CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Rashmi A. Athavale

Project Number
J1901

Project Title
What Does Your Garden Drink? How Does the Quality of Water Affect the Growth of Vegetable Plants?

Abstract

Objectives/Goals
The objective of this project is to determine the effect of water quality on the growth of vegetable plants, comparing lake water, tap water and distilled water.

Methods/Materials
A brief procedure of the experiment is as follows. Using 9 pots filled with potting soil, plant 25 pumpkin seeds in 3 pots each. Plant the same number of radish seeds in 3 more pots and green bean seeds in the remaining 3 pots. Water the first pot with 0.5 liter lake water, the second with 0.5 liter tap water and the third with 0.5 liter distilled water. Label all pots to indicate the type of seed and water used. Keep pots indoors and close to a window. Once germinated, move plants outdoors in direct sunlight. For each seed group, based on the labeled pots, continue to water the plants with lake water for the 1st plant, tap water for the 2nd and distilled water for the third. Monitor and record the height & number of leaves of each plant periodically (take pictures).

Results
The results show a clear difference in the plants that received lake water compared with those that received distilled and tap water. Plants that received lake water grew taller and produced many more leaves compared with those that received distilled or tap water. Plants that received tap water also grew better compared with those that received distilled water.

Conclusions/Discussion
Since the number of leaves and the height of the plants are indicators of plant growth, the results provide strong evidence that the quality of water is a very important factor in the growth of plants. The data here supports my hypothesis that lake water which is high in dissolved mineral content is the most suitable for plant growth compared with tap water & distilled water.

Summary Statement
This experiment tested vegetable plants treated with lake water, tap water and distilled water to monitor its effect on the plant growth.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Savera Y. Bholat

Project Number
J1902

Project Title
Bloom or Gloom? Evaluating Options to Extend the Life of Cut Flowers

Abstract

Objectives/Goals
The goal of my project is to find out if adding copper wire, lemon juice, or aspirin to water will help cut flowers retain their color, petals, and minimize the angle of droop for the longest amount of time. The parameters that I am measuring are very important factors, both for the people in the floral industry and for those who like to keep cut flowers at home. My objective is to come up with a recommendation that can be used in real-life situations. I hypothesize that the aspirin will be the most effective addition for cut flowers because it kills bacterial overgrowth which could clog up plant tissue and slow the water supply. Slowing or cutting of the water supply to the flower is what leads to discoloration, petal loss, and droop.

Methods/Materials
Flowers, aspirin, lemon juice, copper wire, water, vases, protractor.
Set up 10 flowers in each solution type i.e. floral water with aspirin, lemon juice, copper wire and plain tap water as a control, totaling to 40 flowers in four vases. Labeled each flower. Measured change in color, change in angle (also known as the "droop") and loss of petals every three days, over a period of 13 days for each of the 10 flowers in each of the four solutions. This led to a collection of 600 individual data points. Developed a quantitative scale for color change using paint color samples. Collected data until the flowers could not be used in a bouquet, and developed graphs.

Results
Copper wire was the most effective addition to the floral solution and helped keep the cut flowers freshest and usable for the longest period of time.

Conclusions/Discussion
My mother is a florist who works on wedding and other events. She is very particular about how her flowers look, and has a huge amount of work to do the day before she has to deliver her arrangements. I wanted to find something that could help her distribute her work a little better. That is why I thought of doing this experiment. Learning about the copper wire is something important to her work, and can be used by other florists and people who would like to keep their flowers fresh.

Summary Statement
Evaluating Options to Extend the Life of Cut Flowers

Help Received
Sister Maryam helped guide my project in the correct direction. Ms. Mauzy-Melitz answered general questions.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jacob C. Birks

Project Number
J1903

Project Title
If Corn Seeds Are Hydrated, Will They Have a Faster Germination Rate?

Abstract

Objectives/Goals
The purpose of this experiment is to determine if the germination rate is affected by hydrating corn seeds.

Methods/Materials
Using approximately 240 corn seeds divided evenly with 60 seeds in a group, 4 groups of seeds are soaked at different times with a control group that is not hydrated. After the corn sprouts have emerged, data is kept on the number of sprouting seeds and the dates of germination. Once the germination has been recorded, the seeds are then planted and measuring continues as the growth continues. Data is compared between the hydrated and the control groups of seeds.

Results
As a result, 15 minutes had the best over all growth with a finished average of 20.21 centimeters, next was 10 minutes with a finished average of 14.35 centimeters, 5 minutes had an average growth of 9.66 centimeters and last was non-soaked with an average of 7.1 centimeters.

Conclusions/Discussion
In conclusion, my hypothesis was proven correct. The seeds soaked for 15 minutes not only emerged quicker than non-soaked seeds, but they also grew a heartier stalk and higher overall growth, and this; therefore, proves that if seeds are hydrated prior to planting, they will have a stronger outcome with emergence and overall growth as compared to seeds that are not hydrated.

Summary Statement
The purpose of this experiment is to determine if the germination rate is affected by hydrating corn seeds.

Help Received
No help received for project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Gabriel H. Bloch

Project Number
J1904

Project Title
How Does Your Garden Grow? What Is Your Compost to Soil Ratio?

Abstract

Objectives/Goals
The hypothesis: box #3 with 50% compost to 50% soil ratio would grow the fastest and would be the most efficient.

Methods/Materials
I started my project by going to Dixieline and getting a two section worm casting (compost box). I put newspaper at the bottom of the box, a handful of sand, a handful of soil, and some crushed leaves into the box. Then I retrieved 20 red wriggler worms from my garden and consistently gave all our organic leftovers to be composted. I waited about a month, and then I saw worm castings at the bottom section of the box. I got four pots with a length of 44cm, width of 16cm, and a depth of 12cm. I started to fill the pot with only soil, the next pot with 25% compost, the third box with 50% compost, and the fourth box with 75% compost. After doing so, I placed the boxes in a place where they would get a half days sun. After finding a suitable spot, I put 10 cherry radish seeds in each pot 5cm away from each other and 1cm into the soil. I placed plastic food wrap over the pots for 3 days with holes in them, and waited for the seeds to sprout. When they started to sprout, I took off the plastic food wrap. I watered the plants everyday with 1 cup over each pot equally. I waited and measured each plant when they started to grow, and observed obvious signs of health improvements.

Results
After 40 days of testing 10 plants in each of the 4 pots, I saw drastic differences between the plant sizes and health. The second pot was by far the healthiest and tallest of the plants, and had an average plant height of 12.65cm. The first box then came second with fairly healthy looking plants, and an average height of 6.9cm. The plants in the third box looked very weak, and were dying towards the end of the experiment; this pot had an average height of 6.7cm. The fourth pot never sprouted and was too moist and watery throughout the experiment. I then decided to weigh the radishes, and saw that the second pot's radishes weighed the most and tasted the sweetest. I was happy to see this drastic difference because hopefully this will encourage others to stop filling the landfills with left over#s, but instead, compost it down in your own backyard and use it for a smarter purpose.

Conclusions/Discussion
Box #2 with 25% compost was the most efficient, and I would recommend that you should use this ratio to make a healthier and more productive garden.

Summary Statement
too determine the ratio of organic compost to soil that would benefit your garden and the environment around you.

Help Received
my dad helped me compost down scraps, and put compost and soil in each pot.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Michael Castillo

Project Number
J1905

Project Title
Which Organic Material Has the Least Soil Compaction Rate and Allows for the Best Plant Growth?

