CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Sara D. Ansolabehere

Project Number
S1601

Project Title
The Analysis of the Uptake of Nitrogen in Grasses and Legumes

Abstract

Objectives/Goals
The objective of this study was to find the amount of nitrogen that is taken up by both grasses and legumes.

Methods/Materials
The first thing that was done was growing the plants(grasses and legumes) until their true leaves appear. Then the amount of nitrogen in each of the plants was measured and then it was decided about the amount of nitrogen that was contained or taken up in each of the plants.

Results
The legumes that were grown with nitrogen took up more nitrogen than any of the other plants.

Conclusions/Discussion
The legumes took up more nitrogen than the rest of the plants because of the rhizobium bacteria that they contain which allows them to absorb nitrogen from the atmosphere.

Summary Statement
The analysis of the up take of nitrogen in grasses and legumes.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Elizabeth R. Ayral

Project Number
S1602

Project Title
Growth with Less Water

Abstract

Objectives/Goals
The purpose of the project was if water storing granules (Rain Drops) helps to conserve water, while still being able to observe substantial growth in Perennial Ryegrass, Bermuda grass and Kentucky Bluegrass.

Methods/Materials
Plant 2 grams of seeds in cups #1, #2, #3, #4 and #5 of Perennial ryegrass, Bermuda grass and Kentucky Bluegrass. For each #1 cup give it the regular amount of water. For each #2 cup mix 2 grams of Rain Drops into the soil, but water it with the regular amount. For each #3 cup mix 2 grams of Rain Drops into the soil however stop watering 2 weeks before the end of the 4 weeks. For each #4 cup mix 2 grams of Rain Drops into the soil however stop watering 1 weeks before the end of the 4 weeks. For each #5 cup mix 2 grams of Rain Drops into the soil however only water for one week. Every week, measure the growth and record results. When the four weeks are complete analyze results.

Results
Perennial Ryegrass #1 at the end of the four weeks had grown 10.5 cm, #2 grew 10.2 cm, #3 grew 6.5 cm, #4 grew 10 cm and #5 grew 3.5 cm. Bermuda grass #1 grew 2.5 cm, #2 grew 2.5 cm, #3 grew 2.5 cm, #4 grew 3 cm, and #5 grew 2 cm. Kentucky bluegrass #1 grew 7.5 cm, #2 grew 7 cm, #3 grew 6 cm, #4 grew 7.5 cm, #5 grew 5 cm. My hypothesis was proven correct because Rain Drops added to the soil did conserve water, while still being able to observe growth in Perennial Ryegrass, Bermuda grass and Kentucky bluegrass.

Conclusions/Discussion
Bermuda grass conserved the most water when Rain Drops were added to the soil because it is very drought tolerant and takes considerable abuse. It's very common in Arizona. Kentucky Bluegrass needs a lot of water, however being a fast growing grass allows it to have the ability to develop a good root system against drought. Perennial Ryegrass, however, has very high water needs and flourishes best in areas with mild winters and cool moist summers. Rain Drops did help conserve water because it restores the roots water storing granules. Rain Drops, that contains another product called SaturAid, rewetting granules creates channels to move water to the roots. Rain Drops when added to the soil has been known to reduce normal watering by about fifty percent.

Summary Statement
The effects of water storing granules on the growth of Bermuda grass, Kentucky Bluegrasss and Perennial Ryegrass.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Sudeep Banerjee

Project Number
S1603

Project Title
A Taxonomic Reassessment of the Orders Ectocarpales and Scytosiphonales Based on Ribosomal Small Subunit DNA Sequences

Abstract

Objectives/Goals
Evolutionary relationships within the Class Phaeophyceae (brown algae) have long been a source of discussion and speculation. Previously the Orders Ectocarpales and Scytosiphonales had been defined as sister orders, however recent analysis of the Order Scytosiphonales nullified its existence and grouped these species within the larger Order Ectocarpales. This taxonomic hypothesis has been put forth with limited taxon sampling. Due to apparent morphological differences and molecular data based research, I predict that sufficient speciation has occurred so that Scytosiphonales is monophyletic and sister to the Ectocarpales.

