CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Syeda S. Ahmed

Project Number
S1601

Project Title
Bacterial and Enzymatic Soft Rot on Vegetables

Abstract

Objectives/Goals
The first part of my project is to determine what causes soft rot on vegetables and which bacteria is the most destructive to the cell walls of the vegetables. Erwinia carotovora subsp. carotovora will cause the most damage compared to Pseudomonas. The second part was to study the effect of the pectic enzyme without the presence of bacteria and to see if the pectic enzyme is active. I believe that maceration will occur the quickest in the solution containing the pectic enzyme. for the Viscosity test, autoclaved solutions will travel the slowest.

Methods/Materials
I had grown bacteria from rotting a cucumber and green pepper. Then, used these three bacteria to test for soft rot by inoculating each of the sterile vegetables and leaving one each of the vegetables uninoculated with bacteria to serve as a control. The bacteria that used were Erwinia (grown from cucumber) and Pseudomonas (two, grown from green pepper). The vegetables that I used were white potatoes, Chinese cabbages, and baby carrots. I made Sodium polygalacturonate nutrient broth without glucose to determine which one of the bacteria was Erwinia. Then, I did the Maceration Test using 1mm slices from potato cores and placing one slice into five solutions and checking it every 15 min. with a sterile toothpick. The five solutions were 1ml of:live broth, autoclaved live broth,filtered broth fresh polygalacturonase, and autoclaved polygalacturonate. For the Viscosity Test, I used sterile Pasteur pipets to measure the time it took from the first line to the second line.

Results
Erwinia did cause the most damage to the cell walls of the vegetables. The solution containing the pectic enzyme did break down the quickest and the solutions that were autoclaved didn't macerate at all. This also proves that the enzyme is active. The solution containing the pectic enzyme had the fastest flow rate and the ones that were autoclaved traveled the slowest.

Conclusions/Discussion
Erwinia usually contains the pectic enzymes in the vegetables, where in most cases, Pseudomonas doesn't. The solution containing the pectic enzyme made the potato slices macerate the fastest because enzymes are used to speed up the process of breaking down the cell walls, causing it to rot faster. No soft rot occurred in autoclaved solution because the enzymes were denatured while being autoclaved. This is the same reason for the Viscosity Test.

Summary Statement
My project is about soft rot occurring in vegetables.

Help Received
My teacher had supervised me while I was doing my project in class at Bravo High School; parents bought the broad.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sabina R. Bera

Project Number
S1602

Project Title
Systemic Acquired Response and Mutant Vascular Tissue Patterns in Arabidopsis thaliana

Abstract

Objectives/Goals
Local infection with a pathogen can render plants to become resistant to normally virulent pathogens. This biological response is known as systemic acquired response (SAR). This study tested whether varying vascular tissue patterns in Arabidopsis thaliana will affect the plant's ability to respond to SAR when it is infected by a pathogen.

Methods/Materials
Several mutant vein patterns were stained and Mutants 33 and 117 were chosen. Arabidopsis plants were injected with avirulent Pseudomonas syringae (bacteria) on three lower leaves in the primary inoculation. Two days later, virulent Pseudomonas syringae was injected on three upper leaves in the secondary inoculation. After three days, the leaves were crushed, diluted, plated, and later counted under a sterile hood. This process was repeated with both mutant plant lines.

Results
Both mutants showed a tendancy towards developing a strong systemic acquired response resulting in lower bacteria counts, whereas the Columbia Wildtype plants (control plants) showed a tendency to develop more infections.

Conclusions/Discussion
The hypothesis seems to be correct. The proven theory is that dispersed vein patterns of the mutant plants favorably affected the plant's SAR to Pseudomonas syringae. These mutant vein patterns may result in higher crop yields.

Summary Statement
The dispersal of a mutant vein pattern may affect the ability of a plant to defend itself from pathogens when infected in one leaf.

Help Received
Used lab equipment at the University of California, Riverside under the supervision of Dr. Linda Walling, professor in the Department of Botany and Plant Sciences. Acquired Mutant vein patterns from Timothy Nelson (Yale University).

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Stacey L. Bradford

Project Number
S1603

Project Title
Oaks "R" Us

Abstract

Objectives/Goals
I wanted to see if they were certain patterns that the leaves were shaped in or if there was a characteristic difference in the leaves that defined the interior live oak.

Methods/Materials
Materials
leaf samples, leaf press, binders, a digital camera, adn a compass.
Procedure
Collect samples from 18 different interior live oak trees and press them. Then compare the samles and try to find an outlier in the morphologies.

Results
My hypothesis was correct. My hypothesis was that there were too many environmental variables involved with the trees for there to be one defining characteristic of the interior live oak leaves.

Conclusions/Discussion
Conclusion
There are too many environmental variables involved for the interior live oak to be able to follow its own pattern. By affecting the trees directly, the variables affect the leaf morphologies and the number of leaves on each tree. The margin for errors is too wide for nature to allow the trees to follow their own patterns.

