CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Daniela N. Alvarez

Project Number
J1901

Project Title
VitaPlants

Abstract

Objectives/Goals
My project's goal was to determine if vitamins affected the growth of a plant. For this purpose, I used Vitamin B, C, and D and Tap Water.

Methods/Materials
Three bean seeds were planted in each cup. Four cups were used for each vitamin. Four more cups were used to test tap water. I watered them everyday with 2 oz. of water for the tap water plants or 2 oz. of water mixed with 1 vitamin caplet, either B, C, or D. I observed the plants every day for 12 days. Once the beans sprouted, I measured the height and I rated the color of foliage using a color scale ranging from yellow/brown to bright green.

Results
As a result, Vitamin D helped the plants grow to an average height of 11 inches, the plants' stems thicker and the leaves greener. Vitamin B helped the plants grow taller, with and average height of 12 inches.

Conclusions/Discussion
My conclusion is that Vitamin D made plants grow tall and look healthier, even though vitamin B made them grow a little taller.

Summary Statement
I wanted to see if vitamins affected the growth of plants

Help Received
Mother helped mount board .

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Andrew Balise; Ed van Bruggen

Project Number
J1902

Project Title
Do Plants Get Jet Lag? Or Do Plants Have a Sleep Cycle?

Abstract

Objectives/Goals
We wanted to test if plants can adjust to changes in light and dark cycles and how this affects their leaf sleep movement.

Methods/Materials
We used the plant Oxalis and measured the sleep movement of its leafs using time lapse photography. We filmed the plants in a day and night cycle in a light-tight closet. We'd take a picture every hour using a pre-programmed remote. We would simulate day and night using a UV ray light bulb. We altered the light cycle by 12 hours (day becoming night) to induce "jet lag". After several days, we would hook up the camera to our computer and we would view the pictures of the leaf movement. We then would use a scale consisting of one to six (one being completely closed and down, six being fully open or maximum canopy). The leaf movement was measured from 3 different plants to determine the average leaf movement. We used Excel to analyze our data.

Results
Our results showed that plants can synchronize their leaf movement to the light cycle. We found that when we changed the light cycle it obtained "jet lag", that is, they no longer where able to synchronize their leaf movement to the changes in light. After about 10 days the Oxalis adjusted to the change much like humans. We also found that the plant prepared for the oncoming light by simply opening slightly before the light came on. When the light did come on, the plant was prepared for maximum canopy.

Conclusions/Discussion
These experiments prove that plants have a sleep cycle and use light to synchronize to an alteration in the day and night light changes. They prepare to open before the light turns on so they can have maximum canopy during sunlight hours.

Plants have the amazing ability to keep time in their "minds", meaning they will open without light, but not completely. This proves that plants CAN have jet lag, but adjust to it much like you and me!

Summary Statement
The adaption of plants sleep movement to changes in light and dark cycles

Help Received
Parents helped with text format of report and poster

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Jacob C. Birks

Project Number
J1903

Project Title
Will Hydrating Cotton Seeds Have an Effect on How Fast the Seed Germinates?

Abstract

Objectives/Goals
The purpose of this experiment was to determine if the temperature of water used for hydrating a cotton seed will have an affect on how fast the seed will germinate as compared to a non-hydrated cotton seed.

Methods/Materials
The experiment started by placing cotton seeds soaked in different temperatures (including room temperature) of water for various times into Styrofoam containers with pre-soaked napkins. The containers were then placed in plastic bags and set on the counter for a period of 10 days. A control group was also established with a group of non-hydrated seeds. All sets of seeds were checked daily and data was recorded as to the number of seeds sprouted on each day as well as the length of growth from the seeds that had germinated.

Results
The hypothesis was proven true that hydrating the cotton seeds for a warmer temperature resulted in that group of seeds germinating earlier than the non-hydrated seeds and the cold water seeds. The resulting sprout growth of the hydrated seeds was on the average longer than the non-hydrated seeds.

Conclusions/Discussion
Hydrating seeds in warmer water does indeed affect the germination time and sprout growth as compared to non-hydrated seeds. The seeds were able to soak up water and were fooled into thinking they had already been planted, which encouraged the early germination.

Summary Statement
This experiment is to determine if the temperature of water used for hydrating a cotton seed will have an affect on how fast the seed will germinate as compared to a non-hydrated cotton seed.

Help Received
The cotton seeds were received from a local cotton farmer.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Cayley L. Boyd

Project Number
J1904

Project Title
The Effect of Plant Density on Plant Growth

Abstract

Objectives/Goals
To determine the effect of plant density on plant growth.

Methods/Materials
Compass or other sharp tool
12 plastic pots
masking tape
permanent marker
potting soil, enough for 12 plastic cups
12 bean seeds, 12 radish seeds, 12 corn seeds
3 plastic trays
water
graduated cylinder
ruler

1. Fill 12 plastic pots each with 250 mL of potting soil.
2. Take 2 radish seeds and plant them separately in two different cups.
3. Then, plant five radish seeds each in each of the remaining two cups.
4. Follow steps 2 and 3 for bean and corn seeds
5.Put all 12 pots in the same location with the same amount of water every three days (10 mL)
6. Measure the heights of the plants in centimeters each day for two weeks at the dame time of day.

Results
The seeds planted in groups grew significantly taller than the seeds planted alone.The average height of the individual plants was 1.125 cm where as the average height for the grouped plants was 3.916.

Conclusions/Discussion
The main conclusion was that grouped plants grow much taller than single plants. It is very important to identify the sources of error in the experiment that could have caused this. First of all, the plants were grown from seeds. All the nutrition was inside the seed, therefore making the results less accurate than predicted. Also, the grouped plants could have been measured in a more accurate way (e.g. measuring all the seedlings' heights and averaging them, instead of just measuring the tallest seedling).

Summary Statement
My project is about the effect of plant density on plant growth.

Help Received
A friend helped me glue things on to my board.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Michael J. Claridge

Project Number
J1905

Project Title
Creation by Cultivation and Propagation

Abstract

Objectives/Goals
How do different growth media affect the development of roots in newly propagated plantlets?

If the growth rate of spider plants grown in vermiculite, sterile seedless potting mix, and water are compared to the growth rate of plant grown in sterile seedless potting mix would be the greatest.

Methods/Materials
I took three cutting from a spider plant and grew them in three diffferent media, vermiculite, sterile seedless potting mix, and water. The plants were grown with equal amounts of water, sunlight, and grown in the same place for the same length of time. After 26 days I analyzed my plants.

Results
My hypothesis was incorect by my results showing that water was the best substance to propagate a spider plantlet in. This happened becasue the sterile seedless potting mix was too strong for spider plants.

Summary Statement
I'm seeing what is the best media to grow a newly propagated spider plant in.

Help Received
My mom helped me create my displayt board; Mrs. Wolfe my Science teacher gave her spider plants and helped me with my whole project and ansewering my questions.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Julia C. Clark

Project Number
J1906

Project Title
How Does Fertilizer Affect Plant Growth?

Abstract

Objectives/Goals
My objective was to determine how different types of fertilizer affect plants growth. My hypothesis was that the fertilizer urea would have the greatest effect on the plants# mass and appearance. I believed this because urea contains a high percentage of nitrogen, so therefore it causes vegetation to thrive in its environment.

Methods/Materials
Before I planted my seeds, I tested the soil for nitrogen, phosphorus, and potassium. I planted my lettuce seeds, Black Seeded Simpsons, in potting containers. Then I watered my lettuce, I had beakers in which I mixed fish emulsion, urea, and 10-10-10 into the water, and in one beaker I mixed in no fertilizers (control group). I watered my lettuce every five days. As my lettuce grew I measured the height of the plants weekly. Before I harvested my lettuce I photographed the plants and tested the soil again. Then I harvested the lettuce, shook off the soil, and massed it, finding the mass of each group. I then analyzed the data to determine how the fertilizers affected plant growth.

Results
I created three types of graphs: soil nutrients levels, lettuce growth heights, and total lettuce mass for each group. The lettuce growth height graph indicates that lettuce fertilized with urea grew the most. It shows that lettuce fertilized with urea grew 10.8 centimeters, lettuce fertilized with 10-10-10 grew 10.3 centimeters, lettuce fertilized with fish emulsion grew 9.6 centimeters, and control lettuce (unfertilized lettuce) grew 8.5 centimeters. The lettuce mass graph indicates that lettuce fertilized with urea and fish emulsion had the greatest mass at 14 grams, lettuce fertilized with 10-10-10 had a mass of 13 grams, and unfertilized lettuce had a mass of 11 grams. My data indicated that my hypothesis was correct. I concluded that plants fertilized with urea grow faster and larger than plants fertilized with 10-10-10, fish emulsion, and control, because urea contains a high percent of nitrogen, and therefore plants thrive in their environments. If I were to do a similar experiment, I would like to further investigate several aspects; I could test the same fertilizers, except use different crops (wheat, corn, or beans), I could use the same fertilizer, but different plants and see their response, or I could use different soil types and see how these affected plant growth.

