CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Raj M. Amin

Project Number
S1601

Project Title
Conserving Agricultural Irrigation Water by Controlling Transpiration Loss via Wind

Abstract

Objectives/Goals
The objective of this experiment is to determine whether the growth rate of the plants will be affected negatively by an increase in transpiration rate due to high winds. I believe that the plants with low or zero wind will have better growth rate than plants with high wind. The water consumption of the high wind plants will be larger compared to the low or zero wind plants.

Methods/Materials
Fifteen tomato plants of approximately same height, width, weight, and moisture content were transplanted into plastic containers. The plants were equally divided into three groups, the High Wind group, the Low Wind group, and the Zero Wind group. Water was added to equate the mass of each plant to 500-520grams, which was measured using a triple beam balance. The experiment table was set up to keep light, wind speed, temperature, and humidity constant for each group. Wind, temperature, and humidity were all measured with Kestrel 3000 instrument. To ensure all data calculated only the net transpiration, each container was covered with a lid to prevent evaporation from the soil. Temperature was regulated with a space heater. Each day#s experiment started by turning on lights for plants and turning on fan that generated wind of 5.0+mph for high wind group, 1.0-1.5mph for the low wind group and the zero wind group were protected in a cardboard box. Data was collected by taking the measurements of the newest leaf for height and the longest opposing leaves for width. The weight of each plant was calculated (original weight # experimental weight) at the end of each experimental day to show the water consumption of each plant. The experiment lasted for twelve days with each day repeating the same procedure as specified.

Results
The experimental results suggest that wind inhibits growth rate and promotes water loss in the form of transpiration. Slowing down the ambient wind to the plants conserves the soil water an increases the growth rate.

Conclusions/Discussion
The results suggested that wind induced transpiration will decrease growth rates and increase water consumption. The wind-induced transpiration promoted soil water consumption in the high wind plants and conserved soil water in plants subjugated to little or zero wind. The results suggest that it would be beneficial for farmers to protect their crops with natural barriers such as trees and shrubs to conserve soil water and to achieve maximum plant growth.

Summary Statement
My project tests to determine whether, increased transpiration rates (via greater wind velocity) or decreased transpiration rates (via decreased wind velocity) will promote soil water conservation and plant growth

Help Received
My mother helped with transportation: Dr. Dave Gooraho provided me with literary resources and materials necessary for experimentation; My father helped with measurements

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Allen Baclig; Brian Sun

Project Number
S1602

Project Title
Cloning 101

Abstract

Objectives/Goals
The goal of this project is to determine whether or not cloning through fragmentation of a plant is possible. Using the data that we have obtained from the project, we are able to assume that the clones that we have created from the parent plant are indeed a clone, with the same genotypic makeup of the parent. This is because there was not any other plant around in the vicinity, and there because of the sterile and incubated environment, no foreign particles could affect the resultant clones. Creating a sterile environment for the clones was the most difficult aspect of this project.

Methods/Materials
Saintpaulia Gesneriaceae (African Violet); 10% bleach solution; 70% rubbing alcohol; 500 mL beaker; 10 mL beaker; Petri dishes; Grow light; Incubator; Timer; Indole-3-butyric acid/hormone agar growth medium; Hormone shooting medium; Gloves; Face mask; Bunsen burner; X-acto# knife; Tweezers; Glass bottles.

Results
October 22, 2004 Started cloning batches #1 and #2.
October 22 # November 5, 2004 Not much change
November 8, 2004 Noticed mold growth on Batch #1.
November 12, 2004 Noticed mold growth on Batch #2.
November 15, 2004 disposed batches #1 and #2, started batches #3 and #4
November 29, 2004 Noticed mold in both #3 and #4 batches
November 30, 2004 Discarded Batches #3 and #4
December 17, 2004 Started Batch #5
December 17- February 1, 2005 No change, cells beginning to differentiate and calluses beginning to form.