Summary Statement
My project was about the different leaf morphologies interior live oak trees.

Help Received
Mr. Montgomery helped me decide what I should do my project on.I wanted to see if they were certain patterns that the leaves were shaped in or if there was a characteristic difference in the leaves that defined the interior live oak. I didn't find one, but my hypothesis was correct. My hypothesis was that there were

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Alison L. Collins

Project Number
S1604

Project Title
Rain and Primary Production in Estuaries

Abstract

Objectives/Goals
The objective is to determine if precipitation and water quality effects primary productivity in the small estuaries in northern California.

Methods/Materials
Water quality and primary productivity parameters were monitored in the Little River and Mad River estuaries, Humboldt County. Two sample sites were chosen in each estuary. On each sampling date weather conditions (raining or not raining) and water temperature were measured at each sample site. Two replicate water samples were collected at each sample site from which salinity, turbidity, pH, coliform level, and primary productivity were measured.

Results
Water quality and primary productivity were determined from water samples collected on four sampling dates. Precipitation on these dates were: 11/02 and 11/03 = 0 in., 11/12 = 1.08 in., and 11/21 = 0.56 in.. Water temperatures were generally lower when it was raining. Salinity was highest in Little River during moderate rainfall, but lowest during the same period in the Mad River. Turbidity was generally low and pH levels fairly constant among sample dates, except at one location in Little River turbidity increased from 4 to 108 NTUs and pH increased from about 7.5 to 9.0 during moderate rain. Coliform levels were highest in Little River during high rainfall. Primary productivity in the estuaries was about the same during no rain and moderate rainfall events but increased during high rainfall.

Conclusions/Discussion
Precipitation is an important environmental factor which can effect water quality and thus primary productivity. The observed relationships among rain, water quality and primary production varied somewhat among the two estuaries studied. While turbidity and coliform levels increased with rain in the Little River estuary, little difference was observed in the Mad River estuary when it rained. The increased turbidity observed in Little River probably reflects more unstable conditions in the nearby watershed than exists in the Mad River. The increased coliform levels in the Little River are probably due to the close proximity of cattle grazing, where their waste matter is easily flushed directly into the stream when it rains. Primary productivity in the estuaries appeared to increased with precipitation. This might have been due to higher primary producer abundance resulting from increased nutrients supplied by local runoff or upstream sources.

Summary Statement
The relationship between precipitation, water quality and primary productivity were examined in the Mad River and Little River estuaries, Humboldt County, California.

Help Received
My marine biology teacher, Louis Armin-Hoiland provided instructions in sampling techniques and data analysis. My mother and father drove me to my sampling locations ad proofread my report.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Noah P. Elhardt

Project Number
S1605

Project Title
Plant Tissue Culture of Dionaea muscipula: Testing Alternative Media Supportive Materials

Abstract

Objectives/Goals
Plant tissue culture is a method of plant propagation in which plant tissue growth is controlled in a sterile, nutrient-rich environment. Traditionally, the nutrient media used in tissue culture have been supported by agar, which prevents the plantlets from drowning in the medium. The purpose of my experiment was to test whether other media supportive materials - cotton, perlite, peat moss, peat moss/perlite 50/50, and vermiculite - would lead to increased germination and growth of venus fly trap (Dionaea muscipula) seeds in tissue culture.

Methods/Materials
10 cultures were prepared with each of the media supportive materials mentioned above, as well as 10 cultures using agar as a control. All 60 cultures contained identical amounts of identical nutrient media. Each culture received three venus fly trap seeds for a total of 30 seeds per test group, and the cultures were subsequently placed under grow lights. After a period of 130 days, the germination rate for each test group was determined, and all plantlets were measured. Growth was evaluated by calculating the averages of the longest root and leaf of the plantlets in each test group, and of the total number of mature leaves per plantlet in each test group.

Results
My results showed that peat moss, peat/perlite, and cotton showed significantly better germination and growth than the agar control group, while vermiculite and perlite did not.

Conclusions/Discussion
The results indicate that my hypothesis was partly correct, in that three of the five alternative substances tested resulted in higher production. These results could be relevant to commercial plant tissue culture, where low cost and high production are important.

Summary Statement
I tested five media supportive materials and compared them to the traditionally used agar in terms of germination and growth of Dionaea muscipula in tissue culture.

Help Received
Parents helped proofread and edit abstract, report; Brother served as extra pair of hands while placing seeds in cultures.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Rose E. Ericson

Project Number
S1606

Project Title
Gettin' Grubby: The Trace Metal Contamination of Plants Grown in Soil Amendment

Abstract

Objectives/Goals
My Question was "Will plants grown in soil amendment contain more trace metals than plants grown in unamended soil?" I researched trace metals and their effects on plants and was able to hypothesize that "Plants grown in soil amendment will contain more trace metal contamination than plants grown in unamended soil."