Abstract

Objectives/Goals
My goal was to determine which organic mixings have the least compaction rate when mixed with water and soil and will help plants grow the best. I wanted to know the best way to prepare the soil to promote maximum growth once they are transplanted into the ground.

Methods/Materials
I used a 5 gallon bucket with a 1 inch diameter hole drilled 5 inches from the bottom and placed a 1 inch by 10 inch wooden dowel with a hook screw instered at the end. I then filled the bucket 3/4 quarters of the way with top soil mixed with 2 cups of organic material. Organic materials included wood chips, small rocks, leaves, potato peels, grape extract and grass clippings. I added 2 cups of water and placed 2 bricks on top of soil for 2 minutes then proceeded to remove the dowel using a newton compaction tool. This procedure was repeated 5 times for each organic material. After completing this procedure, I poured the mixture into a 20 1/2 inch by 10 inch plant container and placed a 20 inch by 9 3/4 inch wooden palate over the soil and placing 2 bricks for 5 minutes to compact soil. Finally, I planted 3 rows of wheat grass in each container.

Results
The average newtons needed to pull the dowel was 8.5 newtons and the average height of wheat grass was 3.3 centimeters. The maximum height of the wheat grass was 5 centimeters using grape extract which allowed for the best plant growth and the least compaction rate was 7 newtons using grass clippings. The lowest height of wheat grass was 2.5 centimeters using wood chips. The most newtons was 11.5 using grape extract.

Conclusions/Discussion
After testing, I found that grape extract allows for the best plant growth but also has the most newtons. Grass clippings has the lowest compaction of 7 newtons but also has the least plant growth. Crops that are grown using the other organic materials used in this project will not have their best plant growth.

Summary Statement
To determine which organic material has the least soil compaction rate and allows for the best plant growth.

Help Received
Mother helped with typing and Father assisted with testing procedures.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Sergio E. Cuadra

Project Number
J1906

Project Title
UV Light and Plants

Abstract

Objectives/Goals
Whenever someone gets a tan or sunburn, regardless of where they are, they are being affected by ultraviolet rays. These rays do much more than color a person#s skin, though. They help the human body produce vitamin D, ant they are used in science. This experiment tested the effects of ultraviolet rays on Mung beans. The hypothesis was that the UVB rays would affect the plants in a negative way.

Methods/Materials
There were four test groups: UVA, UVB, UVC, and control. Each group had fifty plants, making a total of two hundred plants. Each plant was potted and placed under their respective light. Each light was kept on during the day, but turned off during the night, and each group received water daily. The height was recorded daily for twenty-five days.

Results
The experiment results proved the hypothesis correct. UVB had the most negative effect on the plants. The UVB had the lowest growth average of 2.39 cm, and UVA had the second lowest average of 2.6 cm. UVC had the growth average of 4.26 cm, and control had a growth average of 4.15 cm.

Conclusions/Discussion
The types of ultraviolet rays do affect the growth of plants. UVB affects plants in a negative way. Therefore, the hypothesis was proven correct. The UVB group had the least growth. The results of this experiment show that plant growth could be effected if ultraviolet rays become more intense, and other life on earth could also be affected as well.

Summary Statement
My Project was about the effects of different kids of Ultraviolet radiation on the growth of plants.

Help Received
My father helped me gather materials.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Anna D. de la Rosa

Project Number
J1907

Project Title
Eggcellent Eggshells: How Eggshells Affect Plant Growth

Abstract

Objectives/Goals
The experiment was to measure the effects of eggshell on plant growth. My hypothesis was that the more eggshell added to the soil, the faster the plant would grow.

Methods/Materials
Five groups of five pots were filled with the same amount of soil and three tomato seeds were planted in each of the pots. Each group had different amounts of eggshell mixed in with the soil: no eggshell (control), 1 gram, 5 grams, 10 grams, and 15 grams. As they grew, the plants were watered with the same amount of water and were measured every two days for two weeks.

Results
The results show that the hypothesis is partially true since the plant with 5 grams ended up being the tallest at the end of two weeks. Also, on average, the plants with 1 gram and 5 grams grew taller than those without eggshell. However, the results also show that too much eggshell (10 and 15 grams) does not make the plant grow faster.

Conclusions/Discussion
Overall, I learned that a small amount of eggshell enhances plant growth.

Summary Statement
My project was to determine how eggshells affect plant growth.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Eleni C. Fafoutis

Project Number
J1908

Project Title
One Smart Spud: A Potato Hormone Project

Abstract

Objectives/Goals
In my experiment I set out to prove that no matter how many sprouts a potato, whether whole or cut, may grow from its many eyes, only one sprout will grow into a terminal shoot which will become a potato plant.

Methods/Materials
Materials: Pots, soil, red organic potatoes, steak knife, t-labels, index cards, packaging tape, garden trowel, and spray bottle.

Procedures:
A. Major steps: prepare potatoes for planting and growth in the proper environment for 7 weeks of growth.
B. Variable tested: Whole or cut potato growth behavior.
C. Sample size: 12 total potatoes; 6 whole and 6 cut.
D. Measurements taken: Number of eyes before planting, number of lateral buds grown during growth period, length of terminal shoot.

Results
The vast majority (83%) of the sample grew a terminal shoot in line with what my research indicated. The cut potatoes did almost exactly the same things as the whole potatoes and on some pieces performed better. The potatoes had similar terminal shoot length and the average number of eyes to lateral buds was roughly 2:1 on both whole and cut potatoes.

Conclusions/Discussion
My hypothesis was correct. Both sets of potatoes grew terminal shoots and had eyes that sprouted into lateral buds. The results were very consistent across the whole and cut potatoes which reinforced my hypothesis. The only thing I would have liked to have fixed is to have more time to grow the potatoes to have a 100% success factor, as it was not potato growing season during the experiment. Overall, this project proved how valuable auxins are in controlling plant growth, as seen in the evidence of apical dominance in potatoes. If scientists can continue to find ways to put auxins to good use, we may be better able to increase crop production and continue to feed the growing world population.

Summary Statement
This project is about how hormones control and regulate the growth of potatoes.

Help Received
Father helped edit report and find information; Mother helped get materials, and make board; Science teacher (Ms. Oggiano) helped give support and advice.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Audrey N. Fontes

Project Number
J1909

Project Title
A Symbiotic Relationship

Abstract

Objectives/Goals
My project is to determine if the Anacharis plant would grow more rapidly when placed in glass bowls occupied by goldfish. I believe that the Anacharis plant will grow faster when placed in glass bowls occupied by goldfish. The greater the number of goldfish, the better the rate of growth.

Methods/Materials
Anacharis plants measuring 10.16 cm were placed in four identical glass bowls. Each bowl was filled with tap water and placed in a lighted area. The first bowl did not contain goldfish. The second bowl contained one goldfish, the third bowl contained three goldfish, and the fourth bowl contained five goldfish. After seven days, each plant was removed and measured. All measurements were recorded. This process was repeated weekly over a six week period.

Results
The plant in the bowl with zero goldfish did not have any measurable growth during the six week period. The plant in the bowl with one goldfish grew 1.16 cm during the six week period. The plant in the bowl with three goldfish grew 1.16 cm during the six week period. The plant in the bowl with five goldfish had the greatest rate of growth over the test period. The plant grew 2.16 cm during the six week period.

Conclusions/Discussion
The Anacharis plants grew faster in glass bowls containing goldfish versus the plant in the bowl with zero goldfish. The greater number of goldfish the faster the rate of growth.

Summary Statement
The symbiotic relationship between Anacharis plants and goldfish.