Summary Statement
I was trying to determine how different types of fertilizers affected lettuce plants height and weight, as well as soil nutrient levels in the soil.

Help Received
Father helped purchase fertilizers and lettuce seeds.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Shashank H. Dholakia; Shishir H. Dholakia

Project Number

J1907

Project Title

What Affects Transpiration the Most: Light or Temperature?

Abstract

Objectives/Goals

Our objective was to determine which environmental factor most affects the water loss from a plant due to transpiration- Is it light or is it temperature?

From summer to winter the peak temperature in Santa Clara falls by 14°C. Many plants respond to this by drastic adaptations-loss of chlorophyll and shedding of leaves in fall. Non-deciduous plants go into hibernation. Interestingly, in summer, average day-night temperature change is ~14°C. In response plants do not show visible changes diurnally. We wanted to test if plants instead respond internally by controlling the transpiration water loss. These questions may help us understand the role plants play in the earth's water cycle and the role of native plants in ecology.

Methods/Materials

We experimented on two plants from our backyard, Aster and Grapefruit. Using plant cuttings in a water beaker, we first monitored the amount of water loss to transpiration when the plants are exposed to light and then to darkness, keeping the temperature constant. Later we monitored the transpiration in darkness, at two temperatures, hot (27°C) and cold (16°C). We followed this up with microscopy of the leaf stomata to probe for internal differences.

Results

Transpiration measurements show that Aster responds to temperature changes more than Grapefruit and has a lower water loss at high temperatures. Both plants transpire more in response to light changes than to temperature changes. This disproved our hypothesis. Both showed significant transpiration even in darkness. Microscopy results of the leaves showed that both the plants had different sizes and density of stomata, aster's being smaller. By serendipity, we could observe the stoma open in about 8 min in time lapse photos.

Conclusions/Discussion

Aster responded to temperature changes more than grapefruit, which is probably why it is drought tolerant. The observed difference in stomata size, shape and density are the likely reason for their varying response to environmental stimuli. We found that plants release a lot of water by transpiration, even at night. This shows the importance of planting drought tolerant native plants in arid places and also the importance of rainforests in maintaining the water cycle.

Summary Statement

Effect of changes in temperature and light on transpiration in plants and its implication for the environment.

Help Received

My mother taught me to use a microscope and helped glue the papers in the board. My father helped plot the graph. Ms. Henderson gave advice on the presentation.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Joanna E. Duchesne

Project Number
J1908

Project Title
Radish Round-Up

Abstract

Objectives/Goals
The goal of my Radish Round-Up science project was two-fold: to see if fertilizer aided the growth of radish seeds; and to find out if organic compost or store-bought fertilizer had a positive or negative effect on the plants' growth.

Methods/Materials
Nine pots, divided into three groups, were planted with radish seeds. The control group used potting soil without fertilizer. The store-bought fertilizer group had potting soil and fertilizer from Home Depot. My final group again used potting soil with homemade compost consisting of eggshells, coffee grounds, and fruit and vegetable waste. I observed the growth of the plants for seven weeks, taking measurements once a week.

Results
After observing the plants, I compared results and found the plants with no fertilizer grew fastest, sprouting first in Week 2, and to a height of 4 cm. The plants with store-bought fertilizer grew largest, topping off at 4.5 cm. The seedlings with homemade compost did not sprout during the seven weeks of observation.

Conclusions/Discussion
My hypothesis for the project was the three plants with homemade compost would grow the fastest and strongest. My hypothesis was proved wrong by results. However, www.howtocompost.com stated apple peels, potato skins, orange peels, dryer lint and eggshells would provide the plants with all necessary nutrients. To back this up, www.eartheasy.com website claims eggshells contain the nutrients nitrogen and carbon, fruit and vegetable scraps contain nitrogen, and dryer lint contains carbon, all of which are essential parts of all fertilizers, both store-bought and homemade. Despite including all these ingredients in my compost, the plants that were grown with it grew the slowest. The website www.howtocompost.com also claimed that plants grown with homemade compost would grow healthier and faster than plants grown with synthetic fertilizers.
It was proved through my experiment that compost is not in fact better than store-bought fertilizer. Homemade compost was the slowest and weakest group of plants grown. The plants grown with no fertilizer grew the fastest while the plants that received store-bought fertilizer grew the largest.
During my experiment, I had one problem - I at first did not know what to put in my compost. I researched compost ingredients and many different options for the content of my compost were given.
Overall, this project was fun, easy and a great experience.

Summary Statement
My project was designed to compare fertilizer, soil, and homemade compost during the growth of radish plants.

Help Received
My friend helped me plant my original pots.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Nicholas F. Eisenhauer

Project Number
J1909

Project Title
A Research Study Investigating the Effects of Electromagnetic Fields on Phaseolus vulgaris

Abstract

Objectives/Goals
The objective of this study was to examine how Electromagnetic Fields (EMFs) affect the growth of Phaseolus vulgaris (contender bush beans).

Methods/Materials
Sixteen contender bush bean seeds were planted in sixteen labeled pots of equal size and with equal amounts of the same soil. The pots with the planted seeds were put inside a greenhouse with grow lights to control the lighting and a thermostatically controlled heater to control the temperature. Each pot was placed at 10.16 cm increasing intervals away from a transmitting device, which constantly emitted a 1.5 watt FM radio signal at a varying frequency of 0.9 to 1.3 GHz (approximately equivalent to the frequency and power output of three cell phones). The electromagnetic field strength was measured using a Cornet# ED-15B Electrosmog meter at each interval. All bean plants were given the same watering regime. Measurements of plant height (using a ruler) and stem diameter (using calipers) were taken each week for 8 weeks. At the end of the 8 week growing period, the plants were dug up, the soil carefully separated from the roots, and final weight was recorded for each plant.

Results
Of the 16 seeds planted, 2 plants (numbers 6 and 10) failed to sprout. There was no significant difference in plant stem diameter among the 14 sprouted plants. Average plant height and weight for the 7 plants closest to the transmitter was significantly greater than the average height and weight of the 7 more distant plants.

Conclusions/Discussion
These results indicate that EMFs may have a significant effect on plant growth (at least in contender bush beans), but further study is needed to determine if this is a positive or detrimental effect. Furthermore, the mechanism causing the effect is unknown, and study is needed to determine why Electromagnetic Frequencies affect plant growth.

Summary Statement
A study investigating the effects of Electromagntic Frequencies on plant growth in Phaseolus vulgaris.

Help Received
Mother provided money to purchase materials.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Ohtli A. Garcia-Barron

Project Number
J1910

Project Title
Plant Growth in Zero Gravity

Abstract

Objectives/Goals
To modify the growth of a plant to see if it can grow in zero gravity by affecting the direction at which the plant feels the gravity

Methods/Materials
Hamster balls, seeds, soil, robot Lego, batteries, others

Results
By affecting the growth of the plant we found the plant curves around itself, a test plant was also used to compare growth.

Conclusions/Discussion
This project showed that in the absence of space, food can be grown to save space and optimize product.

Summary Statement
Growing plants in zero gravity

Help Received
Father help type report

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Lena N. Gavenas

Project Number
J1911

Project Title
Carrots vs. Crown Gall

Abstract

Objectives/Goals
Objectives: The experiment was to measure the effects of Beta Carotene (a nutrient commonly found in carrots) on the growth of sunflowers infected with the Crown Gall plant disease. It was expected that since crown gall impairs the plant#s ability to take in nutrients, the more nutrients provided, the more of a chance that some will be absorbed.

Methods/Materials
Methods: Five groups of four plants each with relatively consistent heights were innoculated with agrobacterium tumefaciens (crown gall). Twice a week for two and a half weeks each group was watered with different amounts of Beta Carotene, from 0 to 8,200 mg. The plants were measured twice a week until the end of the testing period.

Results
Results: The group with the highest dosage of Beta Carotene grew the most, while the group with no Beta Carotene grew the least.

Conclusions/Discussion
Conclusions: The conclusion is that the more beta carotene an infected plant receives (up until a point undetermined by this experiment), the taller and healthier it becomes.

Summary Statement
The experiment measures the effect of Beta Carotene on the height of sunflowers infected with Agrobacterium Tumefaciens (Crown Gall).

Help Received
Parents helped locate and buy materials as well as proofread work

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Layla Hamedi

Project Number
J1912

Project Title
Slash and Burn

Abstract

Objectives/Goals
The objective of my project is to determine if nitrogen and nutrient infused ashes from vegetation will have a significant affect on the pH level of soil and the overall germination, quality, growth and coloring of the plants rooted in the soil after a fire.