Methods/Materials
I grew two hundred radish and lettuce plants in both a ten percent and twenty five percent mixture of four differant amendments and in unamended soils. The amendments I used included biosolid, nitrohumus, manure and compost. Preliminary testing was using an electro atomic spectrophotometer to test the soil and soil amendments for twenty four differant trace metals. After forty days the plants were removed from the soil mixture and cleaned. After drying in an oven the plants were crushed and tested for the same twenty four trace metals using an electro atomic spectrophotometer.

Results
My resulting data was extensive. Trace metal contamination was compared using a differance and percent differance ratio. Nearly all plants grown in a soil amendment contained more of each trace metal than did plants grown in unamended soil. This was both a negative and positive effect. For example, the edible portion of lettuce grown in ten percent manure contained 10,553.77 parts per million sodium, which is the same as one percent sodium and nearly toxic to the plant. The same plant grown in unamended soil contained only 1,435.5 parts per million sodium. With 19.85 parts per million manganese in the edible portion of lettuce grown in unamended soil the plants were deficient of manganese. The same plant grown in ten percent compost contained 61.49 parts per million manganese, this level is no longer considered deficient. Manganese is an important micronutrient.

Conclusions/Discussion
Amendments are used to correct deficiencies and to improve the plant. If the amount of trace metal in the soil does become toxic, the plant will usually show symptoms of its toxicity so that the cause can be found and corrected. In order for the contamination to become so toxic that it is unsafe for human or animal consumption, the amount of that trace metal often must be more than most plants will tolerate. This could be seen in my project when neither lettuce nor radish would grow in soil amended with biosolid that contained toxic levels of Sodium and Lithium.

Summary Statement
Through my experiment I identified increased amounts of trace metals in plants grown in several soil amendements and discussed the effect of these increased levels on the plant.

Help Received
University of California at Riverside Professor Christopher Amrhein allowed me access to and guidence in his laboratory

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Jordan Filkey; Allen King; Melissa Winkler

Project Number
S1607

Project Title
Can an Alyssum Become Photo-Luminescent?

Abstract

Objectives/Goals
We are trying to make an alyssum plant photo-luminescent. We believe that this plant, with the proper additives, will become photo-luminescent under a black light.

Methods/Materials
We will be using 3 test plants plus a plant that will not be tested on for comparison purposes. We will also use highlighter fluid, neon paint, glow sticks, and water to use as test materials on the plants. We will also use 3 planters for the experiment. We will also be using a black light to test to see if the plants are photo-luminescent.

Results
The project was a success. After only a few days of testing, we were able to see that the plants were photo-luminescent. The plants are photo-luminescent (glow) under black light. The additives reflect well under black light and are easy to see. They are especially easy to see in complete darkness.

Conclusions/Discussion
With our project being a success, we believe that this experiment could pan out into useful purposes.

Summary Statement
Our project is about making a plant (alyssum) photo-luminescent (glow).

Help Received
A friend (Eric Winkler) helped on one of the days of testing.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Taru M. Flagan

Project Number
S1608

Project Title
Pollinating in the Rain

Abstract

Objectives/Goals
The objective of my experiment was to answer the following question. What happens to pollen when rain, fog, or due wets its flower? This project explores the behavior of many types of pollen when immersed in water, in comparison to the type of flower they came from

Methods/Materials
I began by collecting my first plant sample, the rye grass, and immediately transferred the pollen from this plant onto a concave well on a microscope slide. I then placed the slide under the microscope. I replaced the eye piece of the microscope with the digital camera. Once I found an area of the slide which contained a clear view of the pollen, I photographed it at various magnifications using the digital camera. I then proceeded to add water to the slide using an eye dropper. I photographed the pollen with the water added. I photographed the pollen at various time intervals until the time of explosion. I repeated this experiment multiple times for each plant.

Results
The pollen from all of the different plants ruptured when immersed in water. Some of the samples formed tubes before rupturing, while others just exploded. Different flowers took different amounts of time to explode. The flowers were separated into different groups: the protected group, the group in which the flower closes at night, and the unprotected group. The pollen from flowers in the protected group ruptured in the shortest time. The pollen from the group of plants whose flowers close at night also ruptured quickly. The unprotected group, took the longest time period to the pollen to rupture.

Conclusions/Discussion
These results suggest an evolutionary factor in pollen rupture. Plants whose pollen ruptures quickly, may have reproduced better by developing flower structures that protect the pollen from water. Other ways they could protect the pollen are to hang upside down or close their petals during high humidity. The plants whose pollen took a long time to rupture didn#t need to develop such mechanisms to protect the pollen from rupture.

Summary Statement
The degree to which a flower's structure protects its pollen from rain correlates with the time it takes for pollen to rupture when immersed in water.

Help Received
Used equipment from Ramona Convent Secondary School.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Allyne Garcia

Project Number
S1609

Project Title
Macro Nutrient Effects on Plant Growth

Abstract

Objectives/Goals
The objective is to learn how the presence of macro-nutrients affects the early stages of plant growth.