Help Received
None

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Alyssa Harrell

Project Number
J1910

Project Title
Attracted: The Growth of Radishes by Magnetic Force

Abstract

Objectives/Goals
Would the magnets increase the growth of the radishes at a faster pace?

Methods/Materials
Mathods: Soak seeds in bowl of water for 6 hours. Plant radishes in pots and plug in light from 7 pm to 7 am daily. Place pots on newspaper and use Sharpie to number the pots. Scoop soil with spoon and pour 4 cups of soil into each pot.

Materials: Fern Pots, 90 watt CFL lightbulbs, 10 inch reflector lamps, measuring cup, 16.9 FL oz empty water bottle, package of Cherry Belle Radish Seeds, Eco-Friendly indoor potting soil, 12 toothpicks, ruler, pencil, black Sharpie, Painter's tape, Double Thick Medium Sized Fed-Ex Box, Piece of mesh screen, large spoon, scissors, stuido lighting "C" stand, camera, 3 sheets of newspaper, two 3 inch cow magnets, tweezers.

Results
During week 1, no magnet plants sprouted on day 3. Plants with the magnets sprouted on day 2 and grew an average of 1 inch that week. During week 2, it sprouted 1 1/2 inch with magnets and 1/2 inch without magnets. During week 3, plants with magnets grew another inch. No magnets also sprouted an inch. Stopped growing on last week.

Conclusions/Discussion
The hypothesis appears to be correct with the data given. The radish sprouts with magnets grew faster and taller than the ones without the magnets.

Summary Statement
This project determined that a radish with magnets grew taller and faster than the ones without the magnets.

Help Received
Mrs. Burnett corrected some formatting errors.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ed van Bruggen; Austin Hartman

Project Number
J1911

Project Title
Do Plants Predict the Dawn? The Psychic Plant!

Abstract

Objectives/Goals
Our aim was to discover whether certain plants could predict on the onset of dawn. Some types of plants open and close their leaves to save dew in night and to maximize their photosynthesis during the day.

Methods/Materials
The experiments were set up in a dark closet. The automated time-lapse trigger was used to have the camera take a picture every 30 minutes and ran for several days. A natural light bulb was used to alter the day and night cycle. The images we recorded and this data was analyzed using a program called ImageJ.

Results
We found that the oxalis plant has leaf movement that was synchronized to the light cycle. The leaf would begin to open many hours before the light comes on. We measured this #dawn response# and found that it would begin 8 hours before dawn. We wanted to know what happens when there is a pulse of light during the sleep cycle. When there is a pulse of light the plant reacts to dawn one hour earlier. When there is no pulse of light the plants #Dawn Response# reacts in 8 hours instead of 9. Every time this pulse is given the canopy begins to open but only when the light was on. This shows that it does not react just to the light, instead it syncs to the light.

Conclusions/Discussion
We have discovered that oxalis has a leaf movement that will predict dawn many hours before it happens. This way the plant has a competitive advantage over plants that don#t do this. If a plant simply responds to the light instead of predicting the onset of dawn, it has fewer canopies covering during the daylight hours and thus less efficient for photosynthesis. Therefore a plant that predicts dawn can grow faster than a plant that simply responds to light. We have also shown that a simple pulse of light during the sleep cycle can initiate the dawn response earlier.

Summary Statement
To discover whether plants can predict the onset of dawn

Help Received
Fathers helped prepare poster. Mentoring help from Jayne Hastedt

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Adithi R. Iyer

Project Number
J1913

Project Title
Send in the Clones

Abstract

Objectives/Goals
For this project, I used a geranium plant and took cuttings from three different parts; the roots, stems, and the leaves. I regenerated these different parts and tracked their respective growth rates to see which part of the plant regenerates the fastest. In-depth analysis of the regeneration process was one of my goals, and so I engineered the project to help me accomplish that. Mainly, having the opportunity to explore the scientific process was a big motivator to create this carefully-thought-out testing process.

Methods/Materials
I first took cuttings from the geranium at 50 degree angles. I soaked the cuttings in water and applied Indole-Butryic Acid to the ends of the leaf and stem cuttings to start the process. I then planted them in the side of a clear cup with potting soil. I covered the tops of the cups with plastic wrap to create the humid environment they needed as per common horticultural procedures. I used a spray bottle to mist the cuttings twice a day, and the greenhouse effect caused by the plastic wrap created the humid environment I needed. I used a light bulb for light to keep all the plants at the same temperature and to keep my variables uniform. As the plants grew, I tracked their development through the clear cups by taking pictures and measurements periodically. This process continued for 63 days.

Results
I found that, after 63 days of testing, the leaf cuttings grew the fastest, at an average rate of 2.9 centimeters per day. This was followed by the roots, growing at an average of 0.44 centimeters per day. The stems died after seven days of testing and did not grow at all.

Conclusions/Discussion
The leaves had the fastest rate of growth, which completely disproved my hypothesis. I assumed that the leaves would be cumbersome on the cutting and die quickly, but the leaves photosynthesized during growth. The roots also grew because they absorbed nutrients from the soil outside of the plant. The stems did not have any of these organs, and so they couldn't sustain themselves. I used my observations and diagrams to create a process diagram I call the Regeneration Explosion Theory. This asserts that there is a bulge formed by the hormones collecting at the bottom of the leaf cutting, and that new fleshy roots begin to hook and shoot out from it as it gets larger. The theory sets a basis for future studies and provides a visual chronicle of the regeneration process.

Summary Statement
This project focuses on three different areas of the geranium plant- roots, shoots, and leaves- that are regenerated from cuttings, and analyzes both the regeneration process and their respective growth rates after 63 days.

Help Received
I contacted Dr. Gardiner at UCI, who inspired my project idea and helped guide my project's design.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Samuel J. Kennedy

Project Number
J1914

Project Title
Effects of Soil Sand Content on Chlorophyll Pigmentation in Pea Plants

Abstract

Objectives/Goals
My objective was to learn whether the amount of sand in a soil affects the amount of chlorophyll in a plant growing in it.

Methods/Materials
I mixed together five different mixtures of soil and sand and then planted the plants in these. When the plants had matured sufficiently, I used their leaves to create a pigment extract, which I then tested and drew conclusions from.

Results
In my results the amount of chlorophyll was highest in Treatment 1, second-highest in Treatment 2, third-highest in Treatment 4, fourth-highest in Treatment 3, and fifth-highest in Treatment 5.

Conclusions/Discussion
My results showed that in all but one treatment, there was less chlorophyll in the sandier soil than in the normal soil. This means that soil type does in fact have an effect on how productive a plant is.

Summary Statement
My project is about soil types and their effect on plant pigmentation.

Help Received
Used lab equipment at Fresno State University under the supervision of Dr. James Kennedy.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Steven P. Ledbetter

Project Number
J1915

Project Title
Plant Waves

Abstract

Objectives/Goals
To discover if plants can use wavelengths of light other than visible light to undergo photosynthesis.