Methods/Materials
After selecting a set of morphologically diverse species for the Orders Scytosiphonales and Ectocarpales, I chose Laminariales as outgroup set based on taxonomic divergence. After undergoing DNA isolation, purification with Phase Lock Gel, Polymerase Chain Reaction (PCR), PCR Purification, Cycle Sequencing, Cycle Sequence Reaction Purification, lyophilizing and finally sequencing I obtained DNA sequence of two species. I used both sequences along with several other species of Scytosiphonales, Ectocarpales and Laminariales, from GenBank and analyzed them using Parsimony and Maximum Likelihood systematics.

Results
After employing the parsimony and the maximum likelihood approaches, two consensus trees resulted. Although the species from Order Scytosiphonales formed their own clade, they were not independently monophyletic of the entire Order Ectocarpales, disproving my hypothesis.

Conclusions/Discussion
This experiment based on the 18S SSU has confirmed the nonexistence of the Order Scytosiphonales. Because previous studies, based on alternate DNA regions, have indicated that sufficient speciation had occurred, perhaps the level of conservation on the small subunit is too great to make valid analysis of this ordinal divergence. Since, the taxon sampling of this study is double the quantity of previous studies; the broader range of species also suggests that Ectocarpales on the basis of the 18S region is inclusive of Scytosiphonales. The original tree which separated Order Scytosiphonales and Ectocarpales based on morphological differences is also nullified based on this experiment.

Summary Statement
A study on the extent of evolutionary divergence of Phaeophyceaen Orders Ectocarpales and Scytosiphonales based on Ribosomal Small Subunit comparative DNA sequences.

Help Received
I would like to thank Fresno State University for allowing me to work as an independent researcher with assistance from graduate student Matt Ashworth

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Chris M. Chaplin

Project Number
S1604

Project Title
Sudden Oak Death (Phytophthora ramorum)

Abstract

Objectives/Goals
The major purpose of this experiment was to determine if the zoospores produced by p. ramorum search for hosts after making contact with water. The secondary purpose of this experiment was to determine if light could affect the progression of the zoospores when they travel on water.

Methods/Materials
Phytophthora ramorum cultures were grown in a laboratory. When they reached the proper life stage, the zoospore stage, the zoospores were concentrated and placed into a petri dish with one of three different types of leaves at one end (either rhododendron, tanoak, or bay laurel). After a designated amount of time, samples were taken from both near the leaf and on the opposite side of the plate away from the leaf. These samples were then placed on a medium and incubated for a week, after which time they were checked for new growing colonies and the colonies were counted. (There were also two extremely important preliminary experiments that were performed before the final experiment was performed. The first one was to decide the proper zoospore concentration and the second one was to decide at which time should the samples be taken after innoculation.) [In addition to having the plates with the zoospores in them, half were put under light and half were put into dark for the final experiment.]

Results
The data from the first experiment revealed that the best out of the three tested zoospore concentrations was 10000 zoospores/mL. The data from the second experiment showed that the best time to take the samples from the petri dishes, out of the two tested was 15 minutes after inoculation. The data from the first and second runs of the third experiment revealed that there were slightly more colonies on average near the leaf than away from the leaf (when the zoospores received light) and there were slightly more colonies away from the leaf when the zoospores received no light.

Conclusions/Discussion
There appeared to be an attraction between the zoospores and the leaves (even though the standard deviations caused a slight overlap). There also appeared to be an affect of light on the motility of the zoospores. In the light, there were more colonies found near the leaf than away from it. In the dark, there were just as many if not more colonies found away from the leaf as there were near the leaf.

Summary Statement
The experiment was about determining if the zoospores produced by Phytophthora ramorum (water mold that causes Sudden Oak Death) were attracted to the leaves of known plant hosts.

Help Received
Used lab at U.C. Berkeley under the supervision of Dr. Matteo Garbelotto

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Logan J. Creighton

Project Number
S1605

Project Title
Will Hyperbarics Effectively Increase the Development of the Red Kidney Bean?

Abstract

Objectives/Goals
The purpose of this project is to determine if pressure alone can induce plants to grow with greater efficiency. I believe that in an environment with a higher pressure, the plants, being surrounded with a larger amount of carbon dioxide than is usually present, will grow more effectively.