Methods/Materials
Segmented growing tray(5 segments), Cactus potting mix, 3 T of Bandini blood meal (N), 3 T Bandini bone meal (P), 3 T Potassium amino acid proteinate (K), water, ruler, paper, calculator, camara, film, seeds(sweet peas).
(A)Place equal amount (8 pounds) of the growing medium in each compartment of the growing tray. (B) One nutrient was added to each of three compartments, (3T of Blood meal for N, 3 T. of Bone meal for Phosphorous, and a dilute solution of potassium for K), and three nutrients to the compartment labeled NPK, one compartment was used as a control, and did not have any added nutrients. (C) Twenty-five (25) seeds (sweet Peas) were planted in each compartment. (D) Regular counts were taken of the number of visible plants per square; Average height of the visible plants; Height of the tallest plant per square in cm.

Results
a. Phosphorous(P) is an important nutrient in the early stages of plant growth.
b. The presence of nitrogen(N) without the other macronutrients may inhibit early lant growth.
c. The presence of Pottassium (K) in the absence of Nitrogen (N) and Phosphorous(P) resulted in a yellow-green color in the plant.

Conclusions/Discussion
The presence, lack of, or imbalance of macronutrients has an efffect upon the early growth of plants.

Summary Statement
My project is about the reaction of the macro nutrients when they are separate.

Help Received
Michael Rafferty-He provided the space(back yard)

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Fei Gu

Project Number
S1610

Project Title
Geotropism: A Study of the Effects of Simulated Micro and Fractional Gravity on the Growth of Maize

Abstract

Objectives/Goals
My objective was to determine if growing maize in a simulated micro and fractional gravity environment would have any effect on the growth of maize in terms of height and leaf area.

Methods/Materials
Four identical clinostat devices were constructed using stepper motors and wood. Plastic plates were attached to the motor shafts and four cans were glued to the plates into which potting soil and a single corn seed was placed. The clinostat array was then put into an environmental chamber suited to grow corn and the plates were rotated at a rate of 2.5 RPM. After one week of growth, one half of the test subjects were removed from the chamber for analysis. Stalk height was measured with a ruler. Leaf area was measured by stripping the leaves off of the stalk and scanning the leaves in to a flatbed scanner. A computer program was then used to count the number of pixels of green registered by the scanner. This number was then converted in to dots per inch and then into area in centimeters cubed. Cross-sections of the stalk were analyzed for any abnormalities in stalk structure. After two weeks of growth the other half of the subjects were removed for the same tests. After this was completed, the soil was changed, new seeds were inserted, and the clinostat array was rotated 7.5 degrees for a new set of tests. By rotating the clinostat in this manner, it was possible to study the effects of not only simulated micro gravity on the growth of maize, but the effects of fractional gravity as well as the percentage of gravitational force experienced by the test subjects in a clinostat is proportional to the sine function of degree of tilt of the clinostat. This procedure was repeated until the range of 0 to 90 degrees was covered in 7.5 degree increments.

Results
It was found that the plants exposed to lowered gravity levels consistently grew taller and had more leaf area than those that experienced more gravity. However, it was also found that the plants exposed to lowered gravity grew to be weaker structurally than those that were exposed to higher gravity.

Conclusions/Discussion
In conclusion, maize responds to lowered gravity levels by growing to be taller and growing more leaf area in exchange for structural integrity. Also, the effects of simulated altered gravity are more profound during the early stages of maize development and while they exist, are not as extreme in later development.

Summary Statement
My project is a study of the effects that simulated altered gravity levels have on the growth of maize.

Help Received
My mother helped pay for the science fair board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Panthea Heydari

Project Number
S1611

Project Title
The Effect of Gibberellic Acid on the Chlorophyll Concentration in Brassica rapa Plants

Abstract

Objectives/Goals

The chlorophyll concentration of Brassica rapa seeds soaked in Gibberellic Acid and untouched seeds were studied using the SPAD-502 Chlorophyll Meter#. Brassica rapa seeds were soaked in Gibberellic Acid (GA3) 24 hours prior to plantation (Seed Gibb), while another group was planted and Foliar Sprayed with GA3 Solution daily. The Control had no contact with GA3.

It was believed that the chlorophyll concentration would increase with Gibberellic Acid contact and plants that had the most exposure to this growth hormone would produce better yields. Seed Gibb would have the highest yield since GA3 was present in the seeds during the germination stage. Foliar was to have the second highest yield rate since it had some contact with GA3 and Control was believed to have the lowest production rate.

The hypothesis was both refuted and supported. Foliar sprayed plants had higher pod weight production per plant, yet their chlorophyll concentration decreased. Seed Gibb did not support the hypothesis; it had the lowest chlorophyll concentration readings and produced the lowest weight pods.