Methods/Materials
Method: Fill eight biodegradable planting squares with cactus potting soil and place two fertilizer pellets and one Brassica Rapa seed in each square. Place four squares in an enclosed space with a light bulb stand and a 60 watt light bulb and place the other four near a source of natural light. At 7:40 a.m. turn on light bulb, at 5:00 p.m. give plants 25ml of filtered tap water and record plants height, at 5:40 turn off light bulb. After 7 days, dipose of plants and go through steps 1-3, use 15 watt ultraviolet light bulb instead of 60 watt bulb,follow step 6. After 7 days, repeat step 7 with a 50 watt infrared light bulb.
Materials: Brita water filter; 16 6 1/2 cm by 6 1/2 cm biodegradable potting squares; Brassica Rapa seeds; Brassica Rapa feretilizer; measuring cup; 15 ml measuring spoon; 60 watt light bulb; 15 watt ultraviolet light bulb; 50 watt infrared light bulb; cactus potting soil; light bulb base; customary/ metric ruler

Results
Brassica Rapa plants are capable of sprouting and growing under different wavelengths of light. The plants grew best under sunlight, second best under the visible light bulb, third best under the infrared light bulb, and worst under the ultraviolet light bulb.

Conclusions/Discussion
My hypothesis was completely correct. The plants grew better under infrared light than ultraviolet because the sun has a larger percentage of infrared light in its output, so infrared light is more like total sunlight.Plants evolved to grow in total sunlight, so they would grow best under what is most like total sunlight.

Summary Statement
To discover if plants can use wavelengths of light other than visible light to undergo photosynthesis and discover what wavelength plants grow best in.

Help Received
A science fair mentor showed me the website where I got the Brassica Rapa seeds and fertilizer, and my parents provided the money to buy supplies

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Mary Y. Liu

Project Number
J1916

Project Title
Can Electricity Affect Plant Growth?

Abstract

Objectives/Goals
My objective is to determine whether electricity in various forms can stimulate plant growth or seed germination.

Methods/Materials
Lettuce seedlings in pots were given either positive or negative charges of 5, 9, and 12V DC to determine whether electric charges would stimulate plant growth. Lettuce plants were given both positive and negative charges of 12V DC to determine whether the electricity would stimulate plant growth. Mung beans were soaked in both water with and without a 1% salt solution (with salt and pure water) and given either positive or negative electric charges from 9V DC in petri dishes. Observations were made on seed germination after 1 and 2 days. I also tested whether electric field can stimulate germination of fava beans and mung beans. Fava/mung beans were soaked in pure water in petri dishes. The petri dishes tops and bottoms were wrapped with foil tapes and connected to electrical wires that gave positive and negative charges of 12V DC. Observations were made on germination of fava/mung beans on days 2, 3, and 5. All experiments included controls for comparison.

Results
No real variation was found between lettuce seedlings with either positive or negative charges or the ones that remained neutral with 5, 9, 12V DC. Lettuce plants had no real variation either comparing with treatment and controls. Mung beans with the 1% salt solution inhibited seed germination compared with the mung beans that received only pure water. Mung/fava beans that were subjected to an electric field and were compared with those that were used as controls showed that there was no real variation between them.

Conclusions/Discussion
The results from all the experiments conducted has led to the conclusion that electricity cannot affect plant growth or seed germination under my experiment conditions. Earlier studies done in the 19th century could not be replicated because of lack of description. This means that my results cannot disprove those earlier results that were drawn. Also mung bean germination is inhibited by salt.

Summary Statement
My project was done to see whether electricity can affect plant growth or seed germination.

Help Received
Dr, Yongbiao Liu (my dad) provided the supplies and work space, helped in developing methods, and supervised during experiments.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Nathan T. Lyon

Project Number
J1917

Project Title
Biomimicry in Action: Hypertufa vs. Soil

Abstract

Objectives/Goals
In this experiment, my goal was to test the difference in plant height and width between two medias. I grew one set of plants in soil, which was my control. I planted the other set in Hypertufa, which is a solid block made out of several materials. I believed that the plants set in Hypertufa will grow better than the ones set in soil.

Methods/Materials
For the Hypertufa, several ingredients were mixed in a cement mixer until like the consistency of concrete. Vermiculite, Shagram Moss, cement, glass fibers, and water all make this base for vegetation. To set up my experiment, I placed 4 sets of 4 plants in each media, and placed them in the same spot. I watered them the same amount, and measured the height of the tallest point and the width of the canopy of each individual plant.

Results
With all my results, I determined that the plants grown in Hypertufa flourished a little bit more, with a slightly higher average height and a slightly wider canopy. These results are fairly accurate, due to the same growing conditions and fairly accurate measuring.

Conclusions/Discussion
These results support my hypothesis, that the plants in Hypertufa will grow better. The plants in soil did not grow as well and did not do as well visually, either. Each of the plants# quality was slightly less. I learned from this experiment not about the Hypertufa, but more about biomimicry.

Summary Statement
My project is about the difference in plant growth between Hypertufa and soil.

Help Received
Mother helped put poster together; father helped get supplies and plant.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Bridget J. Macmillan

Project Number
J1918

Project Title
An Investigation on the Effect of Different Concentrations of Gibberellic Acid on Spinach

Abstract

Objectives/Goals
The purpose of my science experiment was to determine which concentration of gibberellic acid, if any, produced the best baby leaf spinach for the purpose of an agricultural crop. Different concentrations of Gibberellic acid; 100ppm, 300ppm, 500ppm, 700ppm, and 900ppm, were compared to two controls, water and water with fertilizer. I believe that the 500-ppm concentration of gibberellic acid will form the best agricultural crop defined by plant height, leaf width and length, number of leaves, and leaf color.

Methods/Materials
My hypothesis was tested by applying various concentrations of GA, water, and water with fertilizer, to forty-nine spinach plants (seven each.) Throughout my experiment, fertilizer was applied once a week to all the plants except Water 1, the group containing no fertilizer or Gibberellic acid. I planted all the seeds on the October 31, 2011 and ended the project on 17th Jan 2012.

Results
The results of my experiment show that my hypothesis was incorrect. The 500ppm concentration of gibberellic acid did not produce the best agricultural crop or the healthiest plants. While the GA plants as whole were the tallest, they produced smaller leaves. Also, despite being watered with fertilizer, they were not as green as the Water 2 plants (water with fertilizer) control.

Conclusions/Discussion
My definition of the best agricultural crop belongs to the Water 2 spinach plants, having the greenest, biggest and greatest number of leaves, meaning that they also have the greatest nutritional value. This research can benefit society, as spinach is a crop planted in many countries and is very nutritional and easily grown. My investigation into the effect of gibberellic acid on the growth of spinach plants is important, as GA can be used to increase the crop and feed more people for relatively little effort.

Summary Statement
Testing the effects of different concentrations of gibberellic acid on spinach plants.

Help Received
My Mother helped glue the board together and take photos.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Katie A. McAllister

Project Number
J1919

Project Title
Blood Drops: Speed and Angles

Abstract

Objectives/Goals
The purpose of this experiment is to determine if there is a correlation between the area of the spatter and length to width ratio and the speed and angle of the falling drop.

Methods/Materials
I dropped different sized drops of simulated blood at known speeds from different heights having them hit a blank index card at 30, 45, and 90 degrees. I measured the area and length to width ratio and used this data to compile two differnt types of graphs for each angle, L/W vs. Speed and Area vs. Speed. In order to determine the speed of the falling drop I flashed a strobe at it as it fell and took pictures using a camera with an open shutter. I calibrated the stroboscope using a phonograph and a steel BB test. For the simulated blood I used a recipe of cornstarch, corn syrup, water, and food coloring. I also used a plumb apparatus with a meter ruler on it, different sized pipettes, a camera, a phonograph, a stroboscope, steel BBs, and index cards.

Results
As the speed increased, the area of the spatter increased as well. For example, the largest volume drop's spatter area increased from 142.18mm^2 at the fastest speed to 108.07mm^2 at the slowest speed. As the speed increased, the length to width ratio increased as well. At 90 degrees the blood drops were uniformally circular, at 45 degrees they were slightly eliptical, and at 30 degrees they had a pronounced elliptical shape.