Methods/Materials
A hyperbaric chamber was constructed out of an 84 inch long cylinder tank with a diameter of 45½ inches. This tank was equipped with all the necessities to sustain plant life including water, heat, and light. Kidney beans were sprouted and planted in pots which were placed into the tank. Growth was recorded through the use of measuring sticks which were placed in the pots along with the plants. Plants grew for ten days, after which the final heights, color, amount and size of leaves, and stem thickness of the plants were recorded. New seeds were selected and the tests were repeated only this time the tank was pressurized to 15 pounds per square inch (double the normal atmospheric pressure). The recordings were made the same way and for the same time duration.

Results
My data shows plants benefit from increased pressure. I have recorded evidence proving plants grown in an environment with an air pressure double that which is normal, have a much darker color indicating an increase in chlorophyll as well as superior health. The pressurized plants frequently had thicker stems, smaller leaves, less leaves, and shorter height due to the higher pressure. I also discovered if a seed is allowed to germinate in a controlled pressurized environment its chances of survival are far greater. Out of a total of 189 seeds grown in normal pressure 29 rotted while out of the same number of pressurized plants I lost only one.

Conclusions/Discussion
Based on my results, I can conclude that my hypothesis was correct. Placing a red kidney bean plant under hyperbaric conditions will improve its development in the area of health which could be considered the most vital of all. It is my belief had I continued my observations for a greater length of time I would have seen that the pressurized plants had a longer life span compared to those grown under normal conditions. (Research still being conducted.)

Summary Statement
This project demonstrates that plants will grow more efficiently in an environment with double the normal atmospheric pressure.

Help Received
Thank you to my father for purchasing the materials and to my mother and sister for proofreading my work.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nicole J. De Nisco

Project Number
S1606

Project Title
The Effects of Interrupting the Dark Period Given to a Short Night Plant with Different Colors of Light

Abstract

Objectives/Goals
The objective of this project was to determine the effect of light exposure during the dark period given to a short night plant on the flowering patterns of the plant. Another goal was to discover which color, or wavelength, of light best emulated the effect of the sun on the plant.

Methods/Materials
I obtained 14 petunia plants and divided them into experimental and control groups. I had two control groups that consisted of two plants each. One control group received a dark period of 11 hours, less than the critical night length, and the other control group received a dark period of 14 hours. I exposed the experimental groups, also consisting of two plants each, to red, yellow, blue, black or white light. The experimental plants were exposed to light during the first four hours of their night period, which was controlled by putting the plants in plastic boxes at certain times.

Results
The control plants that received a dark period longer than its critical length started to flower slower than the other control plants once new buds formed. The results within the experimental group were not as clear since new buds did not have enough time to fully form and flower. All the plants flowered, but most of these were based on pre-existing buds. It appeared that the buds on the plants exposed to the white light were developing at a more rapid rate than the other plants. I am currently repeating this experiment for a longer period of time in hopes that I get results that are clearer.

Conclusions/Discussion
The petunia is a quantitative short night plant and will not flower as quickly or as fully if it receives a dark period over the critical length of 13 hours. This was proven through my experiment because the control plant that received to much darkness did not bud and flower as quickly as the plant that received the correct amount. In the experimental group new buds started forming on the plants exposed to white and blue lights, but the experiment had to be stopped before more data could be gathered. The results of my current trial, which will be included in my final project, will be more conclusive since I am running the experiment for a longer period of time and obtaining a more effective lighting system. This research is very important to the floral industry since it is often necessary to manipulate the flowering patterns of plants so they will be in season at the right time.

Summary Statement
This project deals with the photoperiods and flowering mechanisms of plants by showing the effect that artificial light has on the flowering of a plant when it interrupts the dark period experienced by that plant.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Anthony E. Doser

Project Number
S1607

Project Title
pH and Its Effect on Plants

Abstract

Objectives/Goals
The objective of my experiment was to test the pH levels of the water used to nurish the plants and find out the different effects on the plants.

Methods/Materials
Two different chemicals were used to change the pH balance of the distilled water used to nurish the plants. They were NaOH (Sodium Hydroxide), HCI (Hydrocloric Acid).The growth facters were then tracked for each of the differnt pH levels. For height,sturdiness,color of leaf,and deformity of plant.

Results
Plants tested on the lower end of the pH scale pH-1,3,5,and 6 were effected by having the appearance of burnt leaves as well as pH 1,and 5 had lack of sturdiness. Plants tested in neutral (pH 7) showed the best results for health and growth.Plants on the higher end of the pH scale pH-9,10,12,and 14 failed to thrive.They showed earily signs of deformity of fruit, lack of sturdiness and discoloration of leaves. They died during the course of the experiment.