Once a statistical test was preformed (One-Way ANOVA Test), the results concluded that the difference in pod weight was not a result of the spraying of Gibberellic Acid, but in fact as a result of random factors, such as a small sampling size, mutations, and random chance. The hypothesis was based upon the accusation of farmers who commercially grow crops with use of GA3, which increases their yield. The fact that the yield of Brassica rapa was not accordant with previous studies can be because different plants have different responses to the same hormone.

Therefore, these trials were inconclusive with regard to the effect of GA3 on yields and inconclusive as to whether a foliar spray or soaking was more effective.

Summary Statement

This project was designed to observe if Gibberellic Acid made a difference in the chlorophyll concentration in Brassica rapa plants, which, in turn, would make a difference in the weight of pods (yeilds) produced by the plants.

Help Received

My father and his boss provided me with ProGibb 2X Powder; Ms. Dickson helped me with questions I had and giudance that I needed

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Kaitlin A. Kirk

Project Number
S1612

Project Title
The Effect of Microorganisms on Plant Growth

Abstract

Objectives/Goals
The objective of my experiment is to determine if removing all microorganisms in a sample of potting soil through dry sterilization will have any effect on plant growth.

Methods/Materials
Using two commercially available Jiffy Easy Grow Greenhouse kits, a control group of radish and spinach seeds was planted in commercial potting soil. An experimental group of radish and spinach seeds was also planted in the same commercial potting soil after it had been sterilized by baking for 3 hours in an oven at 365 degrees Fahrenheit. The plants were watered as needed and exposed to direct sunlight as per the greenhouse kit instructions. Every week data were collected about the plants in each cell. The height of each plant, the color intensity on a scale between 1 and 10, and an assessment of overall appearance (i.e. healthy, unhealthy, and dead) were measured and documented.

Results
Overall, the control group germinated sooner; grew taller; appeared greener and healthier; and lived longer than the experimental group.

Conclusions/Discussion
My conclusion is that if soil is sterilized, not only will harmful microorganisms be eliminated, but also microorganisms essential to healthy plant growth. Therefore, the plants in the sterilized soil were not able to grow as successfully as the plants in the untreated soil. Further research should focus on whether this effect occurs in other types of plants.

Summary Statement
The effect of removing microorganisms through soil sterilization on plant growth.

Help Received
My parents purchased all project materials, and my mother helped edit my report.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Victoria B. Ko

Project Number
S1613

Project Title
Orchid Tissue Cultures: Cultured with Juice?

Abstract

Objectives/Goals
The goal of this project is to discover if juices are effective in the culturing of orchid tissue cultures (meristem) when placed in pure chemical mediums. The second goal of my project is to observe which type of orchid; Cymbidium or Phalaenopsis is the best in obtaining tissue cultures.

Methods/Materials
The goal of this project is to discover if juices are effective in the culturing of orchid tissue cultures (meristem) when placed in pure chemical mediums. The second goal of my project is to observe which type of orchid; Cymbidium or Phalaenopsis is the best in obtaining tissue cultures.

Results
The results I got were very interesting. It seems the age-old method of simply using coconut milk is not enough to successfully culture tissues. I found out that the best medium to use is actually the medium that had both orange juice and coconut milk. I also observed that it seems Phalaenopsis tissue, especially Phalaenopsis flower columns, and pollen are the ones that stood healthiest. Although this does not mean that they are necessarily the best tissue though. It seems these tissues are taking longer to multiply than those that are strictly meristematic cells.

Conclusions/Discussion
I have concluded that medium I used (Phymax Orchid Multiplication Medium) is not enough to culture specific orchid tissue cultures. More additives are needed. And in my experiments, juices can fulfill those needs. I expected this to be the case, and it was. Second of all, I concluded that perhaps Phalaenopsis tissue could be the easiest tissue to culture considering the fact that they stay so strong an healthy even after being in the test tubes for long periods of time ranging from two weeks to a month. I did not expect Phalaenopsis to be the better tissue; I expected Cymbidium tissue to be the better tissue. The reason I thought this is because of the difference in the survival skills of both of these plants. Cymbidiums are stronger when it comes to surviving in the winter, and it can survive in harsher weather. However the strength and appearance of the Phalaenopsis tissue out ran the Cymbidiums by a slight margin.

Summary Statement
Orchid Tissue Cultures show that they respond well to organic juice additives, and the best tissue to use for orchid tissue cultures will have to be Phalaenopis tissue.

Help Received
My father helped me understand the process of creating tissue cultures, and he was the one who supplied me with all of the eqipment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Monica Lydon; Brittany Schwandt

Project Number
S1614

Project Title
Mars Sweet Mars: Can Plants Survive on Mars?

Abstract

Objectives/Goals
The objective of our project is to determine which amounts of fertilizer added to Martian soil produces the most growth to bean, tomato, and carrot plants. Our goal is to keep plants alive in Martian atmosphere for 3 days.