Conclusions/Discussion
Based on our current data, we do not have results to prove our hypothesis true. Through our research, we have determined that it should be possible to fragment plant matter and create exact clones of the parent plant, a form of asexual reproduction. The data that we have collected so far points us in the right direction in terms of finding a DNA match between the parent plant and the clones. Because of the two cases of contamination of batches 1-4, time did not allow us to perform the DNA sequencing mapping that we had planned to prove that the parent and clone DNA#s matched, therefore we cannot tell their genotypic similarities.

Summary Statement
Cloning of plants in fragmentation.

Help Received
Mr. Beach helped with lab equpiment phase 1, Professor Close helped with lab equipment phase 2

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Molly K. Estes

Project Number
S1603

Project Title
Cattails in the Water

Abstract

Objectives/Goals
How to minimize the number of cattails in a cattail-clogged marsh / oxbow lake so that an endangered species may be introduced.

Methods/Materials
The materials used are as follows: a meter stick, some garden shears, plastic marking tape, a camera, paper, a pencil, and a clipboard. The method used can be summarized in eight simple steps. 1) Pick out three clumps of cattails of about equal diameter. 2) Cut the first group 5 cm below the water line. 3) Cut the second group 30 cm above the water line. 4) Leave the third group as it is 5) Wrap a length of plastic marking tape either around each group of cattails or around a cattail located close by in order for identification purposes. 6) Take pictures of each group for recording purposes. 7) Once a week, come back to the three clumps of cattails and record the average height of three cattails in each group. 8) After several weeks of recording data, return the environment to the way that it was found by removing the plastic tape.

Results
At the end of September, I collected all of the information that I had amassed over the previous four weeks. According to the data, the clump of cattails that I cut 5 cm below the water line had completely died, with exception of a total of six that had grown back. The clump that was cut 30 cm above the water line showed significant grow back and remained healthy for the duration of the experiment.

Conclusions/Discussion
Based on the research collected over the course of my experiment, I have come to conclude that cutting cattails 5 centimeters below the water line is a more effective way of killing them than cutting them 30 centimeters above the water line. After 4 weeks, the cattails I had cut below the water line had completely died with very few growing back. However, the cattails I had cut above the water line had only continued to grow with a minimal death rate. Based on this raw data, and the graph I created from it, I determined that my hypothesis was correct and that cutting cattails 5 centimeters below the water line is a more effective way of killing them as compared to cutting them 30 centimeters above the waterline.
This experiment was performed only once with only one control group because it was designed to see if this method would be able to work on a small scale project. The next step would be to see if this method would be just as effective on a large scale project (e.g. the entire marsh).

Summary Statement
My project is a fair test designed to see if cutting cattails below the water line might be a better way of killing them than cutting them above the water line; this study was done to help further the introduction of an endangered species.

Help Received
Mother helped in assembly of board; Teacher assisted in research and background information; Friends helped in data gathering.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Christine Haas

Project Number
S1604

Project Title
"How Does the Buckeye Grow?" -California State Senator Dean Florez, August 13, 2004

Abstract

Objectives/Goals
California Senator Dean Florez stated, "In your previous research Buckeye trees seem to have been effective in eliminating mosquitoes." He then asked me, "How easy would it be to grow these trees in large numbers?" Therefore, the purpose of this project was to determine if is possible to mass-produce the California Buckeye Tree.

Methods/Materials
For Experiment #1 & 2, I sought to germinate 24 buckeye seeds in six different chambers.
For Experiment #3A, six already germinated buckeye seeds were placed at four locations.
For Experiment #3B, the seedlings from Experiment #3A were placed outside to see which treatment had prepared them the best.

Results
Buckeye Germination Experiments #1 & 2
Two out of forty-eight seeds germinated, and they had signs of deformities.

Growth of Buckeye Seedlings (Experiment #3 # PART A)
Seedlings outside grew to 1.875#, in Greenhouse #1 grew to 3.5#, in Greenhouse #4 grew to 7.667#, and in the 15ºC Germination Chamber grew to 9.333#. The seedlings at 15ºC had the strongest growth and the best root systems.

