil to the Rescue!

Abstract

Objectives/Goals
Healthy soil provides nutrients for plant growth, holds water, is a habitat for good microorganisms, and helps plants, animals and humans to live. Natural fertilizers help to keep soil healthy and increase plant growth. This study examines how different types of soil fertilizers compare as far as improving plant growth and health. My hypothesis was that plants would grow more efficiently in natural fertilizers when compared to those grown in either artificial fertilizer or in plain soil.

Methods/Materials
In order to test this hypothesis, I planted radish seeds in four plant pots. In plant pot A, the seeds were planted in plain soil. In plant pot B, the seeds were planted in soil mixed with artificial fertilizer. In plant pot C, the seeds were planted in soil mixed with earthworm castings, and in plant pot D, the seeds were planted in soil mixed with kelp meal. The plant lengths were measured and recorded regularly for four weeks. The average number of leaves on the plants was also calculated, and the plant leaf size was observed and compared.

Results
Three trials were performed. In all trials, the plants grown in the soil mixed with earthworm castings grew the fastest, had the greatest average number of leaves, and the largest observed leaf size. The plants grew the next best in soil mixed with artificial fertilizer, followed by the plants grown in plain soil. The plants grew the slowest in kelp meal.

Conclusions/Discussion
The data from this study partially supports my initial hypothesis. Earthworm castings are a natural fertilizer and were the best performing fertilizer in this study. The plants grown in the worm castings not only grew the fastest, but also looked the healthiest, with larger leaves and more leaves on them. Soil can be damaged by artificial fertilizer, which can decrease the amount of soil carbon, kill the good bacteria and algae in soil, and injure or kill the earthworms that live in it. It is therefore best to use natural fertilizer in order to keep soil and our environment healthy for the survival of future generations.

Summary Statement
This study examines different types of fertilizers and their effect on plant growth.

Help Received
Mother provided general guidance during project and board design; Father helped generate graphs representing data.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Kaitlyn L. Lee

Project Number
J1824

Project Title
Reach for the Roots

Abstract

Objectives/Goals
The objective is to see if the roots of a plant grow in the direction of gravity, even if the seeds are turned upside down or lying flat.

Methods/Materials
Six seed cases were built. Each consisted of four seeds on top of a wet, folded paper towel in the corners of the CD case. Then, the outside of the case was labeled up, down, left, and right. Next, two CD cases were placed upright, two were lying flat, and the last two started upright, but were rotated 90 degrees every two days. All six CD cases were placed in a lightproof cardboard box. The roots would be measured by the use of string and a ruler at the end of each week, but would be continually watered every day. I would also observe the direction the roots were growing towards at the end of each week based on the angle they were positioned at.

Results
During the second to third day of my experiment, my seeds started to sprout roots. At the end of week one, CD cases three and four had roots at the length of ten to eleven centimeters long. CD cases one and two were nine to ten centimeters long and CD cases five and six were shorter in length at four to five centimeters long. During the second week, the roots from CD cases one and two grew longer than the roots of CD cases three and four. It stayed this way until the end of the experiment. However, all the roots germinated towards the direction of gravity. After every week, each of the CD cases# roots increased in length, but they still grew in the direction of gravity.

Conclusions/Discussion
At the end my experiment, I came to the conclusion that the roots of a plant always grow in the direction of gravity. This can be from the concept of gravitropism which takes place with the three stages of: perception, transduction, and response. I believe this is the main reason why not only roots develop in the direction of gravity, but why all living organisms mature in the direction of gravity.

Summary Statement
My project is about how the roots of a plant grow responding to a change in the direction of gravity.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

William S. Lyons

Project Number

J1825

Project Title

Zeolite Power: Do Zeolite Minerals Enhance Plant Growth?

Abstract

Objectives/Goals

The purpose of this experiment was to test whether zeolites, a group of porous, altered volcanic minerals, can enhance plant growth in combination with chicken manure beyond the effect of chicken manure alone. The effect of zeolites could make it possible to grow bigger, healthier plants, even in pure quartz sand, which has little to no nutrients and does not hold water. Ultimately, the goal is to determine whether zeolites are a good way to grow food crops on barren land. Zeolites and chicken manure both are cheap and relatively easy to find. Together, they might be the next solution for feeding the world.