Methods/Materials
After terra-forming soil from silicon dixide, magnesium oxide, aluminum oxide, calcium oxide, and ferrous oxide, we planted tomatoes, beans and carrots in tow 20-gallon tanks, using different brnds in each. We simulated Martian atmosphere in the tanks with carbon dioxide, agon, nitrogen, and oxygen, and added various amounts of Scott's and Bandini fertilizer to determine which amounts kept the plants alive longest.

Results
Our control group plants with no fertilizer died within 24 hours. Plants with 56.25 grams of fertilizer survived for 60 hours. Plants with 106.25 grams of fertilizer survived for 187 hours. However, plants with the 165.25 grams suvived for only 9 hours, because too much fertilizer acted as a toxin and killed the plants.

Conclusions/Discussion
Although we predicted that plants would survive for 3 days, they actually survived for 8 days and grew up to 4 inches. This allowed oxygen to be released into the atmosphere, decreasing the amount of carbon dioxide in the atmosphere and becoming more similar to the Earth's atmosphere. As we continue studying the possibility of visitng Mars, we realize that if we could grow enough plants on Mars to alter its atmosphere, eventually humans could live there on the food produced.

Summary Statement
After repliating Mars' soil and atmosphere, we tested what amount of fertilizer produced optimum growth results.

Help Received
Our teacher helped us design the experiment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Stacie L. Nellor

Project Number
S1615

Project Title
Plant Diversity in a Restored Area of Fairview Park

Abstract

Objectives/Goals
My objective in this project was to determine the percentage of native and nonnative plant species in a restored area of Fairview Park. Considering how recently this project of restoring a part of the park was undertaken, I believe that there will be a greater proportion of native plant species.

Methods/Materials
For my materials, I used a string to section off my mapping area, graph paper, native plant field books, and a camera to take pictures of the different types of plants. After sectioning off a 40ft by 48.6ft area, I labeled the variety of plant species on the graph paper. I used the pictures that I took to later identify the plants using the field books.

Results
After recording all of the plant types, I counted a total of 17 plant species, 76.5% being native and 23.5% being nonnative.

Conclusions/Discussion
In the end, my conclusion reflected what I had predicted. There was a greater percentage of native species compared to nonnative. This data appears to support the efforts of enviromental groups trying to repare damage done to the enviroment by restoring what was lost. However, the nonnative species that were recorded were all invasive plants, and may soon take over the native species territory.

Summary Statement
My project was about mapping and recording the ratio of native to nonnative species in a recently restored area of Fairview Park.

Help Received
My science teacher Ms. Claytor helped identify some of the plant species.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sarah L. Nothnagel

Project Number
S1616

Project Title
Salt of the Earth: Inhibition of Corn and Pea Germination by Chloride Salts

Abstract

Objectives/Goals
The purpose of this project was to determine how much salt a plant can tolerate before germination and growth are significantly inhibited; whether plants tolerate sodium chloride, potassium chloride, or calcium chloride better; and whether corn or peas can tolerate more salt.

Methods/Materials
Corn and pea seeds were grown in glass trays lined with paper towels soaked in distilled water, 50 mM salt solution, 200 mM salt solution, 350 mM salt solution, or 500 mM salt solution and covered with Saran wrap. Each salt was tested at each of the concentrations. The seeds were observed for germination and measured for root length for eight days and then discarded. Each trial was repeated twice for a total of three trials. The germination percentage and root length for each day of the trials were averaged. Graphs were made to display the results.

Results
The results show that germination and growth become significantly inhibited when salt concentration reaches 350 mM. The seeds appeared to tolerate potassium chloride better than sodium chloride and sodium chloride better than calcium chloride at equal molarities. Corn seemed better able to resist the effects of the salt than the peas did. However, there was not much difference between the two.

Conclusions/Discussion
Although germination and growth became significantly inhibited when salt concentration reached 350 mM, that was not a sharp threshold. Effects of the salts were already visible at 50 mM, and they gradually increased with the concentrations. This shows that even small amounts of salt affect plants. The seeds tolerated potassium chloride better than sodium chloride and sodium chloride better than calcium chloride in terms of molarity. However, in terms of osmosity, the effects of the three salts were nearly the same, with sodium chloride being slightly more inhibitory in some situations. This suggests that the identity of the solute did not affect the seeds as much as amount of the solute did.

Summary Statement
This project was an investigation of the inhibitory effects of three chloride salts on germination and early growth of corn and peas, a problem that is important in irrigated agriculture.

Help Received
Dad helped obtain materials and references, and showed me how to graph.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Elizabeth L. Shonnard

Project Number
S1617

Project Title
Creating a Protocol for the Micropropagation of Plumcot

Abstract

Objectives/Goals
The goal of this experiment was to create a protocol for the micropropagation of plumcot. It addition, it was to find the most effective dose of the growth hormone IBA in the rooting media in order to optimize roots per shoot and established plants of plumcots.