Methods/Materials
Three tablespoons of grass seeds were planted into two tanks filled up # with a mixture of untreated soil from the nature and fertilized soil. After six weeks of growing, the grass in the experimental tank was burned using a torch and the ashes were worked into the soil. The blades of grass from the control tank were then plucked and the soil from both tanks was transferred to individual containers that grew broccoli, lettuce, chives, and spinach. How long it took for each plant to germinate was then recorded. After seven weeks of growing and observing the plants, the pH level of the soil in each container was calculated using strips of litmus paper. The height of each plant was determined while the stage of their development, quality, and coloring were compared.

Results
The average pH in the experimental group was 7.05 while the average pH in the control group was 5.94. The plants in the experimental group germinated more rapidly and were generally more vibrant in their coloring, healthier, taller, more fully developed, had thicker stems and lateral branches, and were more voluminous.

Conclusions/Discussion
The combustion of vegetation will increase the soil#s potential of Hydrogen (pH) to the optimum range of 6.5 to 7, where beneficial microorganisms that perform nitrogen mineralization and fixation thrive. This results in an increase of ammonium. Ammonium is eventually converted into nitrate through the process of nitrification, which occurs more rapidly the warmer the soil#s temperature. The burning process thereby results in increased total nitrogen, accounting for the healthier appearance of the plants rooted in the soil after the fire. An increase in soil pH also means that the soil#s Cation-Exchange Capacity (CEC) increases, resulting in the soil#s greater ability to retain nutrients. My project expands knowledge about the method of slash and burn agriculture by proving that it is efficient in increasing the soil#s fertility levels. However, annual incinerating of vegetation exceeding a period of fifteen years results in lower levels of soil organic matter and lower rates of net nitrogen converted into mineral material.

Summary Statement
The purpose of my project is to determine if ashes from combusted vegetation will have a significant affect on the pH level of soil and the overall germination, quality, growth and coloring of the plants rooted in soil after a fire.

Help Received
Brother helped with the torch during the combustion process; Science teacher provided me with basic techniques for starting my research; Mother bought the materials I needed to conduct my experiment.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
R. Nicholas Hess

Project Number
J1913

Project Title
Carbon Dioxide: It's a Killer!

Abstract

Objectives/Goals
The objective was to investigate the impact of increased concentrations of greenhouse gases such as CO(2) on C3 plant germination and growth (height and mass). I hypothesized that significant increases would be detrimental.

Methods/Materials
Bean seeds were planted in four sealable gallon glass jars with equal amounts of soil and water. Increasing amounts of CO(2) were injected into three of the four jars using a hypodermic needle. The jars were sealed to create environments in which the CO(2) levels were normal (330 ppm, or .03 percent) and 2440, 4550, and 6630 ppm (7.4, 13.8, and 20.1 times normal levels, respectively). Plant heights were recorded for twenty days. Plants were then removed from the jars, dried, and weighed.

Results
Average plant height increased by 15 percent in the environment with 7.4 times normal CO(2) levels, and decreased by 15 percent and 64 percent, in that order, in environments with 13.8 and 20.1 times normal CO(2) levels. Total plant mass decreased by one-third as CO(2) levels increased from 2440 to 4550 ppm.

Conclusions/Discussion
While some increase in atmospheric CO(2) levels fosters C3 plant growth, that benefit becomes a detriment to growth as CO(2) levels continue to increase. Practical application of these results could include extracting CO(2) from the atmosphere to enhance plant growth and shorten time to harvest.

Summary Statement
My project explores the impact of increases in atmospheric CO(2) levels on the germination, average height, and mass of beans, a C3 plant.

Help Received
Stepfather helped me find a solution for sealing jars and helped me inject CO(2) into jars. Mother helped me calculate atmospheric CO(2) levels, helped type and format research paper, and helped develop double line graph comparing results to Neales and Nicholls'.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Naveed Jahani-Orner

Project Number
J1914

Project Title
Friendly Fungi: Can It Green Up the Planet?

Abstract

Objectives/Goals
My investigative question was: Does Mycorrhizal Fungi affect how much a plant grows? I started the project with hypothesis that Mycorrhizae will increase the height of the experimental plants because Mycorrhizal fungi create greater root surface area for greater nutrient and water intake resulting in larger, healthier plants.

Methods/Materials
The materials I used were: Pots, plants (Hypoestes Phyllostachya), Mycorrhizae product "Great White", potting soil, and water. My procedures were as follows: A: Put each plant in separate pot with potting soil. B: Applied one teaspoon of "Great White" Mycorrhizae to 5 plants. Five plants were used as control plants without application of Mycorrhizae. C: All plants were watered equally daily. D: Measured height of tallest plant stalk in each pot weekly. Also measured diameter of plants. Made note as well of leaves affected by pests.

Results
Average growth of plants with Mycorrhizae was 4.6 inches. Average growth of plants without Mycorrhizae was 3.85 inches. Diameter measurements were inconclusive. Pests ate more leaves on control plants without Mycorrhizae. Largest leaf was on plant with Mycorhizae measuring 3 inches in length.

Conclusions/Discussion
The plants on which Mycorrhizal fungi were applied grew .75 inches taller in height than the control plants without fungi. The plants with Mycorrhizae were more resistant to pests. I conclude that Mycorrhizal fungi create larger, more pest resistant plants organically and naturally without the use of artifical fertilizers, chemical pesticides, or genetically modified plant genes by surrounding and protecting the roots from foreign invaders and by increasing root surface area for greater water absorption. Mycorhizae is a fungus that has been stripped from the soil by over-cultivation and commercial and residential development and has great advantages for the earth and the future of food production when placed back into the ecosystem.

Summary Statement
Mycorrhizal fungi, which has been stripped from most soils of the earth, can increase plant growth and pest resistance organically without toxic chemicals, greening up the planet by restoring soil to its natural state.

Help Received
Mother helped create Excel graphs and take photos. The Eagan's of Plant Revolution provided background research, product design ideas, and mycorrhizae to test. Father helped pick out and purchase materials. Sister helped clean pots for photos.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Shreyan Jain

Project Number
J1915

Project Title
Hydroponics vs. Aquaponics: Can Fish Waste Provide Enough Nutrients to Sustain Plant Growth?

Abstract

Objectives/Goals
Growing plants in water not only allows food to be grown in parts of the world which cannot support soil farming,it also produces a higher yield without the extensive use of pesticides.If this system is integrated with fish culture,it can create a sustainable method of farming,whereby the waste of one biosystem serves as food for the other biosystem.My objective was to find out if fish wastes contain enough nutrients to sustain plant growth and to find which plants will be supported by this system.I hypothesized that aquaponics will sustain plant growth,but plants grown hydroponically will have a higher and healthier yield.

Methods/Materials
I used Thymus x citriodorus(golden lemon thyme)and Salvia officianalis(golden sage)seedlings.I planted 3 of each type of seedlings in a hydroponic system,aquaponic system,and control system(soil).I used 2 ebb and flow systems to provide nutrients to the seedlings.The hydroponic seedlings received nutrients from a mixture of Micro 6-0-0,Bloom 0-6-5,and Grow 2-1-6 diluted in 4 gallons of water.The aquaponic seedlings received nutrients from 4 gallons of fish pond water.Both systems were programmed to flood nutrients at the same time and for the same duration.The length and general health of the seedlings were recorded over several days.The experiment was repeated with Ocimum basilicum(basil lettuce leaf)and Lactuca Sativa(lettuce grand rapids)seedlings.

Results
My results showed that while hydroponics supported all seedlings,aquaponics sustained thyme,sage,and basil.Lettuce did not survive in aquaponics.Basil showed 15% more average growth in hydroponics as compared to aquaponics.Sage averaged a growth of 43% in aquaponics,only 1% less than hydroponics.Thyme however peaked in aquaponics system.Its average growth in aquaponics was 52% compared to 28% in hydroponics.

Conclusions/Discussion
My results show that pond water does contain enough nutrients to sustain plant growth.Nutrient-rich effluent from fish tanks can be used to fertigate hydroponic systems which would otherwise be contaminants building up to toxic levels in the tanks.This finding has real world application as every person depends on agriculture for survival.However,the current agricultural practices, with fertilizers and pesticides,cause harm to our earth,flora, and fauna.Hydroponics and aquaponics provide us with an environmentally friendly way of farming that produces healthier,greater,and faster yields.

Summary Statement
My project explores the possibility of using fish wastes to provide nutrients to plants.

Help Received
Hakone Gardens provided pond water. South Bay Hydroponics provided supplies and guidance for growing plants hydroponically.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Bisma N. Khwaja

Project Number
J1916

Project Title
Grow For It! Soil vs. Hydroponics and the Effect of Vitamin B1 on the Growth of Cherry Tomato Plants

Abstract

Objectives/Goals
My main objective is to compare the growth rates of cherry tomato plants in soil and hydroponic media. I will also explore the effect of vitamin B1 on plant growth. I hypothesize that hydroponic methods will result in greater growth rate and B1 will benefit plant growth over time.