Conclusions/Discussion
In this experiment I found many interesting results. My hypothesis had stated that the plants tested in pH 5,6,and 7 (neutral) would have basicly the same outcome. This statement was proven wrong in the course of the experiment. The plants in pH 5 had a worse reaction of the lower end of the pH scale and pH6 show signs of discoloration in the leaves.pH 7 (neutral)thrived and grew the best. My hypothesis also stated that pH 9,10,12 and 14 would have the worse reaction, this was proven correct. According to my research data it shows just how important the pH levels are to the health and well-being of plants on whether they thrive or not and how important it is for our food crops.

Summary Statement
This experiment will show the effect of pH levels on Plants.

Help Received
Mr. Porter my chemistry teacher helped with equipment and experiment procedures, Mr.Mayfield my FFA adviser helped with board, My mom helped with materials and wording of my report.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Katherine R. Hill

Project Number
S1608

Project Title
The Effect of the Centrifugal Force on the Geotropism of Lentils (Lens esculenta)

Abstract

Objectives/Goals
The purpose of my project was to test if plants will respond to centrifugal force by deviating from their normal lateral growth and how will the magnitude of their response relate to the amount of centrifugal force applied.

Methods/Materials
Methods:
· Seeds were sandwiched between two glass slides containing cotton
· Cotton within each assembly was soaked with water and kept moist throughout the experiment
· Rotating seeds were placed on the rotating disk and controls were placed on a wood block
· The slides were rotated on a circular disk, powered by a small motor, at two different distances from the axis of rotation.
· The magnitude of the growth was checked & recorded daily
· Angle of growth was marked daily on the outside of each glass slide with a permanent marker.
· At the end of the rotation period, the resulting growth pattern was transferred onto tracing paper.
· The angle of stem growth was determined using the "line of best fit" from the tracing paper.

Materials:
1 Small motor, 1 Circular disk, 1 Box frosted glass slides, 1 Box non-frosted glass slides, Cotton balls, Water, Ruler, Protractor, Stopwatch, Lentil seeds, Syringe, Screwdriver, Small rubber bands, Large rubber bands, Parafilm, Permanent marker, Tracing paper, Wood spacers, Wood block

Results
The centrifugal force did affect the angle of plant growth and the magnitude of the centrifugal force was in direct proportion to the resulting angle of plant growth.

Conclusions/Discussion
My hypothesis was correct, plants grown with an amount of centrifugal force acting upon them will experience geotropism and their angle of growth will be in direct proportion to the amount of centrifugal force.

Summary Statement
To establish if the centrifugal force effects the geotropism of plants, and if so, determine the relationship between the magnitude of the applied force and the corresponding geotropic response.

Help Received
Grandfather helped build the rotating device.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Alexander A. Kayvanfar

Project Number
S1609

Project Title
Nutrient Uptake Efficiency in Corn and Wheat and Its Effect on Growth in a Hydroponics Setup

Abstract

Objectives/Goals
This project was done to determine if nutrient uptake efficiency affects the growth of plants, specifically corn (Zea mays) and wheat (Poacease triticum). Nutrient uptake efficiency gives an understanding of how the roots of plants observe nutrients in their surroundings.

Methods/Materials
First, two static hydroponics systems were built to grow the plants. Each hydroponics system contained a tray, a PVC frame, netting, Rockwool grow cubes and a pump. The test was conducted over a three-week period with height and nitrate measurements taken daily and then every two days. Nitrate measurements were taken using a nitrate test kit and spectrophotometer analysis. Nutrient uptake efficiency was defined as the acquired nutrients that the plants take up over the available nutrients.

Results
For all of the measurements the efficiencies for the two plants were consistent excluding occasional oddities. Corn had a higher uptake efficiency than wheat. However, wheat outgrew corn by approximately two times.

Conclusions/Discussion
The conclusion was made that as nutrient uptake efficiency within a species increases, growth rates will also increase. Also, comparisons of nutrient uptake efficiency to growth rate ratios between different species are not highly significant. This is because of the different growth patterns and nutrient allocation methods for each plant.

Summary Statement
My project tested to see if nutrient uptake efficiency affects plant growth.