Methods/Materials

Four plant growth experiments varied the amount of zeolites and chicken manure in the fertilizer: (a) growing pepper plants in mulch, (b) growing pepper plants in sand, (c) sprouting and growing radishes in mulch, and (d) sprouting and growing radishes in sand. In a 4-foot-by-8-foot garden box divided into 8 runs, runs 1-4 had a base of mulch, and runs 5-7 had a base of pure quartz sand. Run 1 was pure mulch, and run 8 was pure sand; these were the control groups. In runs 2 and 7 the fertilizer was all chicken manure. In runs 3 and 6 the zeolites were ~10% of the fertilizer mixture. In runs 4 and 5, the zeolites were ~33% of the mixture. For both peppers and radishes, plant height and weight of the vegetables at harvest were measured.

Results

Judging from the results of Experiment A alone, one might conclude that the best mixture of zeolites and chicken manure is ~10% zeolite and 90% manure. Both plants in the run with this mixture (Run 3) were two of the top three plants showing the most growth in that experiment, and their total pepper weight at harvest was significantly more than any other run. However, the results of Experiment B, C, and D show that a higher proportion of zeolites, ~33%, is much more effective for growing plants, especially in pure quartz sand. In Experiment B, not only did the plants in Run 5 (zeolites ~33%) show significantly more growth than any other plants growing in sand, but Plant 5A actually grew more than any of the pepper plants growing in mulch as well.

Conclusions/Discussion

These results suggest that zeolites in combination with chicken manure can be used as a powerful and cheap biofertilizer to reclaim desert or contaminated land for growing crops.

Summary Statement

The purpose of this experiment was to test whether zeolites, a group of porous volcanic minerals, can enhance plant growth.

Help Received

A gardening organization helped build garden box

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Monique A. Marquez

Project Number
J1826

Project Title
Local Comost Affects Plant Growth

Abstract

Objectives/Goals
My goal is to show that farmers don't need to spend hundreds of dollars on fertilizers and in return can use local leaf compost.

Methods/Materials
My main materials include: grape leaf compost, orange leaf compost, peach leaf compost, native soil, water, measuring stick, and cups.

Results
My results were the orange leaf compost increased the growth the most, the peach and grape leaf compost were neck to neck most of the time and stayed in the middle, and my control variable (native soil) had a slower growth to the plant.

Conclusions/Discussion
My conclusion was that farmers in the central valley don't have to spend hundreds of dollars on fertilizers and use their own leaves from their crops to increase and/or enhance plants.

Summary Statement
My project is about increaseing growth in plants without the high cost of fertilizers and using a more organic way to grow plants.

Help Received
My parents helped me gather the leaves from two different orchards and a vineyard in the central valley.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Divya R. Nair

Project Number
J1827

Project Title
The Effect of Genetically Modified Crops on Their Sugar Content

Abstract

Objectives/Goals
The objective of my project is to find out if genetically modified(GM) crops have a higher sugar content than non-GM crops. I believe that if the crop is genetically modified, then it will have a higher starch and sugar content because of its genetic alteration. When genetic alterations are made, the enzymes in the genetic material change in their quality, influencing the safety of the crop, impacting sugar and starch content.

Methods/Materials
To test my hypothesis, I used GM and non-GM corn and soybeans. The non-GM crops had a price look-up code beginning with '9', were USDA certified Organic, and verified non-GM by the non-GMO project. I tested their sugar content with a refractometer and glucose test strips using the crop's freshly squeezed juice. To test starch, I used Lugol's Iodine solution. I used both quantitative and qualitative data to analyze my results. For quantitative data, I used the results from the refractometer test, which is measured in degrees Brix. Degrees Brix is a measure of one gram of sugar per 100 grams of solution. For qualitative analysis, I used color variations in the test strips to determine the sugar. The color variation in the iodine tests determined the starch content.