Methods/Materials
I used: 6 cherry tomato plants, 6 containers, coco, rockwool, soil, tray for containers, 40-watt fluorescent lights, Grow Nutrient, B1 Vitamin, and Hydroponics pH Control Kit. I also used stakes, twist ties, beaker, bucket, dropper, measuring tape, timer, notebook, pencil, apron, gloves, goggles, and water.
I studied the growth of 6 cherry tomato plants in coco, rockwool, and soil over a period of 64 days. The plants were grown indoors, under controlled fluorescent lighting. My variables were the media used and the addition of vitamin B1. Three plant media received B1 as part of the nutrient solution. The other three plants did not receive B1. Each nutrient solution was maintained at a constant pH. Plants were measured, and data was recorded, graphed and analyzed daily for trends or changes.

Results
The rockwool results support my hypothesis that plants grown in hydroponic media have the greatest growth rate (0.69 in/day). Coco (0.42 in/day) was the only media that had a higher growth rate with vitamin B1 (0.65 in/day). Soil (0.65 in/day) had almost the same growth rate as soil with B1 (0.64 in/day).

Conclusions/Discussion
As I hypothesized, plants grew faster in hydroponic media than soil. Rockwool had the greatest growth rate. The addition of B1 did not initially benefit growth, but began to show results with more data over time. Some sources of error could be stem breakage, genetic variation, and plant shock.
I conclude several real world benefits for domestic and industrial use of hydroponics. My indoor plants grew in the absence of weeds and pests, nutrient levels were controlled, plants grew closer together, and samples grew quickly with fluorescent lighting. Also, rockwool absorbed the most water and eventually outperformed soil. As a result, water was conserved over time, indicating that hydroponics has the potential to resolve water shortage concerns.
As a next step, I will test how hydroponics affects the flavor of tomatoes. I am curious whether the taste, texture, or color of fruit is depend on the medium used. Since there is no need for pesticides, I believe my crops will be healthier and firmer.

Summary Statement
My project is about soil versus hydroponics and the effect of vitamin B1 on the growth rate of cherry tomato plants.

Help Received
I interviewed an employee from Orange County Hydroponics, who donated materials for my project. My father lowered the artificial lighting for my plants and allowed me space in his garage. My mother drove me to the library, hydroponics store, and hardware stores so I could gather information.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Kristina S. Kim

Project Number
J1917

Project Title
The Effect of Plant Growth in the Absence of Geotropism

Abstract

Objectives/Goals
The objective of my project was to determine whether the speed in which you rotate a seed affects the direction it will grow. I believe that the constantly spun seed will grow the most twisted and abnormal because the effect of geotropism is negated.

Methods/Materials
I did my project by having two containers spinning constantly on a device built by k'nex, and three other containers rotated manually. One of them I rotated a quarter turn once a day, the other I rotated a quarter turn twice a day, and the third was my control to see how the plant grew normally in the container.
For my project, I used ziploc containers, orthodontic rubber bands, k'nex, green foam, cotton balls,lima beans seeds,and peat moss.

Results
In the end, I found out that the speed does not really affect how the plant grew, but the mere fact that the plants were being rotated changed how it grew as measured against normal growth.

Conclusions/Discussion
With normal growth, the plants grew downward as expected. But when I rotated the seed, the plant grew differently. The end result was that the plant grew parallel to the rotating axis, which was significantly different from the control, which grew down. All the plants were distinctly different from the control in the end, though not very far set apart based on the speed in which it was rotated.

Summary Statement
My project is about how a plant will grow with less of an influence by gravity.

Help Received
Father helped explain concepts, Mother helped decorate backboard.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Sanjana K. Krishnan

Project Number
J1918

Project Title
Seed to Sprout: Mung, Where Have You Bean?

Abstract

Objectives/Goals
The objective of my project was to identify how the rinse temperature affected the sprouting of Mung beans. If there was a relationship, I also wanted to find the best temperature that would result in the longest sprouts.

Methods/Materials
The method I used was to measure the length of Mung bean sprouts subjected to four different rinse temperatures. The measurements were recorded each day for four days after the initial set up of the experiment. A total of 40 measurements were used for each temperature set, each day.
I started with 16 identical, aerated glass jars. I labeled and separated the jars into 4 temperature groups (40, 70, 100 and 140 degree Fahrenheit) and put about 50 Mung beans in each of them. Each day, the Mung beans in each jar was rinsed with water at the temperature marked on the jar. The next day, I measured with a ruler, the lengths of 10 randomly selected beans from each jar and recorded the results.

Results
The following results were observed:
1. The average sprout length for the 70oF rinse temperature set exceeded that of the other sets at the end of the experiment after 4 days
2. The average sprout length for the 70oF set was the highest on 3 out of 4 days of the experiment
3. Temperatures below and above 70oF resulted in shorter sprout lengths, with the 40oF doing better than the 100oF and 140oF sets.
4. The longest sprout length measured came from the 70oF set.
5. The sprouts in all the jars marked with 70oF appeared longer and healthier when compared to sprouts in the other jars. On the other hand, the 140oF jars appeared to have the shortest sprouts.

Conclusions/Discussion
The results from my project seem to show that 70oF is the best rinse temperature among the four temperatures I used for sprouting Mung beans.
This was different from what I had expected before I performed the experiment.
My original hypothesis was that higher rinse temperatures would result in longer sprouts. I thought so because during my research, I had read that some beans responded to heat-shocking.
My conclusion is that Mung beans sprout better when rinsed with water around 70oF, when compared to rinse temperatures, which are either too cold or too hot.

Summary Statement
How does the rinse temperature affect the sprouting of Mung beans?

Help Received
Dad helped with Excel Add-in tools for plotting data

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Andrew D. Manion

Project Number

J1919

Project Title

Does the pH of Soils Affect the Growth of Baby Butterhead Lettuce?

Abstract

Objectives/Goals

My goal was to find out which of four soils, each with a different pH level, was best for germinating baby butterhead lettuce for my garden. My hypothesis is that the Miracle Gro Seed Starter Potting Mix will provide the best results as its pH level is at the research suggested level of 6.5.

Methods/Materials

The pH level of four different soils was tested with the Rapitest Soil Test Kit. The soils were Miracle Gro Seed Starter Potting Mix, Miracle Gro Potting Mix, OSH Premium Potting Mix, and dirt from my backyard. The Planter's Pride Grower Starter Kit was divided into four sections. A different soil was placed into each section. Three Renee's Garden: Garden Babies Butterhead Lettuce seeds were planted into each seed pot for a total of 72 seeds for each soil with a total of 288 seeds planted. The seed pots were placed outdoors in the same spot everyday and put into the garage at night. The seeds grew for 28 days.

Results

The OSH Premium Potting Mix, pH level 6.0, had 14 of 72 seeds sprout, the average height of the sprouts was 4.35 cm, the tallest was 5.9 cm, and the shortest was 2.3 cm. The Miracle Gro Seed Starter Potting Mix, pH level 6.5, had 14 of 72 seeds sprout, the average height was 3.43 cm, the tallest was 5.1 cm, and the shortest was 1.5 cm. The Miracle Gro Potting Mix, pH level 6.5-7.0, had 12 of 72 seeds sprout, the average height was 3.64 cm, the tallest was 5.1 cm, and the shortest was 1.5 cm. The dirt from my backyard, pH level 7.0, had 15 of 72 seeds sprout, the average height was 3.61 cm, the tallest was 5.7 cm, and the shortest was 2.2 cm. The OSH soil provided the best results with an average height 0.71 cm taller than the others, as well as the tallest sprout and the tallest shortest sprout.

Conclusions/Discussion

After 28 days of letting the seedlings grow in four different soils with four pH levels, I have come to the conclusion that OSH Premium Potting Mix (pH level 6.0) is the best of the soils I tested for germinating Renee's Garden baby butterhead lettuce seeds. I have also concluded that soil from my backyard (pH level 7.0) is another good option. This test did not support my hypothesis. The research I found was also not supported. I think this means that repeated testing and/or further testing for longer growth periods might show different results.

Summary Statement

If germinating Renee's Garden baby butterhead lettuce seeds for your garden, OSH Premium Potting Mix (pH level 6.0) provides the best results of the soils I tested.

Help Received

Mother added pH testing capsule contents to the soil sample, edited the report and helped assemble the display.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Kyle N. Markfield

Project Number
J1920

Project Title
Round Two Algae Attack

Abstract

Objectives/Goals
The objective was to determine if Iron or Nitrogen Fixing Bacterium will cause the most growth of algae in slough, river, or ocean water.