Growth of Buckeye Seedlings (Experiment #3 # PART B)
Seedlings from the 15ºC Germination Chamber had the most growth with 11.292#. Seedlings from Greenhouse #4 were 8.25#, from Greenhouse #1 were 4.667#, and from outside were 4.625#.

Conclusions/Discussion
The seeds germinated better in nature and then grew extremely well in the 15ºC Germination Chamber. I believe it is possible to cultivate the California Buckeye tree on a medium-large scale by starting the seeds at 15ºC and transplanting the seedlings to a natural setting.

Summary Statement
An attempt to mass-produce the California Buckeye Tree to test the feasibility of growing these trees in order to create the "Buckeye Toxin" for use on all stages of mosquito development.

Help Received
Conducted experiments at Clovis East High Agricultural Center. Mother helped with board.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kevin C. Hall

Project Number
S1605

Project Title
The Effects of Metals on Plant Growth

Abstract

Objectives/Goals
To find if the plant growth in poppies and bush pea plants is affected by the application of aluminum, zinc, or iron sulfate; and to find if plants grow and germinate faster in an artificial, heated environment, or a natural, room temperature environment?

Methods/Materials
1 # Bag of California Poppy Seeds, 1 # Seed Heating Mat, 1 # Bag of Bush Pea Seeds, 1 # Plant Heating Lamp, 1 # Can of Aluminum Sulfate, 2 # Plant Flats (Capacity 68),1 # Can of Iron Sulfate, 2 # Bubble Covers for Flats, 1 # Can of Zinc Sulfate, 2 #Water Spill Trays for Flats, 1 # Bag of Seed Starter Soil, 1 # Water Spray Bottle.

Results
The metal additives in both poppies and peas had poor effects on the plant#s growth, and in fact most of the slots with metal sulfates in them didn#t even sprout. In contrast of this, the control groups thrived and grew tremendously. Of the metals iron had the best effects and zinc had the worst. As for the environment, the natural, un-altered environment provided more plant yield and more growth.

Conclusions/Discussion
My conclusion is that in general, metal additives in the soil have more negative effects than good on the plant growth. Also, the environment plays a key role in plant growth, and I found that staying with the natural growth patterns of plants, with real sunlight and no artificial heat, is important to obtain the best possible results.

Summary Statement
I applied 3 different metal sulfates to poppy and pea plants, in two different environments, and I observed and recorded the results.

Help Received
My mother and father drove me to purchase any needed supplies, and gave me some advice to better my project.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Helen C. Jackson

Project Number
S1606

Project Title
Salt: Friend or Foe?

Abstract

Objectives/Goals
There are many countries in the world that suffer from infertile or salty soil. This can drastically affect the citizens ability to grow food crops. The basis for this project was to determine if plants would die when a saline solution slightly less than the oceans was watered into the soil. If they did, at what level of salinity would the plants cease to grow and die. Depending on the plants# salt toleration; it may be possible to grow certain plants in salty soil.

Methods/Materials
Nine beans, nine zucchini, and nine lettuce seeds were cultivated in indoor pots. Each type of plant was then watered at three different salinities: three of each type at 30g of salt per liter, three at 15g of salt per liter, and three of each type as controls with normal fresh water. After about ten days of testing, all the experimental plants were dead. Consequently, four beans, four lettuce, and four zucchini plants were re-grown, maintaining the regular watering of the healthy controls. Two of each plant were watered with 5g of salt per liter, and two at 10g of salt per liter; the plants# progress was observed every day.

Results
At 15g and 30g of salt per liter, the plants died relatively quickly. The lettuce were the less tolerant plants as they died first, followed by the zucchini and beans at 30g of salt per liter, and finally the zucchini and beans at 15g of salt per liter. The bean plants survived longer than both the zucchini and lettuce. In the second set of testing, though reaction time decreased drastically, all plants at 10g per liter of salt and 5g per liter of salt showed salt spots by one week and a half. They then continued to become floppy by the end of the second week.