Results
My experiments demonstrated that the GM corn and soybeans yielded a slightly higher sugar and starch content, as compared to the non-GM corn and soybeans, as predicted by my hypothesis. The sugar content of GM corn was 4.4 degrees Brix higher as compared to non-GM corn. The sugar content of GM soybean was 1.52 degrees Brix higher than non-GM soybean. The glucose test strips for both GM corn and soybeans had a darker color than their non-GM counterparts, indicating a higher sugar content. For the Lugol's Iodine Solution, the dark splotches indicating starch on the GM corn and soybeans were darker and more spread out, indicating more starch.

Conclusions/Discussion
Based on the results of my experiments, the GM corn and soybeans had a higher sugar and starch content, as compared to the non-GM corn and soybeans, as predicted by my hypothesis. The variation in sugar and starch content of GM versus non-GM crops may differ from crop to crop. Although this is a small variation in the sugar content, this can have a large impact on human health, particularly for type 2 diabetes, given the large direct and indirect consumption of these two crops.

Summary Statement
My project determines the variation in the sugar content between genetically modified and non-genetically modified corn and soybeans.

Help Received
My mother helped me aquire the crops and equipment required for my experiment and my uncle helped me analyze the resuts.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Ishani P. Narwankar

Project Number
J1828

Project Title
California Water Crisis: Landfill to the Rescue!

Abstract

Objectives/Goals
The purpose of this experiment is to reduce the use of water on farms to help the farmers during the on going water crisis in California.

Methods/Materials
Materials:
1: 40 quart sized pots 2: 3 cubic feet potting soil 3: Water 4: Cut pieces of jute 5: Unused baby diapers (for sanitary purposes) 6: Styrofoam packaging peanuts 7: Moisture sensor
8: Green bean seeds 9: Measuring cup 10: Bucket to make desired soil + additive mixtures
General Project Method:
In this project, the cross-linked polymers found in everyday waste materials - Styrofoam, Jute, & Diapers - are directly added to the soil to see their effectiveness for moisture control and plant growth. Each experiment is repeated two times to confirm statistical validity of the data. Results are then compared to control soil samples without any additives. Various additives were mixed in soil in different ratios, and they were compared to the control - without any additive. In addition, green bean seeds were added to a second batch of the mixtures to study the impact of these additives on plant growth.

Results
Pots with diaper additive consistently showed high moisture contents. Four out of nine seed pots with the diaper additive sprouted and had grown into healthy seedlings by the end of 2 weeks. Pots with the jute additive had inconsistent moisture content, but maintained a high moisture content. Three out of nine of the seed pots had sprouted and showed healthy seedling growth by the end of 2 weeks. Pots with the Styrofoam additive barely showed differences in contrast to the control samples. The water resistant property of this polymeric additive may have caused it to not hold moisture content in the soil. None of the nine of the seed pots for Styrofoam sprouted.

Conclusions/Discussion
In conclusion, my hypothesis that cross-linked polymers can help improve the water retention in soil was proved correct. Mixing moderate amounts of cross-linked polymers in soil can help reduce the amount of water requirement in a farm, which in turn can help California in its water crisis and reduce the amount of landfill trash.Long term effect of cross-linked polymeric additives on fertility of the soil need to be tested. Varieties of cross-linked polymers may have different water retention capability. Different crops require varying amount of water through its growth cycle. This will require accurate control on the additive concentrations.

Summary Statement
Cross linked polymers in landfill materials can help conserve the amount of water needed to grow a plant.

Help Received
Teacher encouraged; Parents provided resources.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Isaiah L.D. O'Neal

Project Number

J1829

Project Title

Plant Electrophysiology: How Does the Stimulation of Trigger Hairs Affect Action Potential Generation in Venus Flytraps?

Abstract

Objectives/Goals

This study examined the effect of trigger hair stimulation on the generation of action potentials and their relationship to trap closure in a B52 Venus Flytrap (Dionea Muscipula). I wanted to confirm that one stimulation of a trigger hair resulted in the generation of one action potential. Additionally, two action potentials must reach the midrib within a certain period of time to initiate trap closure, but different scientists claim different durations ranging from 20 to 40 seconds, and I wanted to narrow down that range. Finally, I wanted to see what affect multiple, almost simultaneous, stimulations had upon action potential generation and trap closure.