Methods/Materials
I collected three gallon water samples from San Benito River, Elkhorn Slough, and Salinas River Beach. I then placed 12 oz. of San Benito River water in 3 labeled quart containers. I repeated this for the Elkhorn Slough and the Salinas River water samples. I set aside one 12 oz container of each water sample, and labeled them Controls. I then placed 1 iron Tablet in another quart container for each water sample. These were labeled Iron added. I then added 30ml of Nitrogen Fixing Bacterium Fertilizer to the remaining three containers. These were labeled Nitrogen Fixing Bacterium added. I then took 30ml samples of each container and placed each in a Petri dish which was labeled the same as the container the sample came from. All the Petri dishes were placed on a window sill and observed over 5 days. I measured the amount of algae growth in each Petri dish

Results
The river water control Petri dish had 1.2% algae growth in its Petri dish, while the river water, that had iron added, had 11% algae growth and the river water, with the Nitrogen Bacterium added, had 1.2% algae growth. The slough water control Petri dish had 1.2 % growth, while the slough water, with iron added, had 20% algae growth, and the slough water, with the Nitrogen Bacterium added, had 5% algae growth. The beach water control Petri dish had .3% algae growth, while the beach water, with Iron added, had 11% algae growth, and the beach water, with Nitrogen Bacterium, had 8% algae growth.

Conclusions/Discussion
My conclusion is that Iron added to river, beach and slough water samples does increase algae growth. The Slough water with iron added did produce the most algae growth than the other water samples. I also concluded that the Nitrogen Fixing Bacterium though it did not produce as much growth as the iron did, did produce more algae growth than the controls did, and also may have a negative affect on the environment.

Summary Statement
My project is the affects Iron and Nitrogen Fixing Bacterium Fertilizer have on algae growth in river, slough, and beach water samples.

Help Received
Mother helped me collect water samples, bought supplies and helped me download picturesw onto my charts.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Julia C. Matthews

Project Number
J1921

Project Title
Absorbing Vitamin C, One Drop at a Time

Abstract

Objectives/Goals
My objective was to prove that vegetables grown in an ebb and flow hydroponics system obtain more vitamin c than those grown in a soil medium.

Methods/Materials
First, I built this system using twenty liter buckets, fiberglass screening, plastic tubing, and barbed connectors. I planted two spinach transplants in this system and watered them with Earth Juice nutrient solution, maintaining the solution at the ideal pH level for spinach, between 5.4-7.0. I planted two other spinach transplants in soil, and watered them with one liter tap water daily.All four plants were grown for five weeks. I ran a redox titration test on leaf samples from each plant to determine their vitamin c levels, using iodine and starch. I did a total of ten experiments, testing one leaf sample from each plant in each experiment (a total of four leaves per experiment)

Results
My hypothesis was proved wrong. I found that the plants grown in a soil medium had about three times as much vitamin c as in the hydroponic plants. The hydroponic plants were also smaller, and less healthy than the soil grown plants.

Conclusions/Discussion
I conclude that my results were due to the way the nutrient solution was transferred to the plants in the ebb and flow system. It was inefficient because it did not give the roots enough time to absorb the necessary nutrients from the solution. I would like to try a different type of system, such as a drip hydroponics system, which may solve this problem.

Summary Statement
I grew spinach plants in a hydroponic system and tested their levels of vitamin c through a redox titration test, comparing them to spinach plants I grew in soil.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Sean McGovern

Project Number
J1922

Project Title
Going Bananas

Abstract

Objectives/Goals
My two objectives were to test whether sugar content was the best indicator of banana ripeness, and whether ethylene absorbers (EA) delayed the ripening of bananas.

Methods/Materials
The experiment was performed in two parts.
Part 1. To determine the best tests for ripeness, skin color, weight, pulp to skin weight ratio (digital scales),skin thickness (digital calipers), firmness (my original "splat test"), sugar content (Brix refractometer), starch content (iodine solution and digital light microscope), and taste (volunteers) were measured on bananas of different ripeness. Then, bananas were tested using the best tests (weight, pulp to skin weight ratio, sugar content, skin thickness, and firmness) on 13 consecutive days.
Part 2. The effect of EAs were studied. Unripe bananas were placed either in: the refrigerator, box A (alone). box B (with 3 apples), box C (with an EA), and box D (with 3 apples and an EA). The bananas were tested for ripeness using pulp to skin weight ratio, skin thickness, sugar content, and splat test on day 6. This was repeated 3 times.

Results
The pulp to skin weight ratio and firmness (splat test) were the best indicators of banana ripeness. Sugar content initially increased with ripeness, but reached a maximum concentration early on, and then reduced as the banana became over ripe. EAs slowed the ripening of bananas, as measured by the pulp firmness and pulp to skin weight ratio, in boxes B and D (compared to A and C respectively). However the refrigerator slowed the banana ripening the most.

Conclusions/Discussion
The project demonstrated that sugar content was not the best test of ripeness. The pulp firmness, as measured by the splat test, and pulp to skin weight ratio were the most reliable tests of banana ripeness. EAs slowed banana ripening a small amount, however refrigeration is better than EAs for delaying ripening. Therefore, once bought, this project suggests that half of a hand of bananas should be placed in the refrigerator, and half in the fruit bowl, so that bananas can be enjoyed for longer.

Summary Statement
My project was about finding the best test for measuring the ripeness of bananas, and seeing if ethylene absorbers delay banana ripening .

Help Received
My father helped me understand excel spread sheets and graphs.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Elizabeth (Lizzie) G. McMillin

Project Number

J1923

Project Title

Growing Green: A Study of Organic vs. Inorganic Fertilizers for Crop Production

Abstract

Objectives/Goals

In an era of environmental concerns, the objective of this project is to determine if there is any significant differences in the types of commercially available fertilizers: compost, organic and synthetic.

Methods/Materials

Using an indoor seed starting system, four trials were conducted using potting soil amended with fertilizer. Each trial consisted of 36 samples; each sample contained three radish plants grown from seed. The average plant height was tracked during the course of a two week period to determine the growth rate for each soil.

Results

There appeared to be little, if any, significant difference between the fertilized soils. Though, the soil amended with compost was the first to germinate and develop non-cotyledon leaves. This is not to say that fertilizers do not alter plant growth because many potting soils are already nutrient-rich prior to use. A longer term study is recommended to observe the long-range effects of fertilizer use on plant growth during the course of an entire growing season since this often will require amendments to be added to the soil over time.

Conclusions/Discussion

Fertilizers are a large number of natural and synthetic materials worked into the soil to increase its capacity to support plant growth. The primary nutritional needs obtained by the use of fertilizers are nitrogen, phosphorus and potassium. Organic fertilizer may include things such as manure, blood meal, alfalfa meal, or seaweed. Likewise, compost consists of manure, decayed plant and vegetable matter, and under the right conditions, animal matter. Yet synthetic fertilizers are made by the Haber process using oil or other petrol-based chemicals and/or other fossil fuels such as coal.

The results of the project are potentially significant, in that, it makes little or no logical sense to continue to use fossil fuels to produce synthetic fertilizers for crop production. The economic expense and environmental consequences with continued use of these fertilizers is foolish when low-cost, green alternatives are readily available.

Summary Statement

This study focuses on the comparison of organic and synthetic fertilizers for crop growth and production.

Help Received

My mother helped type the report. All equipment used in the project came from my family's hobby farm, Terra Del Sol.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Devin M. Montgomery

Project Number
J1924

Project Title
Vines and Their Spines: Fact or Friction?

Abstract

Objectives/Goals
This project was designed to show the amount of friction, produced by different grades of sandpaper that is needed, for a vine#s tendril to elongate and twine itself around the support. This project provides the basis for the most effective way to grow and maintain vines for gardeners, biologists and horticulturalists.

Methods/Materials
The growth of sweet pea tendrils around the stimulus was measured in complete turns around the support. There were five groups, each with 3 different plant samples and all with different grades of sandpaper: Group A (The control group with a smooth stimulus), Group B (grade 400), Group C (grade 220), Group D (grade 100), and Group E (grade 50). Over a period of 20 days, the number of complete turns on the supports in each group was recorded each day in the afternoon.

Results
The friction created between the support and tendril allowed the tendril to stay firmly entwined and not slip off. Once the tendrils fell off of the supports, due to rain, with finer grades of sandpaper, they did not have a #backbone# and could not grow upright.

Conclusions/Discussion
This experiment proves my hypothesis that the more the friction or the rougher the sandpaper, the more complete turns around the stimulus.
To continue this project, the diameter of the supports could vary, testing if the angle at which the tendril curls makes a difference in the plant#s growth. The weather in this project was not controlled, so to continue this project, I could grow the plants in a greenhouse.

Summary Statement
This project determines whether friction increases the growth of a vine's tendril.