Conclusions/Discussion
From the original test, the results showed that zucchini, beans, and lettuce plants could not tolerate a level of salinity greater than or equal to 15g of salt per liter of water. The second experiment showed that plants could not survive healthily when 5g of salt per liter was watered into the soil everyday. It would be difficult to effectively grow these plants, and probably others similar, in salty soil without them dying; however, some plants are more tolerant than others, as the bean plant seemed the hardiest towards salt in the first test.

Summary Statement
Salts affect on plant growth.

Help Received
N/A

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Kiira J. Johal

Project Number
S1607

Project Title
Determining Which Percentage of Nitrate in Fertilizer Will Yield the Greatest Height in Vigna unguiculata

Abstract

Objectives/Goals
The purpose of this project is to determine whether varying percentages of nitrate in fertilizer will affect the height of Vigna unguiculata.

Methods/Materials
The percentage of nitrate in fertilizer acted as the manipulated variable while the height of each plant served as the responding variable. Fertilizer solutions with the analyses of 0-5-5, 3-5-5, 6-5-5, and 12-5-5 were produced. The required quantity of diammonium phosphate was added to warmed water. After that amount had dissolved, the required amounts of potassium chloride were added. After this step was completed an additional three times, correct amounts of urea were added to each solution. After the urea had dissolved, water was added until each of the four solutions reached a mass of 680 grams. 340 grams of potting soil were massed and placed in four large plant containers. Each plant container represented the various fertilizers. Twelve cowpea seeds were placed in each container, and 50 mL of each fertilizer was applied to the corresponding container a total of three times throughout the experiment. The plants were watered with 200 mL every three days and height measurements were taken daily.

Results
The plants exposed to fertilizer containing 12%, 6%, 3%, and 0% nitrate grew to the heights of 7.50, 6.29, 5.76, and 6.00 cm, respectively. Final deviation percentages show that the plants exposed to 0% nitrate deviated by 14.7% and the plants exposed to 3% nitrate deviated by 21.9%. Lastly, the plants exposed to 6% nitrate deviated by 23.4%, and the plants that received 12% nitrate deviated by 14.5%.

Conclusions/Discussion
The results for the plants containing 12% and 6% nitrate were expected because they contained the two greatest quantities of nitrogen, an essential element in stimulating plant growth due to its role in protein building and photosynthesis. The finding that the plants that received 0% nitrate outgrew those that received 3% was unexpected, and may be explained because there was not a great enough differentiation between the percentages of nitrate. The high percentages in deviation could have been affected by the outliers present in the data or volatilization. Volatilization was attempted to be deterred with appropriate application methods, yet arose as a flaw in the experimental design.

Summary Statement
This project served to observe whether a relationship can be stated between the percentage of nitrate in fertilizer and the growth of a plant.

Help Received
Doctor Sarjit Johal provided the chemicals and calculations necessary to produce the four various fertilizer solutions.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Jeorgina Lopez

Project Number
S1608

Project Title
Does Bean Mass Affect Plant Height?

Abstract

Objectives/Goals
The objective of this experiment was to find out if the mass of a bean would have any effect on the height of its plant. For this experiment three different beans masses would be tested.For example the small beans would weigh 1-2 grams, the medium beans would weigh 3 grams, and the large beans 4-5 grams.

Methods/Materials
First, the beans would be weighed and seperated into three categories accordng to their masses (small beans 1-2 grams, medium beans 3 grams, and large beans 4-5 grams). Then they are planted in a greenhouse at a 1-inch depth each.Also, they are watered withn a certain amount of water each. The beans are monitored,observed, and the progress is recorded. The materials use were: black beans,scale,soil,greenhouse, ruler,and a logbook.

Results
In this experiment the small and large beans palnts grew almost the same average height. The medium beans grew the tallest plants.

Conclusions/Discussion
Based on this experiment and the data recorded the medium size beans grew the tallest plants. This conclusion is based on a sixteen day period.