Help Received
Used lab equipment at Viewpoint School; Communicated with mentor at University of Minnesota - Duluth

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Adam J.P. Krause

Project Number
S1610

Project Title
Natural Reintroduction of Valley Live Oaks in an Abandoned Walnut Orchard in a Major Urban Park

Abstract

Objectives/Goals
I tried to show that there is a pattern for the new Valley Oak trees that are growing in an abandoned Walnut tree orchard in a city park.

Methods/Materials
I counted young Valley Oak trees. I located them in grid squares and showed how far they were from the big Valley Oaks around the edge of the orchard. The grid squares were already there as the Walnut trees were planted 60 feet apart in all directions. The young Valley Oaks inside each square were counted and recorded on a map. The only trees that were counted were trees above 3 feet in height and larger than one inch in diameter. The big Valley Oaks on the edges of the orchard were measured in diameter.

Results
There is a relationship in the number and locations of new trees that are growing and the locations of old trees that are next to the main road.

Conclusions/Discussion
I have shown that there is a concentration of naturally occurring Valley Oak trees. As of yet I have not proved why this happens, but some of the possible reasons would be, there is an underground stream effecting soil moisture, different places in the orchard have different levels of fertile land, the shadows from the established Walnut trees affect the new Valley Oaks, or even that squirrels bury nuts only in certain locations.

Summary Statement
It is about the natural reintroduction of native vegetation in an urban park.

Help Received
Paul Krause (father) helped with the tree measurements; Mary Krause (mother) helped arrange the information on the poster; and Jena Krause (sister) also helped arrange the information on the poster.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Caitlin A. McCabe

Project Number
S1611

Project Title
Alterations of Growth and Genetic Make Up Due to the Introduction of Organic Compounds

Abstract

Objectives/Goals
By feeding 2 young tomato plants carrot juice with organic substance, injecting 1 tomato plant with carrot juice, and by cutting a tomato plant open and injecting carrot juice into the wound characteristics of carrot plants will appear in the tomato plants either visually (by human sight) or by molecular testing and make the tomato plants a form of a recombinant organism.

Methods/Materials
In this experiment I grew six young tomato plants and let them grow under their conditions stated in the hypothesis for 13 days. After 13 days I took the plants and put them under several tests.
The first test was Thin Layer Chromatography in which small portions of the plants were taken and tested for pigmentation to see if there were any carrot cell uptake into the tomato plants.
The sencond test was DNA Extraction in which the DNA from the tomato plants was extracted in order to perform Gel Electrophoresis.
The third test was Gel Electrophoresis in which the extracted DNA was run in order to compare the DNA from the tomato plants grown to a carrot plants DNA, a tomato plants fruit, and a carrot root.

Results
In growing the tomato plants the plants fed were significantly smaller in size than the controls. Also the plants fed had shown newer characteristics such as leaf shape, size, and color not found in the controls or the injected.
In Thin Layer Chromatography there were significant amounts of Carroteniod pigment in the tomato plants that had been fed the carrot juice and small traces of Carroteniod in the injected and cut tomato plants.
In the DNA Extraction there was no DNA extracted from any of the test subjects. Instead of DNA I used the protein extract to perform the Gel Electrophoresis.
In the Gel Electrophoresis the protien substance that had been extracted in the previous test was run and the results concluded that the plant that had been injected the carrot juice had a small trace of carrot protien in themselves. It also showed that the plants fed carrot juice had a small bar but not as significant as the injected plant.

Conclusions/Discussion
In conclusion the results of the experiment proved that the hypothesis was true because there was an in take of the carrot cells and carrot protien and that it had caused some of the tomato plants to show new or modified characteristics different to the normal tomato plants growth.

Summary Statement
The effects of specific organic compounds on tomato plants growth and characteristics.

Help Received
Used Ribet Academy lab facitlites and equiptment under the supervision of my teacher Mr. Michail.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Luke C. Penn-Hall

Project Number
S1612

Project Title
The Effects of Three Common Weather Conditions on a Plant's Rate of Transpiration

Abstract

Objectives/Goals
The objective of this experiment was to test the effects of three common Southern California weather conditions, humidity, wind, and Santa Ana wind, on a plant's rate of transpiration.