Conclusions/Discussion
Based on my research and observations, I have come to the conclusion that the speed and angle of a blood drop with a known volume can be determined. It was easy to determine the differences between volumes; smaller volumes had smaller areas. By knowing the area and length to width ratio, it becomes apparent that each volume of drop has a distinct splatter at certain low velocities.

Summary Statement
I wanted to find if the speed and angle of a low speed blood drop spatter with a known volume could be predicted by using the spatter's area and length to width ratio.

Help Received
I would like to thank my dad for helping me find the materials, my grandpa for helping me understand the equations, my uncle for teaching how to use Microsoft Excel, and Mr. Briner for his support and encouragement.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Lillie M. Meyer

Project Number
J1920

Project Title
The Germination Rate of Different Aged Ranunculus Tubers

Abstract

Objectives/Goals
The purpose of this project is to determine if older ranunculus tubers can still germinate as well as younger ones.

Methods/Materials
There were 20 tubers from each year being tested, 2005/06 - 2011/12. Before planting the tubers they were soaked in water for 1 hour. 140 four inch pots were used with one tuber in each pot. Each pot was marked 1 through 20 along with the year of the tuber. Each pot was filled with moist soil up to one inch below the rim of the pot. Each tuber was planted one inch down in the soil of the pot and was covered with soil up to the rim of the pot. After all of the tubers were put into pots they were separated into their groups by year.

Results
Results started to be recorded when the tubers began to germinate showing growth above the soil line. The year 2011/12 had 18 out of 20 tubers germinate, year 2010/11 had 12 out of 20, year 2009/10 had 6 out of 20, year 2008/09 had 11 out of 20. The remaining years 2005/6 - 2007/08 had no tubers germinate.

Conclusions/Discussion
My conclusion validated my hypothesis that the newer the tubers the higher the chance they had to germinate. This information is useful to gardeners to determine how long ranunculus tubers can be stored and still remain viable.

Summary Statement
To determine if the age of a ranunculus tuber effects its germination rate.

Help Received
My father helped me set up the experiment and plant the tubers. My Mother obtained the tubers for me along with getting me access to talk to Fred Clark of The Flower Fields. She also let me use her greenhouse for the experiment. My science teacher Patricia Young spent extra time with me after school

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Abdulsattar Mohammed

Project Number
J1921

Project Title
Suffocating Stomata: The Effect of CO(2)

Abstract

Objectives/Goals
The goal of this experiment was to determine how increased amounts of carbon dioxide exposed to plants affect their stomata. I hypothesized that the plant that was exposed to the most carbon dioxide will have the most stomata open compared to the plants that were exposed to less carbon dioxide. I theorized this because the stoma#s main function is to open and close for gases to pass in and out of the plant, which meant it would be ideal for the plant that was exposed to the most dry ice to have the most stomata open.

Methods/Materials
Firstly, I gathered five ice plants from school. Next, I labeled each plant as A, B, C, D, and E, and placed them each in different containers. I exposed plant A to 0 g of dry ice, plant B to 100 g, plant C to 200 g, plant D to 300 g, and plant E to 400 g and left the plants exposed for 24 hours. Later, I extracted one leaf from plant A and removed the epidermis and proceeded to create a wet mount slide by placing the sample on a slide, adding one drop of water and one of iodine, and placing a cover slip on the sample. I viewed the slide under a microscope and observed/recorded how many stomata were open and closed and repeated the process with 4 more leaves from plant A. Finally, I repeated the process of observing 5 stomata samples with plants B, C, D, and E.

Results
The final data showed that the plant with the most carbon dioxide exposed to it had the most stomata open. Plant A, exposed to 0 g of dry ice, had an average of 17.6 stomata open, and Plant B, exposed to 100 g, had an average of 12.6 stomata open. Plant C, exposed to 200 g, had an average of 13 stomata open, Plant D, exposed to 300 g, had an average of 12.2 stomata open, and lastly, Plant E, exposed to 400 g, had an average of 20.2 stomata open.

Conclusions/Discussion
My hypothesis that the plant with the most dry ice exposed to it will have the most stomata open compared to the plants with less dry ice exposed to them was supported by the data. I hypothesized that the plant with the most carbon dioxide exposed to it will have the most stomata open because the main function of stomata is to open and close to let gases like oxygen and carbon dioxide enter and exit the plant. This experiment connects to the real world because if the stomata on plants did not open or close, then it would be impossible for plants to receive carbon dioxide or release oxygen, which will make it impossible for human beings to live.

Summary Statement
My project is about how carbon dioxide affects the stomata on plants.

Help Received
Mother bought supplies; Ms. Fisher supplied me with and taught me how to use items such as microscopes and slides, and she stayed afterschool for me; Mrs. Diaz helped me write my research report; Classmates helped me clean up my experiment after I was done; Sisters helped me make board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ishana H. Narayanan

Project Number
J1922

Project Title
The Effect of the Different Colors of Light on Plant Growth

Abstract

Objectives/Goals

I became interested in this project when I was growing roses with my mom last summer. The roses my mother planted grew strong and healthy, but the ones I grew were frail and weak. Blaming it on sunlight, I decided to test which colors of light (red, blue, green) would be the best to grow plants in.

Different shades of light are proven to have different wave lengths; the longer the wave length, the slower the speed of the wave is, the shorter the wave length, the faster the speed of wave is. Plants grow in sunlight which is white light of all the lights in the visible spectrum put together. Since plants need light to grow, I wanted to test which color of light, red, blue, or green would be the best for plant growth.

Methods/Materials

Build a box using plywood which is 24" wide, 18" tall and 12" deep. Plant green bean plants in each clay pot and wait for the plants to become about 1.5 centimeters tall and then begin the experiment. Place three plants in each section of the box in a way so that each different color has three green bean plants inside of it. Turn the light on for 12 hours and off for 12 hours. Record results every other day.

Results

The plants grown under the green light had a very unsteady growth rate as the plat grew about 13 cm in the first two days and grew just about 1/10th of a cm towards the end of the experiment with minimal leaf increase. The plants that were grown under the blue light had a steadier growth rate compared to the plants grown in the green light but again the growth fizzled towards the end. The plants grown under the red light had a very steady growth rate as each red plant grew about 2 cm every other day throughout the two week period. There was a steady leaf increase as well. In comparison to my control, red is the best to grow plants in.

At the end of the experiment, I studied each plant's roots. The plants grown under the green light had extremely thin roots, small stems, and very unhealthy leaves when compared to the plants grown under the red light which had sturdy roots, thick stems, and healthy leaves. The plants grown under the blue light had healthy stem and leaves but not very healthy roots.

Conclusions/Discussion

Plants are grown best under red light because photochromic pigments absorb the red light resulting in seed germination, root development, flowering and fruit production.

Summary Statement

Which color of light is the best for plant growth?

Help Received

Father helped me build the boxes. Mother helped to buy supplies. Mrs. Nguyen gave guidance.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Natalie G. Opalach

Project Number
J1923

Project Title
Ring around the Redwood

Abstract

Objectives/Goals
This two-year study calculated and examined the correlation of young and old redwood tree diameter growth to rainfall at elevations of 100 and 1,500 feet. A total of four stands were included in the study. The young redwood stands were 25 to 30 years old and the old redwood stands were 80 to 100 years old.

Methods/Materials
Diameter core increment samples were taken from ten redwood trees within each stand, and annual tree growth was measured and recorded for the past ten years. This data was compared to rainfall data, and correlation coefficients were calculated.