Methods/Materials
Dormant five inch plumcot sticks are excised and sterilized by immersing them into ethanol. All steps from here on are done under the laminar flow hood using aseptic conditions. It is then placed into the sterile 10% sucrose solution. When buds push they are put onto the rooting medium. The pH is adjusted and when they have multiplied individual shoot tips are subcultured singly onto rooting MS medium containing 0.25, 0.5, 0.5 IBA for one week, or no mg/l IBA, no BA, 3% sucrose, standard vitamins and micronutrients, and 7.2 g/l agar and put into capped test tubes. Once roots are well formed the plantlets are transplanted into soilless media and are acclimated in a greenhouse.

Results
The plumcot was most efficiently propagated when 0.5 g/ml IBA was used. For the accession E2.031 the .25 g/ml IBA had an average of 0.7 roots per shoot, .5 IBA had an average of 1.5, and .5 IBA for one week had an average of 0.8 roots per shoot. The control had an average of 0.3 roots per shoot. For the accession E2.067 the .25 g/ml IBA had an average of 0.6 roots per shoot, .5 IBA had an average of 1.35, and .5 IBA for one week had an average of 1 root per shoot. The control had an average of 0.1 roots per shoot.

Conclusions/Discussion
Since the largest dose of IBA (.5 IBA for the full two weeks) yielded the greatest number of roots per shoot and established the most plantlets, it remains unknown whether higher concentrations of IBA would be necessary to identify the optimum protocol for the micropropagation of plumcot, but it can be concluded that the protocol that I used is both effective and efficient.

Summary Statement
The purpose of my project is to create an effective, efficient way to micropropagate plumcot.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Heather B. Stalker

Project Number
S1618

Project Title
In the Shade: A Study on Moss

Abstract

Objectives/Goals
To determine the conditions on the north side of trees which are conducive to moss growth and not found on the south side of trees. I predict the north side will have a cooler temperature because it is not exposed to as much direct sunlight as the south side of a tree.

Methods/Materials
Five trees at Irvine Region Park with moss growing on the north side of their trunks and branches were selected for the study.To measure the atmospheric temperature in the sun and shade on the south and north side, four ounces of water sat in a clear plastic bottle and were allowed to acclimate to the air temperature for an hour and a half. A thermometer then measured the temperature of the water, and the difference between the south and north side was determined. Three trials were run, one studyig three trees and the other two studying all five sites.

Results
The average difference in temperature between the south and north side was 5.6 degrees Celsius. The temperature difference ranged as high as 10 to 12 degrees Celsius but also as low as 2 to 4 degrees. Also, when the water exceeded 30 degrees, condesation formed on the inside of the water bottle, indicating evaporation. Condesation only occured on bottles placed on the southern side of the tree.

Conclusions/Discussion
The lower temperatures found on the north side of the tree as a result of little to no direct sunlight create optimal growing conditions. As an indirect result of lower temperatures, water does not evaporate as quickly on the north side of trees. The moss uses and requires this water for reproduction for the sperm to swim to the egg in the archgonium of a female gametophyte. Moss,of course, are not limited to growing on the north side of trees. When shade and water are present on the south side,moss can readily grow there.

Summary Statement
Moss predominantly grows on the north side of trees because of the lower temperatures and presence of water.

Help Received
My parents drove me to the park and acted as an extra set of hands when setting up the experiment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Noelle R. Stiles

Project Number
S1619

Project Title
Plant Reactions to Historic Martian Conditions

Abstract

Objectives/Goals

1 Problem Statement: Could plants survive on an ancient Mars, which is predicted to be wetter and warmer and have a denser atmosphere? Which plants were fair the best under the most strenous conditions (carbon dioxide and UV light)in this historic environment? It is my goal that in this project to discover more about the possibility of bringing life to Mars if the ancient conditions reoccur.

2 Hypothesis: I believe that the plants will prosper in the carbon dioxide, due to their photosynthetic needs. I believe that plants will die under the UV light because of danger of their shorter rays to life.

Methods/Materials

3 Materials:
Plastic tubing; Four Succulents; Black light; Carbon dioxide; Four Daisies; plastic bags; Micro valves; Four Tomato plants; Table & Board; Connector and spray nozzles; Small nuts (fit on spray nozzles); Syringe.

4 Procedure: A. Label plants, connect valves to bags, syringe and carbon dioxide tank; B. Vacuum air out of bags, place all plants in carbon dioxide bags and not in places (under UV light or in sunlight); C. Record data daily on plants conditions, water according to schedule, and fill carbon dioxide bags as needed.

Results

5 Results: The tomato generally faired the worse out of all my plants; they especially suffered in the carbon dioxide. The succulent faired the best, prospering in the carbon dioxide and showed some adaptations to the UV light. Under the UV light a succulent that was originally green with purple edges and turned completely purple. The daisy gradually died in all areas however exhibited more endurance than the tomato plants. This indicats the pacific changes and reaction plants have to Ancient Mars.