Methods/Materials

B52 Venus Flytraps were germinated from seed and grown for two years. Each trap was connected via electrode gel to an Arduino board with a Plant SpikerShield, which was connected to a computer. Action potentials were gathered and recorded in the Processing 2 programming language using a plant processing sketch. Trigger hair stimulation was controlled using a linear actuator. The experiment was recorded with 3 cameras, (one running at 240fps) in order to verify and calculate results.

Results

It was found that one trigger hair stimulation resulted in one action potential. However, it was discovered that when two stimulations occurred within 0.229 seconds of each other, only one action potential was generated. Additionally, it was confirmed that two action potentials within 20 seconds of each other closed a trap, except in the special case noted above. Traps also closed intermittently up to 42 seconds between action potentials, suggesting that a trap begins to lose its charge after 20 seconds, and loses its charge completely after 42 seconds.

Conclusions/Discussion

For the next step, a better knowledge of calculus and chemistry would be required to investigate the decisive moment just before trap closure, in which there occurs a myriad of chemical and physical events that are beyond my skill set to evaluate. However, I would like to investigate how the flytrap uses its properties as an electrical storage "battery". In biotechnology, this knowledge could help scientists create a similar "battery" or operate a microcontroller in plants. Understanding how all plants use electricity could pave the way for manipulation of electrical memory in agricultural products and open new forms of electronic communication and real time feedback from crops.

Summary Statement

This study examined the effect of trigger hair stimulation on the generation of action potentials and their relationship to trap closure in a B52 Venus Flytrap.

Help Received

Doug Foster from LA Biohackers answered questions about modifying the SpikerShield circuitry and Timothy Marzullo from Backyard Brains answered questions about software and hardware.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Jacquelyn B. Opalach

Project Number

J1830

Project Title

Investigating the Accuracy of the Method Foresters Use to Estimate the Radial Growth Rate of Trees

Abstract

Objectives/Goals

The objective of this experiment is to determine whether the current method foresters use to measure radial growth rate on redwood trees and spruce trees is accurate. This was a two-year study beginning with the experiment meant for redwoods which triggered the idea for a similar project conducted using spruce trees. I hypothesized that the method may be inaccurate for redwood trees because they grow in clusters. However, my hypothesis for spruce trees was quite different. Because spruce trees grow singularly I expected that the practice of extracting a single increment core would result in accurate information for this species.

Methods/Materials

Two recently harvested forests were visited; a redwood forest and a spruce forest. Fourteen tree disks were obtained from each study site, which were collected by locating accessible tree stumps. The redwood disks came from stumps that had varying amounts of neighbors within their own sprout clump, and the spruce disks came from trees with different amounts of nearby trees within 15 feet of the subject tree. The place on the disk where radial growth would most likely be measured by a forester was determined, followed by calculating the average growth by measuring radial growth in each of the four cardinal directions, adding them together, and dividing by four. The forester's estimate of growth was then compared to the average growth for each disk.

Results

For redwood trees it was found that for 9 out of 14 disks radial growth rate is overestimated by the forester's method that relies on a single measurement. The average overestimation of all my redwood trees was 11 percent. The spruce tree data showed that the forester would overestimate radial growth 6 out of 14 times and that the average overestimation was 12 percent. It was found that there is no obvious relationship between the amounts of neighboring trees and the difference between the forester's growth rate and the average growth rate for each species.

Conclusions/Discussion

Although measuring radial growth in only a single place on the stem is typically expected to be accurate, this method is flawed when applied to redwood trees from sprout clumps and stand-alone spruce trees. Estimates of growth rate are more likely to be accurate if the subject tree is measured in more than one place around the stem on both tree species studied.

Summary Statement

This study found that the current method foresters use to estimate the radial growth rate of redwood trees and spruce trees leads to inaccurate results.

Help Received

My father operated a chainsaw to cut the tree disks and he also showed me how to use Microsoft Excel.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Corin J. Ropp

Project Number
J1831

Project Title
Can Plants Use Glucose to Replace Photosynthesis?