Results
The correlation significance between rainfall and old low elevation trees was 96%, young low elevation trees was 98%, old high elevation trees was 29%, and young high elevation trees had a negative correlation to rainfall of 88% significance. At the low elevation, diameter growth was strongly related to rainfall even in the north coastal region of California where water seems abundant. Interestingly, rainfall seems to influence young tree growth negatively at high elevations.

Conclusions/Discussion
Greater water abundance is not the only outcome of greater precipitation; others include low temperatures, snow, freezing rain, wind, hail, and erosion. Young trees at the high elevation could have reacted poorly to one or more of these rather than simply greater amounts of water. One hypothesis concerning the effects of global climate change suggests it will lead to greater rainfall in north coast California. An increase in tree growth is associated with more water in lower elevation redwood forests, consequently increasing the trees# carbon dioxide intake. Redwood trees may therefore in some part counter these possible global climate change effects.

Summary Statement
This study found the correlation between rainfall and young and old redwood tree growth.

Help Received
Father helped calculate correlation coefficients; Allyson Carrol helped conduct background research.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Yue Xin

Project Number
J1924

Project Title
Does the Color of Light (Red, Yellow, Green, Blue, Violet, White) Affect Plants' Growth?

Abstract

Objectives/Goals
This project asked, #Does the color of light (red, yellow, green, blue, violet, and white) affect plants# growth?#
The author hypothesized that her seedlings would grow best under white light and worst under green light. She thought this because white light contains a full spectrum (all seven colors) and plants do not absorb green light, they reflect it.

Methods/Materials
Procedure: The experiment#s methodology was to first use four wooden sticks as support (stuck into the soil at the corner of each flower pot), then use six different colored (red, yellow, green, blue, violet, and white) garbage bags and make little tubes (like tents) over her six seedlings (hyacinth hybrids). Water (1/8 cup) and measure the height of the seedlings everyday for nine days.
Experimental Design: Organization of this experiment was a primary goal:
Constants: Constants included the same amount of water for each seedling everyday, the same type of seedlings used, same flower pots used, same soil used, same spot the seedling are being placed, same temperature, same number of days for each trial, and the same starting point for each seedling when measuring.
Controlled Variable: The controlled variable was the amount of sunlight everyday.
Manipulated Variable: The manipulated variable included the different colors of garbage bags that caused light to change into the six colors (red, yellow, green, blue, violet, and white).
Responding Variable: The responding variable measure was how much each seedling grew everyday.
Trials: Tests were repeated five times in total and each trial included the sample size of six seedlings (testing still continues).

Results
Results showed the growth process of the six seedlings, and that seedlings under white garbage bag grew most (average: 1.0 cm, 0.311 cm, 0.377 cm, 0.422 cm, and 0.422 cm) and seedlings under green grew least (average: 0.211, 0.077, 0.144 cm, 0.122 cm, and 0.077 cm). It also showed the order from the best color to the worst: white, violet, blue, red, yellow, and green.

Conclusions/Discussion
The author concluded that plants (seedlings) grew best under white light and worst under green light. This experiment is still in progress.

Summary Statement
This project focused on testing which color of plastic green house cover produced the best growth characteristics in hyacinth hybrids.

Help Received
Mother helped buy plastics and hyacinth hybrids for experiment.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
David W. Pickart-Jain

Project Number
J1925

Project Title
The Effect of Nitrogen and Phosphorus on Competition between a Non-native and a Native Dune Plant

Abstract

Objectives/Goals
This study was designed to test whether the invasive plant ripgut brome (Bromus diandrus) has a competitive advantage over the native dune plant beach buckwheat (Eriogonum latifolium). In addition the study will test how the outcome of this competition is affected by elevated levels of nitrogen and phosphorus. I chose these two nutrients to test because invasive Bromus tends to grow where another invasive species, yellow bush lupine (Lupinus arboreus) has previously grown. This lupine elevates nitrogen levels in the soil. I chose phosphorous because it is very limiting in the dunes.

Methods/Materials
I collected seedlings of Bromus and Eriogonum from the dunes at Humboldt Bay National Wildlife Refuge, and (after measuring their height) planted them in flats at different ratios of Bromus:Eriogonum (0:1, 1:1, and 2:1). I watered them with different fertilizer solutions (no fertilizer, nitrogen, phosphorous, and nitrogen+phosphorous). After 6 weeks I remeasured the plants and calculated the average amount of growth.

Results
Eriogonum, in the absence of Bromus, grew the most in the nitrogen and control groups. When the two species were planted together Bromus always did better than Eriogonum. The nitrogen and phosphorus treatments separately gave a greater competitive advantage to Bromus than the control or nitrogen+phosphorus treatments. In the 2:1 ratio Bromus did not do as well as it did in the 1:1 ratio.

Conclusions/Discussion
This experiment demonstrates that invasive Bromus outcompetes native Eriogonum in conditions that imitate nature, possibly because Bromus germinates before most California native, perennial, dune plants. Bromus grew less in the 2:1 ratio than in the 1:1 ratio, possibly due to increased intraspecific competition. In addition, the experiment supports the concept that elevated nitrogen and phosphorus levels make Bromus even more competitive. This explains why, in nature, the nonnative Bromus can outcompete native dune plants such as Eriogonum, especially if yellow bush lupine leaves behind elevated nitrogen when it dies or is removed.

Summary Statement
My project tested whether non-native Bromus diandrus outcompetes native Eriogonum latifolium with and without added fertilizer.

Help Received
My mom helped me with typing and with my project idea.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Pravin Ravishanker

Project Number
J1926

Project Title
Vrikshayurveda, Bio Vita for Plants: The Effects of Antioxidant Rich Foods on Plants' Growth and Health

Abstract

Objectives/Goals
The intent of this project is to study the effects of antioxidant-rich foods (both type and amount) on plants' growth and health. I hypothesized that if soil is supplemented with antioxidant-rich food, plant growth and health will be better. I also hypothesized that since cloves rank as the richest source of antioxidants known, cloves have greatest potential to display rapid plant growth and vigorous health.

Methods/Materials
I designed a series of 10 trials using 16 antioxidant-rich foods and testing 6 different types of plants. I observed quantitative and qualitative data like plant height, number of leaves, length of leaves, and overall health of plant. 183 treatments of antioxidant-rich food supplements based on different combinations of different amounts and frequencies on 672 test plant subjects over an 8-week period were examined. Statistical analyses like one-way and two-way analysis of variances (ANOVA) were also conducted. In trials 3 to 6 and 8 to 10, the power of replicates was employed. Trial 10 employing 345 plant subjects tested 57 experimental groups, each with 6 replicates, covering 19 different combinations of antioxidant-rich foods in 3 different amounts to study the effects of both factors. 2-way ANOVA with replication was run on the trial 10 experimental data.

Results
At 99.5% confidence level, I concluded that the type and amount of antioxidant-rich foods affect plants' growth and health. At 86.7% confidence level, I also concluded that the effects of antioxidant-rich foods on plants depend on the amount of supplement. Antioxidant-rich foods such as Green Tea, Neem, Gotu Kola, Hibiscus, Cinnamon, Onion, and Ginger positively affect plants. Certain combinations of antioxidant-rich foods like Gotu Kola, Hibiscus, and Amla work together to beneficially affect plant growth and health. Higher concentrations of certain antioxidant-rich foods like Cloves and Spirulina are harmful to plants. At the end of the experiment, experimental plant subjects survived longer than control group subjects when they were subject to water and nutrient stress.