Help Received
My grandfather helped me obtain the necessary materials for my project.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Willow K. Muir

Project Number
J1925

Project Title
The Effects of Different Types of Music on Plants

Abstract

Objectives/Goals
The objective of this experiment was to determine whether different types of music -- blues, classical, hard rock, and country -- affect plant growth differently. My hypothesis was that plants listening to classical music would grow the best.

Methods/Materials
Four pots with six pea seeds in each pot were each exposed to different types of music. A fifth pot was not exposed to music. A four inch speaker was taped to the side of each plastic pot, facing inward, and hard rock, classical, country, blues, or no music was played over the entire course of the twenty day experiment. Plant growth was measured over time and the results were compared.

Results
The plants exposed to blues music grew the most on average, and directly after them came the control group, which was not exposed to music. The classical music group did the next best, then the country music group. The plants exposed to hard rock music grew the least.

Conclusions/Discussion
My hypothesis was not supported by the results. I had thought that the plants exposed to classical would grow best, but the plants exposed to blues grew the best.

Summary Statement
When plants were exposed to classical, blues, country, hard rock, or no music, the plants exposed to blues music grew the best.

Help Received
My Dad helped me with wiring the CD players to the amplifier and the amplifier to the speakers. He taught me how to use a spreadsheet to graph the data and he helped me make the music CDs.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
An Q. Nguyen

Project Number
J1926

Project Title
Gyration Cultivation

Abstract

Objectives/Goals
The objective of this experiment is to find out if centripetal force has a positive or negative correlation with the growths of Lima bean plants. If a positive correlation is shown, new invention that involve centripetal force could be made and will maximize plant growth. This will greatly benefits plant owners as they would want their plants to grow faster in a shorter period of time.

Methods/Materials
The experiment main requirement was a ceiling fan. The fan was then mounted against a flat surface facing downwards. Next Tupperware cases were tape rigidly on the blades. Plants then were grown inside the cases after 550 grams of potting soil was added to each of them. The experiment consist of 2 testing periods. One was the low speed group and part of the control group and the second was the medium speed group and the other part of the control group. The low speed group and the medium speed group were both spun for 6 hours a day for 3 weeks. They were also misted 2 times a day, before and after being spun.

Results
The Low speed group ends up with the highest height average of 20.36 cm and has an angle average of 15.75 degrees after 3 weeks of growth. The Medium speed group ends up with the lowest height average of 16.72 cm, but has the second highest angle average of 14.42 degrees. Finally the control group has the second highest height average of 19.34 and the lowest angle average of 11.58 degrees. More testing to be conducted before state.

Conclusions/Discussion
The ending results did attain the objective, as centripetal force can result in having a positive correlation with the growth of bean plants. Hopefully future experimenters can continue to expand on this experiment, perhaps even track hormones movement and possibly fine the right force of centripetal that will greatly benefit plants the most. Conclusion may change before state.

Summary Statement
How Centripetal Motion affects the growth of Lima bean plants.

Help Received
Mrs. Gillum help gave information on the science fair and ideas on doing it, Dad help mount the ceiling fan and getting materials, Mom supported and gave ideas on the topic, Brother help me understand the concept better.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Riley A. Nolan

Project Number
J1927

Project Title
The Impacts of Leaf Surfactants on Water Absorption Rates in Soil

Abstract

Objectives/Goals
While watering the yard, I noticed the leaves beneath an African Sumac tree foamed up whenever water hit them. This made me wonder about the leaves of that tree. I did some research and found that African Sumacs contain Saponins which contain surfactants. Surfactants are chemicals that reduce surface tension, potentially allowing water to absorb into the soil more effectively. I designed a test to determine if a variety of native and non-native plant leaves contained surfactants. I hypothesized that drought resistant plants related to the African Sumac would have the fastest percolation rates, and plants native to areas that receive more precipitation would have slower percolation rates.

Methods/Materials
Materials in my experiment included 12 varieties of leaves, five gallons of soil, distilled water, a hygrometer, thermometer, soil moisture meter, and various containers for measurement. A liquid solution was made from each variety of leaves and poured over 240 cc of chaparral soil. The amount of water exiting each soil sample was measured at one minute intervals.

Results
My test results showed the Lemonade Berry had the fastest percolation, followed by Sugar Bush, Cottonwood, Black Sage, Narrow Leaf Willow, Toyon, African Sumac, Liquid Amber, Laurel Sumac, Sycamore, Coast Live Oak, and Coffee Berry.

Conclusions/Discussion
The African Sumac, Lemonade Berry, and Sugar Bush come from the order Sapindale. All Sapindales contain saponins. Since these three plants are from drought prone areas, I believe that saponins are an adaptation to drought. Future testing could include comparing leaf surfactants to testing commercial surfactants, more varieties of plants, and testing the partially decomposed leaf litter found at the base of each plant.

Summary Statement
My project investigated naturally occuring surfactants in a variety of native and non-native leaves and their impacts on water absorption rates in soil.

Help Received
Thanks to my parents and science teacher for guidance and support. I would also like to thank Valerie Phillips from the Las Pilitas nursery for telling me where I could find various leaves.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Natalie G. Opalach

Project Number
J1928

Project Title
Redwood Rings and Rain

Abstract

Objectives/Goals
The objective of this study was to find whether older or younger redwood trees are more affected by temperature and precipitation. I believe younger trees will be more affected by these factors, high elevation trees will be more influenced by temperature, and low elevation trees will be more influenced by precipitation.

Methods/Materials
Increment core samples were extracted from ten 30-year-old, and ten 80-year-old redwood trees at low and high elevation sites. A total of 40 increment cores were taken. The width of each tree ring for the past 16 years was measured and recorded for each increment core. I used this data to calculate 15 annual changes in ring growth for each set of ten trees which I then compared to changes in annual precipitation, summer precipitation, average annual temperature, and average summer temperature. The correlations of younger trees were compared to the correlations of older trees at both high and low elevations.

Results
Changes in annual precipitation matched up with changes in ring widths for young, low elevation trees 12 of 15 years; with old, low elevation trees 11 of 15 years; with young, high elevation trees 7 of 15 years; and with old, high elevation trees 10 of 15 years. Changes in summer precipitation were matched with changes in ring widths for young, low elevation trees 6 of 15 years; with old, low elevation trees 7 of 15 years; with young, high elevation trees 7 of 15 years; and with old, high elevation trees 9 of 15 years. Changes in average annual temperature were matched with changes in ring widths for all four sets of trees 8 of 15 years. Changes in average summer temperature were matched with changes in ring widths for all four sets of trees 6 of 15 years.

Conclusions/Discussion
Tree ring growth was strongly influenced by annual precipitation, and older trees appeared to be influenced to a greater degree than younger trees. Trees at the lower elevation site appeared to be influenced to a greater degree than the trees at the higher elevation site. Tree ring growth was not correlated with summer precipitation, average annual temperature, or average summer temperature. It is likely that temperature didn#t influence tree growth because of its minimal amount of change from year to year. This study could be helpful to foresters because it demonstrates that water is a limiting factor to growth even in the north coast where precipitation averages 43.4 inches a year.

Summary Statement
This project studies whether younger or older trees are more affected by precipitation and temperature changes.

Help Received
Father helped use equipment and display data in charts

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Sara M. Patz

Project Number
J1929

Project Title
Forever Green? Keeping Christmas Trees Fresh

Abstract

Objectives/Goals
The purpose of my project is to see what will help fresh cut Christmas trees stay fresh longest.

Methods/Materials
I did an experiment and conducted a web survey. In the experiment I cut 16 Douglas fir branches and put four each in either plain water, vinegar water, sugar water, or bleach water. Two of each four I sprayed with anti-transpirant Cloud Cover. I weighed them on the first day and then twice a week for four weeks. I also conducted a survey where I sent out questions about how people who bought trees at a tree farm kept their trees at home and how fresh the trees were on Christmas Day.

Results
Branches in plain water stayed freshest, keeping an average of 87% of their original weight. Branches in sugar water or bleach water kept about 60% of their weight. Branches in vinegar water did the worst, losing their needles and keeping only 29% of their weight. Branches with Cloud Cover kept 7% more of their weight than branches without Cloud Cover. The survey showed that people who re-cut their tree at home did not have fresher trees but people who let the water run out had less fresh trees in the end.

Conclusions/Discussion
There are many ideas about how to keep trees fresh. My project suggests that adding things to the water may not help. Spraying on Cloud Cover and making sure the tree does not run out of water may give the best results.

Summary Statement
My project explored through an experiment and survey how to keep Christmas trees fresh after they are cut.

Help Received
My Dad helped me analyze my data.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Bella L. Penza

Project Number
J1930

Project Title
UnbeLEAFable Chromatography: The Discovery of Hidden Pigments in Leaves

Abstract

Objectives/Goals
The objective of this experiment is to look at the various pigments in leaves to be able to determine which pigments are more prevalent as the leaves change colors.