Conclusions/Discussion

6 Conclusion: My conclusion is that succulents would survive and prosper on ancient Mars. Also that they would be the most adaptive to this new and strange habitat. This expands our knowledge on what plants are the best under strenous conditions and best to send to a biome on Mars or other plants. This also tells scientist that at one time plants could survive on Mars and if it is possible agian they could pave the way for mankind.

Summary Statement

My porject is about learning through plants reactions to historic martian condittions if its possible that higher life forms could have survived and prospered on a foriegn plant.

Help Received

My father helped me set up the connections for carbon dioxide bags and proofread my conclusion.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Janelle A. Williams

Project Number
S1620

Project Title
Does Prehydration of Cotton Seed with Organic Compounds Outyield Prehydration with Water? A Four Year Study

Abstract

Objectives/Goals
The purpose of this year#s experiment is to build on the previous three years work on presoaking of cottonseed before planting. This year#s project is to see if presoaking cottonseed in an organic compound has the same results as the presoaking cottonseed in water only.

Methods/Materials
My materials: 5-five gallon buckets, Water, Towels, Cottonseed (Maxxa, grower standard), Flags to mark replications, Marking pen to mark flags, Growers field and planter, with driver, Scale and bags for yield data, Trial treatments: Liquid seaweed, Vesta, Fulvic Acid and Ceres.

My method was to presoak cottonseed in the various treatments, and water, for 10 minutes before drying and then planting. In season readings as to plant emergence, bloom and boll counts were made throughout the season. Cotton yields for the various treatments were acquired through hand harvest after defoliation.

Results
The results from this year#s trial again showed that presoaking cottonseed for 10 minutes before planting gave the greatest yield in cotton lint. This result was greater than any of the organic compounds used instead of simple water.

Conclusions/Discussion
The fourth year of this presoaking cottonseed trial gave some interesting results. Initial seedling counts showed that presoaking the seed with simply water gave the best results. The organic compounds tested showed slower emergence, and in the case of the two soil inoculants tested showed lower plant populations overall. The results in mid May as to initial flowering, as in boll counts showed that the presoaking with water only, gave the best results. Total lint results again showed that presoaking cottonseed in water out yielded the organic compounds tested. Although all treatments out yielded the control, where there was no presoaking of the seed. The results must be interpreted that the compounds themselves did nothing to increase yields, but the simple hydration of the cottonseed by the liquid organic compounds acted much the same way as simple water would.

Summary Statement
My project is about presoaking cottonseed before planting with various organic compounds, as well as with water.

Help Received
Cottonseed, planter, treactor driver, water and field # JG Boswell Harvest # family, Superior Soil Supplements - Fulvic Acid, Acadian Seaplants Limited # Liquid Seaweed, Biologically Integrated Organics Inc. - VistaO, and Ceresâ.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Tammy N. Ziemba

Project Number
S1621

Project Title
How Different Plant Hormones Affect Stem Growth in Lima Beans During Germination and Early Stages of Development

Abstract

Objectives/Goals
The purpose of the experiment was to measure how different plant hormones affect lima bean stem growth depending upon what stage the young plant is in.

Methods/Materials
First I made the plant hormone solutions by following the instuctions of a Flin handbook. Then I soaked 15 lima beans in water over night, and waited for them to germinate. Next I placed three seeds in each jar (I had 5 Jars. Each was for a different hormone, ABA, IAA GA3, Kinetin, and the contolled group.), and only gave them water. I repeated this step 2 more times until the third set of seed had been soaked. At the end of this process I had 3 stages, stage1 were the dormant seed, stage2 were the seeds with radicles, and stage3 were the seed with shoots and foliage leaves. Once all of the seeds had been placed in jars, I gave them .25ml of the hormonal solution each day for 14 days(the contolled group only recieved water.). I recorded the shoot height every day, and I got my average shoot growth per plant by subtracting the total hieght on day 14 by the heigth on day 1.

Results
The stage 1 plants grew on average 5.6152cm. The stage 2 plants grew on average 2.6164. The stage 3 plants grewon average -0.0996cm. In stage 1 the plants to grow the most to the least tall are as follows: ABA, GA3, Kinetin, IAA, and the controll. Instage 2 the plants to grow the most tall to the least tall are as follows: Kinetin, controll, ABA, an the IAA tied with the GA3. The stage 3 plants to grow the most tall to the least tall are as follows: the IAA, Kinetin, control, ABA, and the GA3.

Conclusions/Discussion
My data supports the idea that the earlier the stage of development a lima bean is in when hormones are first applied to it, the taller it will grow. The data can not support the idea that certain hormones will cause a lima bean plant to grow taller than a different plant.

Summary Statement
The purpose of the experiment was to measure how different plant hormones affect lima bean stem growth depending upon what stage the young plant is in.

Help Received
My parents took me to the library so that I could do research.