Conclusions/Discussion
Antioxidant-rich foods as supplements to plants can be employed as a tool to improve farmers' net income with longer harvests, higher quality yields, and better shelf life. We can consume these high quality plant products, fight free-radicals and diseases, and say hello to a healthier world!

Summary Statement
My experiment aims to demonstrate a norm of Vrikshayurveda, an ancient practice of giving herbs with potent antioxidant activity as supplements to plants, and proves that antioxidant-rich foods positively affect plants' growth and health.

Help Received
Grandma motivated to undertake this project; Mom guided in design of experimental trials; Dad taught me the power of replicates for greater experimental success; Grandpa, Uncle, Aunt provided rare antioxidant-rich food supplements; Mrs. Hall initially advised; Mrs. Nguyen guided me in this project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Sean Rhoades; Devin Walker

Project Number
J1927

Project Title
Bug-a-licious

Abstract

Objectives/Goals
Many different insects are used as food for reptiles, birds, and carnivorous plants. Which are the most nutritious for Sundews? To find which feeder insect is the most nutritious to Sundews.

Methods/Materials
Fifteen Sundews, small crickets, small mealworms, small Guyana Spotted Cockroaches, and caught spiders to feed to the Sundews. We then measured all the Sundews both radius and weight. Each day we fed and water the Sundews, always making sure the sun lamp was on all day and off all night. We measured each insect into one by one centimeter pieces. We took good notes each day. Once a week we measured and weighed each Sundew. We did this for forty-two days. Then we compared the growth and charted or graphed results to find out which was the most nutritious insect to feed the plants.

Results
The Guyana Spotted Roach or lime group had the most growth with .4 centimeters. Coming in second was Mealworms or green group with a total growth of .3 centimeters. Third were crickets or black with a total growth of .2 centimeters. The grey group or spiders and control group had the same growth of .1 centimeters.

Conclusions/Discussion
We find it funny that every year we do this project a different insect wins. This proves that my dropping of the Cricket fed Venus Fly Trap terrarium was not a factor in my first project. Also that ensuring that each Sundew receives an equal amount of food did not have an effect on our results. We believe if we were to continue this project and improve it, we would also do a bare root weight at the beginning and end of the project, we would also use a different type of Sundew to see if that will change the results.

Summary Statement
Which insect is most nutritious for Sundews.

Help Received
Our mothers helped with the display board; our fathers helped with feeding the Sundews.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Venkat N. Sankar

Project Number
J1928

Project Title
Using Astragalus purshii var. tinctus to Inhibit Growth of Invasive Thistles (Centaurea ssp.)

Abstract

Objectives/Goals
The goal of this project is to find a natural and cost-effective method that does not use pesticides to control the spread of star thistle, genus Centaurea, a family of plants that has reached invasive levels in California. Thistle infestations deprive native plants of water, reduce access to open spaces and cause fatality when ingested by livestock. Specifically, based on the observation that star thistles coexist in their native Mediterranean habitat with several species of milkvetch (Astragalus), the project attempts to determine whether native California milkvetches (Astragalus purshii var. tinctus) can be effective in inhibiting the growth of star thistles.

Methods/Materials
The growth of star thistle was compared in two experimental settings: a control group where star thistle was grown from seeds by itself; and an experimental group where thistle was grown along with milkvetch. The plants were grown in large redwood planter boxes inside a temperature-controlled greenhouse facility. Much care was taken to replicate a classic foothill soil similar to what may be found in the Sierra Nevada and Diablo Range mountains of central California. The growth of these plants was observed over a one month period. Seedling count for star thistle was systematically recorded in the control and experimental groups at 4-day intervals. Biomass of star thistle and milkvetch was also measured at the end of 32 days.

Results
The growth of star thistle in the experimental setting was observed to be significantly less compared to the control group, in terms of both seedling count and biomass measurements. The results support the hypothesis that milkvetch could be effective in inhibiting the growth and spread of star thistle.

Conclusions/Discussion
The experimental results indicate the effectiveness of milkvetch in controlling the growth of star thistle. Further experimentation during spring or summer months in larger outdoor plots of land to derive statistically significant results is recommended as a next step.

Summary Statement
An experimental study confirming the effectiveness of Pursh's Milkvetch (Astragalus purshii var. tinctus), a California native plant, as a natural and cost-effective inhibitor in controlling the growth and spread of the highly invasive star thistle (Centaurea ssp.).

Help Received
Mr. Sommer helped me with the experimental setup in the greenhouse.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Connor T. Schademan

Project Number
J1929

Project Title
The Importance of Coyote Bush in Chaparral Ecosystems

Abstract

Objectives/Goals
My objective was to learn what roles the coyote bush and its' visitors play in chaparral ecosystems during the fall.

Methods/Materials
Using insect nets, kill jars, and observational skills, I collected insect specimens and sighted other animals, such as tree frogs. I visited the site four times and collected and sighted specimens on two different coyote bushes. I pinned the insects and identified each one down to family using books and the help of CSU Chico professor and entomologist, Dr. Donald Miller. By comparing our specimens to those of the University's insect collection, I managed to do this. Dr. Miller reviewed my identifications for accuracy. I calculated the number of individual specimens collected in each family. To determine the food source and niche of each specimen, I used textbooks and Internet searches.

Results
I observed and/or caught and identified 82 individuals from 9 different orders and 23 different families. Most of these were pollinators/nectarivores, followed by carnivores/predators, herbivores, omnivores and parasites. I calculated percentages for each order caught, individuals caught in each niche category, and native/non-native species. I then generated several graphs to show these results.

Conclusions/Discussion
My conclusion is that an entire food web of animals was located on these two bushes. This is important because fall is a time of year when insect populations are very low. These data suggest that coyote bush plays a vital role in providing both native and non-native pollinators and pest-eating predators essential nutrients to make it through the winter. The data further suggests that planting or conserving coyote bush will increase animal diversity in chaparral ecosystems.

Summary Statement
My project is about how flowering coyote bush is vitally important to chaparral ecosystems because it supports an entire food web of organisms in the fall when insect populations are very low.

Help Received
Mother and father helped format report; Used insect collection at CSU Chico under the supervision of Dr. Don Miller; Dr. Kristina Scheirenbeck, CSU Chico, helped with plant identification; Mr. Jeff Mott, Dir. of Butte Creek Ecological Reserve - Honey Run Unit, for permission to collect specimens and encouragment

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jerry M. Song

Project Number
J1930

Project Title
Solving World Hunger

Abstract

Objectives/Goals
I have always been upset that so many people in the world have hardly anything to eat. If food were more common, that wouldn#t be a problem. My experiment, #Solving World Hunger# will test if plants can grow all day and nights. It will also test if artificial sunlight is as efficient as natural sunlight.

Methods/Materials
In my experiment, I grew three broccoli plants with different lighting and time. One plant was grown only during the day with natural light. Another was grown only at night with artificial light (55-watt incandescent light bulb). The last was grown day and night; it was exposed to sunlight during the day and under a light bulb at night. I used very similar broccoli plants to control many factors. The independent variable was the different lighting and time, while the dependent variable is the amount each plant grows.

Results
At the end of my experiment, I found out that the plant grown at day and night grew the quickest. However, it was not as efficient as I had hoped as it only grew a few more centimeters than the plant grown only during the day. Meanwhile, the plant grown at night could not grow quickly and did not have any buds.