Methods/Materials
As autumn approached, leaves from a White Ash, Sumac, and Japanese Maple tree were collected and separated based on their color and the type of tree. Then 2.5 grams of the same leaf color from each tree were used to extract the pigments. The pigments were extracted by mashing the leaves in a mortar and pestle with 2 teaspoons of acetone and 1/8 teaspoon of sand. These extracted pigments were blotted 10 times onto a piece of chromatography paper, letting the paper dry between each application. The chromatography paper with the blotted pigments was placed in a glass test tube with acetone. The acetone solvent was allowed to migrate to within ¼ inch from the top of the paper. The paper was allowed to dry and the various pigments were identified by comparing them to a control chromatogram. This process was repeated on a separate paper for each leaf color of each tree.

Results
All of the green leaves contained chlorophylls a and b. As the leaves changed colors chlorophyll b was absent and chlorophyll a began to fade. Xanthophylls were present in all leaf colors of all trees except the dead leaves of the White Ash tree. Anthocyanins were found in the red leaves of the Sumac and the red-orange and red leaves of the Japanese Maple tree.

Conclusions/Discussion
My experimental results supported my hypothesis in that as the leaves changed from green to other colors, the amount of chlorophyll was reduced, xanthophylls were unmasked, and new anthocyanin pigments were formed.

Summary Statement
I used paper chromatography to isolate various pigments in tree leaves to determine why leaves change colors.

Help Received
Parental advice and oversight for the project procedure. Teacher advice was given for format and content.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Jadyn V. Reed

Project Number
J1931

Project Title
Growing a Better Beanstalk

Abstract

Objectives/Goals
The purpose of this project is to determine if soil pH has an effect on plant growth.

Methods/Materials
Pole Beans were planted in soils with acidic, neutral, and basic pH. The time to sprout and growth were recorded over several weeks.

Results
The seeds planted in neutral soil took the least days to sprout and had the greatest average height at the end of the experiment. However, not as many of the neutral plants grew and survived to the end compared to the acidic and basic soil.

Conclusions/Discussion
It was found that the soil pH had an effect on how quickly the plants grew, how many plants sprouted, and when they sprouted.

Summary Statement
The purpose of this project is to determine if soil pH has an effect on plant growth.

Help Received
Mother helped with adding chemicals to soil and arranging board. Father helped with typing and making graphs.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Juan Pablo Robayo

Project Number
J1932

Project Title
Oxygen and Carbon Dioxide: Coexistence between Photosynthesis and Respiration

Abstract

Objectives/Goals
I hoped to prove that if a lit candle and a plant are placed in a closed container during daytime, the oxygen and carbon dioxide levels should be maintained in balance; due to the processes of photosynthesis and combustion and this will be evident as the candle will stay lit.

Methods/Materials
This project mainly consists of putting a plant and a lit candle in a closed container, and watching what happens. Then placing the lit candle alone in the container and watching what happens. Then other variables were changed to see in what ways the experiment would be affected. So the experiment was repeated changing some conditions. I did it during the day and night, so I would be able to observe if the plant stopped producing oxygen at night. I did it with plants of different sizes, to see if the size of the plant changed the amount of oxygen produced. Finally, I conducted these tests in and out of my house, to see whether the oxygen level was different.

Results
The lone candle stayed more time lit outside than indoors and more time in the night than in the day. Using a small plant I witness that the candle went out during the day and the night with a very small difference as when it was alone, just 30 seconds. This happened again with the larger plant. Finally when I used a patch of plants growing in my backyard (during daytime) the candle stay lit until the wax ran out, this was 5 hours and 17 minutes. And when I repeated the experiment at night with the patch of plants the candle went out, which confirms that plants do not produce oxygen at night, they stop doing photosynthesis.

Conclusions/Discussion
When a candle is placed in a container with a plant during daytime, it doesn#t go out. Because the plant undergoes photosynthesis at the presence of sunlight and produces oxygen, this doesn#t let the candle finish all the oxygen in the container, needed for its combustion.

Some plants don#t produce enough oxygen to keep a candle alive. To keep the candle alive plants have to produce more oxygen than the one used for combustion by the candle. But the oxygen production is not influenced only by the size of the plant.

At night plants don#t produce oxygen, they don#t undergo photosynthesis because there is no sunlight. As I witness with the experiment at night with my backyard plants.

Summary Statement
Showing the balance between the photosynthesis and combustion, seen from the inputs and outputs of each process (Oxygen and Carbon Dioxide).

Help Received
My mother took the pictures. My mother and sister gave me advice.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Nicolas S. Schroeder

Project Number
J1933

Project Title
How Will Gibberellic Acid Affect Pea Plants?

Abstract

Objectives/Goals
My goal for doing this project was to see if Gibberellic acid will effect the growth of pea plants and if so, by using what amount of the acid. I want to find out if higher concentrations of Gibberellic acid make bigger plants.

Methods/Materials
The method used in this experiment is first germinating the seeds by placing them between wet paper towels. Then, put them in a plastic bag and let the seeds sit for one week. After they began to sprout I planted them with potting soil in twenty-seven pots. I waited until they came up then I began watering them with Gibberellic acid (GA3) or water. I used a beaker and measured 0.720 liters of water, then put 1 scoop which is 0.080 grams of Gibberellic acid and that became 100 PPM (parts per million) of the mix. For Gibberellic acid that is 200 PPM, I took 0.720 liters of water adding 2 scoops of GA3. The controlled plants were just watered with water. I watered the plants with the plain water and GA3 concentrations every five days. Every 5 days, I recorded the measurements of each plant in my journal. I then added up all of the measurements in the three categories. I divide by nine because that is how many plants are in each section and that got me the height average for each group. I did this for 4 weeks.

Results
The 200 PPM plants grew a couple inches bigger then the 100 PPM. By using GA3 the plants grow a lot bigger then just by using water. The last measurement I did A=100 PPM the average height was 30.6 and B=200 PPM average was 30.7 and Control was 26.3. The more GA3 I used the bigger the plants grew.

Conclusions/Discussion
My conclusion is that GA3 does help the growth of plants. By seeing how hormones effect pea plants it expanded my knowledge on the subject because I now have a curiosity about how agriculture may use plant hormones.

Summary Statement
My project is about Gibberellic acid and how it effects the growth of pea plants.

Help Received
Dad helped drive, Dad and Mom helped with photography, Dad bought Gibberellic acid, Mom helped type application.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Andrew Shimshock; Philip Zehnder

Project Number
J1934

Project Title
Evapo-licious: An Investigation into Evapotranspiration

Abstract

Objectives/Goals
To determine if the number of stomata and surface area have any correlation to the evapotranspiration(ET) rate.

Methods/Materials
The set-up used included 3 types of plants, USB humidity sensor, dirt, cups and zip-lock bags. Plants were planted in dirt, they were placed in a zip-lock bag with the sensor and it took readings which were graphed on Excel

Results
The blue fescue had the highest ET rate but the mint had the most surface area. It is believe that fescue would not be the ideal roofing material do to its low surface area. Mint would be the most ideal because of its high surface area and number of stomata.

Conclusions/Discussion
At first it was thought that the mint was going to transpire the most due to its high surface area and dense leaf structure. After tests we found that the fescue had the highest rate of transpiration.

Summary Statement
An investigation into evapotranspiration

Help Received
A college professor helped with experimental set up; Dad helped us use an electron microscope. Mom helped with editing.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Kapil Sinha

Project Number
J1935

Project Title
Bugs B Gone: Aphid Control through Home (Organic) Remedies

Abstract

Objectives/Goals
The purpose for my experiment was to find out if there is a way to get rid of/preventing aphids on lettuce plants by using organic substances which are readily available in the kitchen.

Methods/Materials
1.Use blender to chop/grate different organic substances 2.Measure each of the substances and put in Petri dishes 3.Measure 250ml water and heat it and put in an air tight container along with the measured amount organic substance 4.Keep them aside for 24 hours, in a cool place 5.Filter them using cheese cloth and a funnel to get the extract in the spray bottles 6.Label the spray bottles 7.Use the sprays to study the effect of organic substances as a pesticide and as a preventive 8.For preventive, spray lettuce plants, each with different organic substances and label it with different concentrations and also with different substances and put them in a cage (#1) 9.Using a suction pump, collect 50 winged aphids in a jar from a cage (#2) of infected plants 10.Place the jar filled with aphids in the cage (#1) and release the lid 11.After a week, count how many aphids were there on each plant 12.For pesticide, spray all the lettuce plants with different organic substances and manually count and put 10 aphids on each plant via paintbrush. Place each plant in a separate cage and label it 13.Record number of aphids dead/alive after 3 days 14.Repeat steps 2-14 for different sets
Funnel,Airtight container,Microscope,Spray bottles,Flower pot, Labels,Blender,Coffee grinder,Paper towel,Pipette,Weighing balance,Large cage,Waterbed,Jar for aphids,Grater,Strainer,Magnifying headgear,Knife,Petri dish,Magnifying glass,Pestle,Heater,Disposable gloves,Trash bag,Cheesecloth, Small cage,Counter,Needle,Paint brush,Suction pump

Results
Garlic was the most optimum solution for using as a pesticide. Garlic/pepper (30g+30g) was the most optimum solution for using as a preventive.