Methods/Materials
This experiment required several Rose of Sharon shoots, the construction of a potometer for which I needed: one glass pipette, one metric ruler, one stand, and one 12 inch length of flexible plastic tubing. I also required one fan, one blow dryer, one spray bottle and one plastic bag. The Rose of Sharon shoots were placed into the potometer. I then made sure that the seal was ait-tight. Each shoot was subjected to one of the weather conditions for a period of 5 minutes with the amount of water loss in centimeters recorded every minute. The data was coalated and averaged. The results were put through a formula which converted the measurements from distance in centimeters to volume in mm cubed.

Results
The results of the experiment supported my hypothesis that the weather conditions would alter the plant's rate of transpiration. The wind experiment had the lowest rate of transpiration, only 282.75mm cubed per five minute period. The control and humidity experiments both had the same the same rate of transpiration, 329.87mm cubed. And the Santa Ana, or "hot" wind, experiment had the highest rate of transpiration, 471.24mm cubed.

Conclusions/Discussion
Transpiration is an important life process because it is a necessary step in the photosynthetic process. Knowing how much water a plant transpires under certain conditions is invaluble in times of drought and water conservation. This experiment could also be expanded to help decide which plants would best survive in an arid or demanding climate for terraforming purposes. The test plant, a Rose of Sharon, would work well in Southern California. It would require a little more water during the Santa Ana winds. It would conserve water during the normal, dry winds. And it is well suited to this area's climate.

Summary Statement
The point of this project is to find the effects of three common weather conditions on a plant's rate of transpiration.

Help Received
My mother helped me design the board and took photograohs.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Maya A. Segal

Project Number
S1614

Project Title
Nitrogen-Fixing Bacteria vs. Nitrogen Fertilizer

Abstract

Objectives/Goals
When using legumes which raises the nitrogen level in the soil more, nitrogen-fixing bacteria or nitrogen fertilizer?

Methods/Materials
I enoculated alfalfa plants with three different amounts of nitrogen-fixing bacteria and exposed the plants to three different solutions of nitrogen fertilizer. In the first experiment I measured plant growth. Then I realized that the height which the plants grew was not information applicable in everyday life. I realized that testing the soil for its nitrogen content would be more usefull information for future crops of farmers. So I conducted a similar experiment but instead of testing for plant growth I tested for the level nitrogen in the soil with nitrogen soil testers.

Results
The control's plant height average in the first experiment was 92.7mm. The nitrogen bateria's average, which was the highest average, was 97.1mm tall. The average height of the nitrgen fertilizer was 95.6mm. The results in the test were I focused on the nitrogen content of the soil showed me that nitrogen-fixing bacteria had the heighest nitrogen levels slowely progressing from two to three and then it stayed at three. The control's averages started from one to three and then it stayed at three for the last sample. The results for the nitrogen fertilizer started at 1.5 then progressed to 2.5, then to three.

Conclusions/Discussion
Results for the first experiment showed that the more nitrogen fertilizer of nitrogen bacteria you used the taller the plants would grow. The nitrogen-fixing bacteria had a taller plant height average than the nitrogen fertilizer. In the second experiment the results showed that the proscribed amount of nitrogen-fixing bacteria fixes the most nitrogen into the soil. The nitrogen fertilizer fixed the second most nitrogen to the soil.

Summary Statement
In this experiment my goal is to find the differences in the levels of nitrogen in the soil when using legumes enoculated with nitrogen-fixing bacteria and nitrogen ferilizer.

Help Received
My English/science teachers helped me chose my topic and the edited all my work.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Michael H. Sinanian; Alex I. Yerevanian

Project Number
S1615

Project Title
The Learning Plant

Abstract

Objectives/Goals
In this experiment, we attempted to test the hypothesis that plants can be classically conditioned. We used the Venus flytrap as the plant specimen and its trapping response as the behavior to be conditioned. We used stroking the leaf as the unconditioned stimulus (UCS) and vibration of the plant as the conditioned stimulus.