Abstract

Objectives/Goals
The objective of the project was to find out if a plant needs to photosynthesize if they are given the materials produced in photosynthesis, or if they have the capability to respire only. Do the plants need a certain amount of time in the light, or none at all? Does the concentration of glucose affect their ability to grow, with or without light?

Methods/Materials
-Grow Lights
-Wheatgrass Seeds
-Glucose
-Boxes (to keep out light)
-Water
First, I planted the seeds in three light conditions, with three different watering conditions. The light conditions were no light, 3 hours of light (half light), and 6 hours of light (full light), and the watering conditions were plain water, 1% glucose water, and 5% glucose water. There were nine different conditions in total. I watered daily and measured height daily.

Results
The results demonstrated that the 5% glucose watered plants grew only slightly better than the no light, plain water plants, which grew the worst. The plain water, half light plants grew around the middle of the height range. The plants with 1% glucose watering grew the next best, regardless of their lighting conditions. The plants that grew the very best were the plain water, full sun plants.

Conclusions/Discussion
Further investigation of scientific papers indicated that 5% glucose watered plants might have grown so poorly because the glucose lowered the osmotic potential of the soil. When plants take in nutrients from the soil, the osmotic potential of the plant must be lower than the osmotic potential of the soil for the transfer to happen. The concentration of glucose was so high that the glucose began to interfere with the plant's ability to take in sufficient nutrients to help them grow. However, plants watered with 1% glucose did manage to grow taller than their 0% glucose counterparts, with both deprived of light, which shows that they grew solely off of respiration, using the glucose that was provided.

Summary Statement
To find out if plants need to make their own glucose, through photosynthesis, to grow, or if they can live and grow without photosynthesizing.

Help Received
My dad helped me make the boxes, and my mom helped me plant some seeds into the containers.

CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Neal B. Shipman

Project Number

J1832

Project Title

Marsh Invasion: Testing if Early Germination Gives an Edge to Algerian Sea Lavender

Abstract

Objectives/Goals

My objective was to determine which plant will germinate faster, the invasive plant (Limonium ramosissimum) or the native (Limonium californicum) under the conditions of light (one layer of fiberglass window screen and ambient) and salinity (0, 15, and 30 ppt)?

Methods/Materials

-Plywood (for greenhouse); -Plexiglass (for greenhouse); -60 petri dishes with lids; -300 LICA seeds (native plant); -300 LIRA seeds (invasive plant); -Pipette; -Salt; -Graduated Cylinder; -Buckets (for holding water); -Potting soil; -Green/blue electrical tape; -Fiberglass window screen; -Refractometer ;-Tap water.

Results

I believe that my results were appropriate to support the claim. The first germination was on 11/14/14 in the nonnative 0 salinity level. Although the invasive plant germinated first, it was not the first on all salinity levels. Germination in the 15 and 30 ppt salinity level was first reached by the native plant. In total, the native plant had 147 germinated seeds while the invasive one had 175.

Conclusions/Discussion

My hypothesis was that the nonnative plant (Limonium ramosissimum) would germinate faster at all levels of light and salinity. I thought this because invasive plants are normally more adept and aggressive than native ones. To test my hypothesis, I ran an experiment to test the speed in which the two different species of plant germinated. I believe that my results were appropriate to support the claim. The first germination was on 11/14/14 in the nonnative 0 salinity level. Although the invasive plant germinated first, it was not the first on all salinity levels. Germination in the 15 and 30 ppt salinity level was first reached by the native plant. In total, the native plant had 147 germinated seeds while the invasive one had 175. In conclusion, my hypothesis was partially correct. The invasive plant germinated the fastest, but not in all of the salinity and light levels. Towards the end of the experiment, some of the germinated seeds started growing. If I were to continue the experiment, I would measure and compare the height of the plants grown.

Summary Statement

My project was to determine the germination rates of invasive and native species so that the information could be used to find a way to counter the invasive plant.

Help Received

Plant specifics and background research was helped by my mother. Construction of the greenhouse and writings was helped by my father.