Summary Statement
The effect of bean mass and plant height.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Samantha L. Lowther

Project Number
S1609

Project Title
What's in That Soil? A Study of Zinnia Growth in Four Different Soils

Abstract

Objectives/Goals
Farmers and florists have been trying to uncover the secret to creating crops with strong flowers. Abrupt weather conditions and unknown nutrient deficiencies have been troubling problems. This project was designed to determine which soil is best for growing strong, healthy plants. Although this experiment focused solely on Zinnias, the information gained could be helpful in the growth of other plants. It is predicted that the container mix(soil #1)will prove to be the best soil for the Zinnias. Due to its specific purposes, it is assumed that soil #1 will provide the optimum nutrients for growth.

Methods/Materials
This project began 2 ½ months ago and involved 1 type of Zinnia and 4 different soils. Three of the soils were purchased at a garden store and 1 was taken from a local backyard(no fertilizers). Each one of the 3 store bought soils had an almost completely different chemical analysis, as stated by the manufacturer. Most importantly, each one of the 4 soils contained different amounts of N, P, and K. The Zinnias were planted in late December and were controlled throughout their growth time with equal amounts of soil, distilled water, sunlight, and a constant temperature. Each week, the Zinnias were analyzed and stem and leaf growth were recorded. The plants were also photographed. During the growth period, information was researched and soil tests were conducted. Soil pH and soil texture(sandy, loam, or clay)were determined. N, P, and K levels were also measured and re-measured to validate project results and manufacturer claims.

Results
The Zinnia in soil #1 had the best results. Its stem height was last recorded at 11½#. It had the greatest leaf length and stem diameter as well. The leaves# lengths were last recorded at 5½# and the stem was visibly thicker than the rest. These results are immense considering that the plants in soils #2 and #3, which measured only 8# high with leaves of 3½# long, were the next largest. The Zinnias in soil #2 did, however, appear to be stronger than those in soil #3. The stem in soil #3 required a stilt to stand up. The Zinnias in soil #4 showed the least progress, measuring a mere 5½# high and with leaves of only 2#.

Conclusions/Discussion
The data supports the original hypothesis. Soil #1 was shown to be the best soil for growing healthy, strong Zinnias. Upon project completion, soil #1 supported the most growth due to its high level of N and its loam texture.

Summary Statement
Analyzing four different types of soils to determine which one provides the best growth for Zinnias and why.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Caitlin A. McCabe

Project Number
S1610

Project Title
The Effects of Mutualistic and Parasitic Fungus on Plant Growth and Their Soil

Abstract

Objectives/Goals
The goal of this project was to analyze the effects that a parasitic fungus and a mutualistic fungus would have on tomato plants', as well as Bacopa plants', growth, developement, and soil. This experiment uses several tests and experiments performed over several years in order to observe the results of each plants as well as obtain the answer to the given question.

Methods/Materials
This experiment uses four Early Girl Variety Tomato Plants as well as three Blue Bacopa Plants and three White Bacopa Plants. Using normal gardening tools these plants were put under observational conditions for a time period with notes being taken on each plant on a daily basis. These experiments aslo use a soil test kit that tests the phosphorous, nitorgen, potash, and pH levels of each plant at the begining of the observation period and the end.

Results
From the results obtained through each test it was determined that the plants that were placed in an environment grown with the parasitic fungus did very poorly compared to plants grown under normal, control, conditons. However, the plants that had been grown in the mutualistic fungus had grown slightly better than the plants grown under the normal conditions. The plants that had been grown in the steralized soil as a comparison group had grown the worst of all the plants. These plants expressed nutrient defficieny, as well as discoloring.

As for the soil tests it was determined that the plants grown in the soil bought fertalizer produced a slightly hazardous environment for the plants to grown in, but the plants grown in the mutualistic fungus had the most suitable soil for plant growth. The plants grown in the parasitic fungus soil as well as the steralized had developed soil that was lacking in nutrients and very poor for plant growth.

Conclusions/Discussion
In conclusion through the test that had been performed over the years to test the effects of fungus on different types of plants it was determined that the best growing methods for plants was in a soil that was composed of an organic symbiot, mutualistic fungus, as opposed to a soil that had chemical additives introduced, store bought fertalizer. As for the parasitic fungus it was determined that the fungus that had developed created an environment in which the plants could not absorb nutrients efficiently, ultimately causing the plants to suffer and die.