Methods/Materials
1. 3 Venus# Flytraps (Fully grown with leafs)
2. Massager as the source of vibration
3. Toothpicks
4. Stopwatch

We conducted 4 separate experiments using different parameters for the conditioning paradigm. The experimental conditions were as follows:
1.Duration of CS for one minute with low frequency vibration
2.Duration of CS for one minute with high frequency vibration
3.Duration of CS for two minutes with low frequency vibration
4.Duration of CS for two minutes with high frequency vibration.
Each of the four experiments in this research was conducted in 4 phases:
Phase one: baseline assessment of plants' responsiveness to stroking the interior of the leaf with a toothpick. This was to ascertain that the Flytraps were indeed capable of trapping and were healthy.
Phase two: Plants were stimulated with a massaging vibrator for a period of one (or two) minutes to assess whether there was any trapping response to vibration stimulus alone.
Phase three: Coupling of the unconditional stimulus of stroking the inside of the leaf with the vibration stimulus. This was achieved by stimulating the plants with the vibrator applied to the container pot for a period of one or two minutes at high or low frequency
. Midway during vibration, the individual leaves were stroked inside with a toothpick. This procedure was repeated daily for 5 consecutive days.
Phase four: after the 5 day conditioning period, the leaves were stimulated by vibration alone.

Results
Five days following pairing of the CS with the UCS, 0/17 leaves responded to vibration stimulus in experiment 1. In experiments 2, 3 and 4, the response rates were 0/21, 0/22, and 0/22 respectively. There

Summary Statement
Do Venus Flytraps have the ability to be conditioned, and therefore be able to associate a neutral stimulus with and unconditional one?

Help Received
Sister gave technical assistance; Mother helped with board layout design and technical work with the board

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Noelle R. Stiles

Project Number
S1616

Project Title
The Study of Echeveria's Chemical Reactions to Historic Martian Conditions

Abstract

Objectives/Goals
Determine which plants from the genus Echeveria will have the most chemical and productivity change under the chosen Historic Martian conditions (CO(2) and UV light)? Which plant will be the best suited to survive? What conditions cause the most chemical and productivity change?

Methods/Materials
Materials:
Carbon dioxide Four Echeveria species
Table & Board Valves,Connectors and spray nozzles
Ten Plastic Boxes Syringe and Microscope
Sap testing materials (for Benedict, Iodine and Precipitate tests)
Black light

Procedure:
A. Label plants, connect valves to boxes, syringe and Carbon Dioxide tank
B. Blow air out of boxes, place all plants in appropriate conditions (UV, CO(2), Both), with a thermometer in each condition
C. Record data daily on plants conditions, watering, temperatures, and refill boxes every two days
D. Remove plants from conditions, take samples and conduct Benedict, Iodine, Precipitate and Ph tests.

Results
Echeveria Gibbiflora had the most chemical change, Echeveria Pulidonis and Echeveria Doris Taylor both had the second most chemical change, and Echeveria Aeonium Cyclops was the least chemically changed (according to the Iodine, Benedict, and Precipitate tests). For overall conditions Echeveria Gibbiflora faired the best and Ecehveria Aeonium Cyclops the worst. The conditions of solely CO(2) and Both UV and CO(2) caused the most chemical change.

Conclusions/Discussion
My conclusion is that Ancient Mars would chemically alter Echeveria Gibbiflora the most, in terms of energy production and storage. Therefore because Gibbiflora is the best fairing species as well this change can be accounted as positive. This information gives scientists a narrower range in the types of fossils to search for on modern mars, and allows us a glimpse of the possible differences between Martian life and Earthly life.

Summary Statement
I am exploring the possibility of historic plant life on mars, and the difference and parallels this life could have to earthly plant life.

Help Received
My father helped me set up the CO(2) apperatus

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jonathan A. Voos

Project Number
S1617

Project Title
Flamingly Good: Fire Ecology

Abstract

Objectives/Goals

An experiment was set up to test the effect of burned soil on seed germination. Soil samples were collected from five sites, each one varying in burn history. The most recent of three months prior to the least recent of over one hundred years. A variety of indigenous seeds were then planted in the soil and allowed to germinate. The hypothesis was that the soil with the most recent burn history would have the most germination and the one with the most remote burn history would have the least. The data supported the hypothesis.