Conclusions/Discussion
Overall, I determined that my hypothesis was partially correct. I correctly guessed that the plant grown in the day and at night would grow the quickest. However, I did not think the growth rate would be so close to the plant grown only at day. Therefore, I can conclude that plants, like humans, need to #go to sleep.# At night, plants are performing respiration, a process which changes food to energy plants can use. However, my experiment wasn#t flawless. First, rain kept on pouring which decreased the growth of the plants that grew outdoors. Also, bugs constantly ate the plants that grew outside. Next time, I will use spray to get rid of bugs and build a greenhouse to protect the plants from rain.
If my experiment were more successful, plants can be grown at a quicker pace resulting in an increase of the amount of food. This will help farmers be more efficient. Due to the concept of supply vs. demand, if there is more food, the price of the food would go down. More people would be able to afford food, and this may help solve world hunger.

Summary Statement
My project is about finding an efficient way to grow plants by using 24 hour lighting.

Help Received
My mom and sister helped make my board. My teacher helped me create my write-up. My dad helped find problems with my experiment.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Chaitra S. Subbarao

Project Number

J1931

Project Title

An Elegant Test to Measure Post-Harvest Decay of Different Lettuce Cultivars

Abstract

Objectives/Goals

Lettuce is an important commodity in the Salinas Valley, and a popular vegetable. Four principal types of lettuce are grown in the Salinas Valley; and with the popularity of salad mixes, different lettuce types are mixed even though not all lettuce types have the same shelf life. I wanted to determine which lettuce type had the longest shelf life and the reason behind it. I hypothesized that decay is related to the number of ruptured cells. My project developed a method to measure decay based on which people can select cultivars with a longer shelf life.

Methods/Materials

I harvested six lettuce cultivars of various types from an experimental field. I processed each cultivar with a processor that chopped the lettuce into small pieces, bagged them, and placed them in the cold storage maintained at 3.5°C. Each bag was visually evaluated for pinking and decay of lettuce once a week for 7 weeks using a scale of 1-5 (1=worst and 5=best). I wanted to determine the reason for difference in decay of the cultivars. The percentage of ruptured cells was estimated indirectly through measuring of electric conductivity (EC). With fresh tissue, all the cells are whole and none of them are ruptured, so less electricity is conducted from one electrode to another.

Results

Two of the cultivars were fully (or almost fully) decayed at the end of the experiment, with the rating of less than 2. Pinking occurred much faster than decay; three cultivars showed severe pinking (values below 3) already in the first week. Some cultivars with severe pinking did not decay fast, indicating that the two processes are independent. The cultivars with the most decay had the highest electric conductivity.

Conclusions/Discussion

Lettuce cultivars differed in their shelf life with some lasting many weeks post-harvest and some breaking down within a few weeks. This break down could be measured by visual evaluation of decay and pinking. Both decay and pinking ranked cultivars similarly suggesting any one of these measurements was sufficient to evaluate cultivars. For example, La Brillante was the best cultivar for both decay and pinking. However, it is possible that in a different set of cultivars this relationship will not be observed. EC was directly proportional to the decay rating. The higher the decay for a given cultivar, the higher was the EC value. The study of my experiment reveals that ruptured cells are the cause of faster decay.

Summary Statement

I studied the variation in lettuce cultivars for post-harvest shelf life and developed a method to measure it.

Help Received

Under the supervision of Dr. Ivan Simko, Research Geneticist, USDA-ARS, Salinas, CA 93905

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Lindsey B. Swall

Project Number
J1932

Project Title
Soil Microorganisms: Who Needs 'Em?

Abstract

Objectives/Goals
Soil may look like a bunch of dirt, but good quality soil is actually a complex mixture of dirt, nutrients, microorganisms, insects and worms. What type of benefit do these microorganisms offer a growing plant? I tested this by baking and freezing soil to try and sterilize it and kill the microorganisms. I hypothesized that, "If I plant 8 radish seeds in soil that has microorganisms and is unsterile, and 8 radish seeds in two other containers where the soil has been sterilized, then I predict that the radish seeds planted in the unsterilized soil will grow better because of the microorganisms in the soil."

Methods/Materials
I baked a sample of soil in 300 degrees for 2 hours. I froze soil in my freezer for 2 hours as well. I planted the radish seeds in each of the three different soils; baked, frozen and non sterile soil.

Results
The soil that was untouched and full of microogganisms did much better then the two sterilized soils. The plants grew faster, were fuller, taller and healthier.

Conclusions/Discussion
I proved my hypothesis correct and learned that caring for soil and preparing it with nutrients and additives to keep the microorganisms thriving and healthy, is very important!

Summary Statement
Determining if soil microorganisms are crucial to the health of a growing, thriving plant.

Help Received
Mother helped type and edit report.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Amelia Woo; Veronica Zehnder

Project Number
J1933

Project Title
Speady Sprouts: Treating Seed Coats to Speed Up Germination

Abstract

Objectives/Goals
The purpose of our project is to see if treating the seed coat speeds up germination of pea seeds.

Methods/Materials
In our experiment we were measuring the speed of germination which we defined as the time that we first saw the beginnings of the root. We pretreated the seeds by sanding one side of the seed coat (sanded), peeling the entire seed coat off (peeled) and putting the seeds into a rock tumbler with sand (rock polished). We ran two trials, testing 4 seeds in each condition. Pre-testing was done to determine the time to run the rock polisher and the seeds we should use.

Results
From our experiment we saw that out of the three conditions tested, the peeled condition worked the best to speed up germination. The second best treatment was rock tumbling. Sanding the seed did little to help germination.

Conclusions/Discussion
Based on our results the peeled seeds germinated faster than the other conditions. We think this happened because the seed did not have to use as much force to sprout through the seed coat. Rock polishing also worked to speed up germination but wasn#t as fast as peeling the seed coat off. We think sanded did not work as well as we thought it would because we might have damaged the nutrients inside the seed when we sanded the seed coat.

Summary Statement
Our project investigated how treating the outside of a pea seed affected the rate of germination.

Help Received
Mentors (Dr. Hastedt, Mrs. Shimshock, Dr. Sivanand) suggested ways to think about our experiment and improve our project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Casey K. Wu

Project Number
J1934

Project Title
Fibonacci Phyllotaxis in French Marigolds

Abstract

Objectives/Goals
To observe if excess light affects the Fibonacci phyllotaxis of marigolds thorough mutations.

Methods/Materials
Cardboard boxes, 75watt plant bulbs, Six French Marigolds, Water, Lampshades, Wiring. To test, grow Marigolds under varying amounts of light until a sufficient amount of buds is grown to accommodate an accurate test group. Observe each marigold for mutations in petal shape or count.

Results
: Marigolds grew mutations throughout all groups including control, all mutations were similar in shape and Group-1 the control, received 10 hours of light, had mutations in two of three remaining flowers, the other 3 flowers died off before being able to bloom. In Group-2, three of three flowers had mutations, the remainder of plants died off before being able to bloom. In Group-3 one of three flowers had mutations, remainder of flowers die off before being able to bloom. All marigolds with mutations had an #m# mutation where the petal tip was an extreme #m# shape. No marigolds had phyllotaxis mutations

Conclusions/Discussion
Marigolds do mutate under light, however the extent and probability of mutations is unknown because of insufficient an insufficient testing size. No phyllotaxis errors occurred during the testing period. French Marigolds have a phyllotaxis that is sufficient in most amounts of light.

Summary Statement
To observe whether exposure to excess sunlight affects the Fibonacci Phyllotaxis in French Marigolds.

Help Received
Teacher helped with writing of notebook, Mother helped watering plants, Father helped with electrical wiring