Summary Statement
This project is a set of tests and experiments that analyze the effects that a mutualistic fungus and parasitic fungus have on plant developement, as well as how the fungi effect the soil of the plants.

Help Received
Biology Teacher, Mr. Michail, on Lectures about the Fungi

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Maya J. Mileck

Project Number
S1611

Project Title
Saline Soils and Hay Crops

Abstract

Objectives/Goals
The objective of my project was to determine which of four hay crops--barley, oats, vetch, or peas--is most tolerant of saline soils.

Methods/Materials
The different seed types were planted in soil with a range of salinities, created by adding various amounts of table salt to soil. The control was the soil containing no added salt. The plants were then allowed to grow for 16 days before being gently removed from the soil. The roots were then rinsed, and the plants were dried and weighed.

Results
I compared the different plant types to one another by finding their weight as a percentage of their control. The results for the lower salinities were inconsistent. At the higher salinities, a pattern developed. The barley was the most tolerant, then the oats, the vetch, and finally the peas.

Conclusions/Discussion
The results were inconclusive, although they did lean toward my background research at the higher salinities where the pattern developed. To make a final conclusion I would need to repeat the experiment, growing the plants for a longer period of time in order to make the weight of the seeds negligible, as I believe this was the primary factor that skewed my results.

Summary Statement
My project tested the tolerance of four hay crops to different soil salinities.

Help Received
My father provided me with the books I used for my background research, as well as my materials and advice.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Sushruth V. Subbarao

Project Number
S1612

Project Title
Effects of Metabolites Produced by Cladosporium species on Bean and Lettuce Plants

Abstract

Objectives/Goals
The effects of metabolites produced by the fungus, Cladosporium sp. on crops in the Salinas Valley such as beans and lettuce were determined. This fungus has shown a remarkable suppressive effect on one of the most serious pathogens (Sclerotinia spp.) affecting a wide variety of crops grown in the Salinas Valley. It was hypothesized that the target of Cladosporium sp. is specific to Sclerotinia spp. and it may not be toxic or cause disease on crop plants such as beans and lettuce. Only the latter part of this hypothesis was explored experimentally.

Methods/Materials
Bean and lettuce seeds were planted in 16 oz styrofoam cups containing autoclaved sand and watered as needed. Cladosporium was grown in Petri plates containing potato dextrose agar, the culture filtrate was extracted from 20-day-old cultures, and was partially purified by repeated filtration and heating to 80°C to neutralize the fungus and to concentrate the filtrate. Two dilutions of this filtrate (1:4 and 1:8) and an uninoculated control (0) were the treatments tested in this experiment. When the bean and lettuce seedlings produced two true leaves, 9 bean plants in five styrofoam cups and 15 lettuce plants in five styrofoam cups per replication each were sprayed with each concentration of the culture filtrate and sterile water. For each treatment, there were 4 replications. Plant heights for the bean plants were measured before spraying and at weekly intervals after spraying for 3 weeks. Since lettuce in early stages has a prostate growth, height was not measured. The number of lesions was also measured before and after spraying the culture filtrate or water. At the termination of the experiment, the plants were washed free of soil, dried at 60°C for 48 hours and weights were taken. The data were analyzed to determine the treatment differences.

Results
Cladosporium sp. did not affect either the growth of bean or lettuce plants nor cause any disease on these crops.

Conclusions/Discussion
After further testing, the suppressive effects of Cladosporium sp. on Sclerotinia spp. can be exploited for disease control in commercial agriculture. Scientists at the University of California, Davis, are currently characterizing this interaction between Cladosporium sp. and Sclerotinia spp. further.

Summary Statement
My project studied the effects of metabolites produced by a currently unidentified species of the fungus, Cladosporium on common crops in the Salinas Valley such as beans and lettuce.

Help Received
Dr. Wu from UC Davis suggested the project and provided the preliminary literature on the topic. Dr. Durkee corrected all of my write-ups.