Conclusions/Discussion
My hypothesis 1 was correct. Organic homemade pesticides were effective in preventing and removing aphids from lettuce plants. My hypothesis 2 was incorrect. The combination of ginger and red hot pepper was not the best organic pesticide. My hypothesis 3 was partially correct. In most cases, a stronger concentration was better than a lower concentration.
Discussion
I learned that the results should be considered logically, not just blindly looking at data. Qualitative information should also be considered.

Summary Statement
Organic, homemade pesticides will be effective in preventing and removing aphids from lettuce plants.

Help Received
Help received from Dr. Yong Biao Liu and his lab assistant Tiffany, who work at USDA lab.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Matthew D. Trost

Project Number
J1936

Project Title
The Effects of Light Duration on the Photosynthesis of Anacharis

Abstract

Objectives/Goals
I wanted to understand how the rate of photosynthesis in the aquatic plant Anacharis is affected by different light durations (on/off cycles). I believe that if the rate of photosynthesis is solely dependent on the percentage of light the Anacharis receives, then there should be no change between the observed rate and the expected proportional rate.

Methods/Materials
The experimental apparatus consisted of a ring stand, clamps, and a 60 mL syringe connected to a 1 mL graduated pipette. After filling the syringe with 0.75% sodium bicarbonate solution, the Anacharis was added and capped with the plunger. A lamp was positioned four centimeters away from the syringe. A timer (intervalometer) was used to turn the light on and off at designated intervals. Data was collected by measuring the movement of the meniscus down the pipette as oxygen was produced. An expected proportional response was calculated relative to the 100% on rate.

Results
I had predicted that the rate of photosynthesis would be proportional to the full on rate. The results did not support my hypothesis. On average, observed rates ranged from 21% under to 9% over the expected rate.

Conclusions/Discussion
(1) The rate of photosynthesis under new light durations greatly depends on prior light conditions; under nonconsecutive, but identical conditions, steady rates could differ by 72%. (2) A minimum amount of on time is required to achieve high photosynthetic rates; 10 seconds on/10 seconds off showed a dramatically slower rate than 5 minutes on/5 minutes off. (3) Photosynthesis was observed to continue during the dark periods, but the dark rate decreased to 33% of the on rate.

Summary Statement
My purpose was to understand the effects of light duration (on/off cycles) on the rate of photosynthesis of the aquatic plant Anacharis.

Help Received
I borrowed equipment from academic and industrial science labs. My dad taught me how to graph and analyze data (regression) using Excel and Powerpoint.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

Emma C. Williams

Project Number

J1937

Project Title

Does Treating Soil with Vinegar to Kill Vinca minor Decrease the Future Growth of Native Plants?

Abstract

Objectives/Goals

Does treating soil with vinegar to kill Vinca minor decrease the future growth of native plants? I predict that the seeds planted in vinegar treated soil will have little or no difference in weight compared to plants grown in untreated soil.

Methods/Materials

Flats of Vinca minor (V. minor) were separated into four equal sections also a flat of plain soil was divided into two equal sections. Each section of V. minor and soil was labeled. Everyday for six days I sprayed the sections, "vinegar (vinca)", "vinegar and pull (vinca)", and "vinegar (soil)". After 6 days of vinegar spraying I pulled the V. minor from the sections, "pull (vinca)" and "vinegar and pull (vinca)". I planted equal amounts of a mixture of native seeds in these areas: "vinegar (soil)", "no vinegar (soil)", "pull (vinca)", and "vinegar and pull (vinca)". For 14 days I watered the seedlings and move them inside on cold nights. After the 14 days I pulled the seedlings out of the soil, including roots. I weighed the seedlings on a scale.

Results

The seedlings from the soil that had V. minor and had been pulled weighed 37.44 grams(g), the seedlings that were planted in soil where the vinegar sprayed V. minor was weighed 47.61g. The seedlings from the soil that had been sprayed with vinegar weighed 110.24g, the seedlings that were grown in plain soil weighed 115.91g.

Conclusions/Discussion

My hypothesis was incorrect for seeds grown in untreated potting soil. Plants weighed 5.67 grams more than the plants grown in potting soil that had been treated with vinegar. My hypothesis was correct for the soil where V. minor had previously been planted, the seedlings that were in the soil of vinegar treated V.minor weighed 10.17 more grams than the native seedlings that were planted in soil were V. minor had simply been pulled. My explanation for the difference is that the V. minor robbed the soil of nutrients, or left something in the soil that impeded the sprouting of the native seeds. Since the vinegar sprayed V. minor was dieing it could not rob the soil of as many nutrients. For last year's science fair I found an effective and natural way to kill the invasive species V. minor using vinegar. The herbicides used commonly on this pest are harmful to the environment and the people who used them, and can limit future plant growth. I found a natural alternative that does not limit native seed germination.

Summary Statement

My project is about killing invasive Vinca minor and the restoration of native plants.

Help Received

My mother bought supplies and edited my abstract to fit this form. My father and sister helped move plants and take pictures. The staff members at Native Revivals Nursery (Aptos, CA) gave advice on the selection of native plant seeds.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Arianna M. Wood

Project Number
J1938

Project Title
Improving the Food Supply and Environment Worldwide: Using Adjuvants to Augment Organic and Conventional Herbicides

Abstract

Objectives/Goals
My objective was to determine if weed killing could be improved by adding the adjuvant, ammonium sulfate, to an organic weed-killer, D-Limonene, and to glyphosate, the most commonly used weed-killer worldwide. Controlling weeds is important as they compete for nutrients and sunlight in the same soil.

Methods/Materials
Herbicide and adjuvant levels were varied to create different spray solutions. Using two pump-and-spray backpacks, I sprayed each of the resulting eleven solutions on separate six-foot by ten-foot plots of weed-covered land, with six-foot by ten-foot buffers in-between to minimize drift between each of the eleven conditions. A Calgamite Indicator analyzed the hard water elements of the local water used in the solution, in order to determine ammonium sulfate levels. Weed death in all conditions was measured weekly over a span of four weeks, and percentages of weed death were compared.

Results
Weed death did not occur during the first week, but began during the second week in all conditions with a 50% of the calculated ammonium sulfate dose and above. Weed death spiked during the third week, in conditions with 50% ammonium sulfate and above, and then leveled off in the fourth week. Both glyphosate and the organic D-limonene were twice as effective at killing weeds when combined with a 50% or greater dose of ammonium sulfate, compared to the herbicides without the adjuvant. Using half the manufacturer's recommended dose of glyphosate was very effective when combined with the adjuvant, and more effective than glyphosate alone.

Conclusions/Discussion
In conclusion, the organic herbicide did exceedingly well if paired with at least half the recommended dose of ammonium sulfate, showing the effectiveness of organic herbicides can be improved with a surfactant. The finding that a large amount of weeds was killed by 50% glyphosate, if combined with 50% ammonium sulfate and above, demonstrates that a farmer can use half the glyphosate normally used. Reducing glyphosate use by half in the farming community is a great cost savings and helps the environment. It also gives farmers the chance to kill weeds more often and across a larger area, leading to healthier crops and better food production worldwide. The results also suggest that with glyphosate, the adjuvant's effect may be as a surfactant, a protein-synthesis inhibitor, or both.

Summary Statement
My project is about how using adjuvants to enhance the effectiveness of herbicides to kill weeds is a great way to help the food supply and environment worldwide.

Help Received
My dad mixed the herbicide solution, and supervised me while I sprayed, because he has a private applicator certificate; a Camrosa Water District specialist analyzed the water sample I submitted.

CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Selma E. Kondoker

Project Number
J1999

Project Title
Turning Greywater Green

Abstract

Objectives/Goals
The purpose of this experiment is to determine if plants watered with greywater will grow better than plants watered with tap water.

Methods/Materials
A total of sixteen plants were grown. There were four different types plants, each type of plant referred as a plant group. Two plants form each plant group were watered with tap water (control gorup), and two plants from each plant group were watered with greywater. The height of plants were measured and averaged to one height every day. The control plants' heights were compared to the greywater plants' heigths.

Results
The results show that plants watered with greywater grew taller than the plants watered with tap water. Grewywater contains soap residue, which consists of nutrients like nitrogen, potassium, and phosphorus which can fertilize plants and help them grow tall.

Conclusions/Discussion
Greywater could be used water plants.

Summary Statement
Greywater can be green.

Help Received
Mother helped to get all the materials. Father helped with the pictures. Sister Reham and Jeanette helped to organize.