Methods/Materials

The map is a little outdated, revised in the late 1990's, but all recent fires (which were not on the map) were accounted for when choosing the soil sample sites. From the information four sites were chosen ranging in burn activity: Cold Springs, Painted Cave, Ojai, and Cate School. Two soil samples were collected from slightly different areas in each site. The seeds were indigenous to chaparral of Southern California. The soil was then placed in potting containers. The same number of seeds were used for each type of plant, but varied from species to. The seeds were then water occasionally so that the soil stayed moist. Shovel
Containers - eight
Camera
Seeds

Type	Quantity
California Poppy	200
Chaparral Yucca	80
Giant Coreopsis	80
Island Buckwheat	200
Meadow Rue	200
Succulent Lupine	80

Water
Planting Container
Notepad
Pen
Marking Sticks - eight

Results

Summary Statement

This research presents data that supports the idea that fires establish conditions that enhance the ability of indigenous seeds to germinate in the chaparral biome. The only nutrient that is in excess in the chaparral soils (recently burn

Help Received

Mrs. Powers helped to collect data.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Janelle A. Williams

Project Number
S1618

Project Title
Does the Prehydration of Cottonseed in Plant Growth Regulators Outyield the Prehydration in Water?

Abstract

Objectives/Goals
The purpose of this years experiment is to build on the previous four years work on presoaking of cottonseed before planting. This years project is to see if presoaking cottonseed in plant growth regulators has the same positive results as the presoaking of cottonseed in water only.

Methods/Materials
Soak the cottonseed in separate buckets needed for 40 feet long planting in enough water, and the advised amont of plant growth regulators concentrate (Dip N Grow, ProGibb 4) to cover the seed for the designated time. Cottonseed was then drained, dried, and 120 seeds counted for each treatments five times before planting. Mark five random replications in the field. Plant counts were taken at 5 days, 7 days, 10 days, 12 days, 14 days, 17 days, 19 days, 21 days, and 24 days. Plant map the field mid season. Pick final cotton lint, weight and record at picking season.

Results
The results show that presoaking of cottonseed in simple water out yield presoaking of plant growth regulators. It also showed that more plants emerged from presoaking in water and not the plant growth regulators.

Conclusions/Discussion
The results from this years trial again showed that presoaking cottonseed for 10 minutes in water only, before planting gave the greatest yield in cotton lint. This result was greater than the plant growth regulators used instead of simple water. The treatments with plant growth regulators caused seed emergence problems. Germination of treated seeds was non-typical. This leads to the conclusion that the ratio of treatments to water was to strong, leading to lower plant stands, thus lower yields.

Summary Statement
A five-year study on presoaking cotton seed, this year testing presoaking of water to plant and root growth regulators.

Help Received
Field provided by the Shafter Reseach and Extension Center. Planter, tractor, manual labor, randomization, and research provided by Dr. Brian Marsh.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Evangeline Wong

Project Number
S1619

Project Title
Does an Optimal Level of Salt Concentration Exist for Plants?

Abstract

Objectives/Goals
This experiment's purpose is to determine whether an optimal level* of salt concentration exists for radish plants. I expect that an optimal level exists at 2x10^-4 M, because the concentration is not high enough to dry out the plants; this allows plant growth to continue.
* optimal level: high percentage of germination at relatively high level of salt concentration.

Methods/Materials
Eight hundred randomly selected radish seeds were planted in cups filled with perlite * as well as water or salt water solutions of four different molarities (.2 M, .02 M, 2 x 10^-3 M, 2 x 10^-4 M). Cups were placed in storage boxes to create a dark environment to promote rapid growth. Growth was recorded through the measurement of each plant height (mm) from the collar to the hypocotyl arch. Plants grew for eight days, during which coloration, size, and the number of leaves were also noted and compared. This data was compared to that of plants grown in water solutions. An ANOVA program calculated the variance between the different plant growths.
* holds the plant in place

Results
According to my data, my hypothesis is correct; nearly 65% of the radish plants germinated in the 2 x 10^-4 M solution. However, there was a surprisingly high rate of plant germination in the .02 M salt solution; nearly 40% of the radish plants germinated in the .02 M solution.

Conclusions/Discussion
I planted the radish seeds in salt solutions of different molarities to determine the "optimal level of salt concentration." If an optimal level exists, then this finding can help provide cost-effective and environment-friendly usage of recycled salt water. These findings can ameliorate the water shortages recurring in California and address soil salinity increases resulting from droughts and water cutbacks of the Colorado River. This experiment's relevance to water problems in California as well as the world is undeniable.

Summary Statement
This experiment suggests that an optimal level of salt concentration exists at .02 M and 2 x 10^-4 M.

Help Received
Thanks to my dad for buying the supplies, to Dr. William K. Purves for his botanical knowledge and guidance, and to Mr. Steve Levy for his enthusiasm and encouragement.