CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Mhir Bawal; Rohit Ghosh; Jordan Wagner

Project Number
S1601

Project Title
Symbiosis: Always There to Help

Abstract

Objectives/Goals
The objective of our project was to determine how usable forms of nitrogen and symbiosis inhibit or encourage plant growth. We believed that plants with usable nitrogen would grow better and also that plants with nitrogen-fixing bacteria would have an edge over plants with none. We thought that plants with neither would have a disadvantage against other plants.

Methods/Materials
For our experiment, we used alfalfa. We used it because it is a quick-growing plant. The first thing that we did was creating four groups of plants. Group 1 was made of alfalfa seeds in soil, with no extra nitrogen. Group 2 consisted of alfalfa seeds plated in soil, but unlike group 1, it was given extra nitrogen. Group 3 consisted of alfalfa planted in sand with extra nitrogen added, and finally, group 4 was made of alfalfa planted in sand with no extra nitrogen.

Results
We found that group 1, our control group, seemed to have grown without anything hindering its growth. We do not state its height here because it is our control and it is the group we compare others to. Group 2 seemed to be about the same as group 1. Group 3 seemed to grow like groups 1 and 2. Group 4 was the only one with different growth. It grew little. We found that our results contradicted our hypothesis a lot.

Conclusions/Discussion
Based on our data, we concluded that nitrogen encourages plant growth. Also symbiosis between nitrogen-fixing bacteria and plants is only efficient when there is competition for nitrogen. Our experiment brought up many questions. We asked ourselves if terrain affected the plants# ability to absorb nitrogen. Also we asked if terrain would affect root growth. The last question was could abnormal amounts of nitrogen encourage growth beyond nutrient availability. We hope that if this experiment is done again, then the experimenters keep these questions in mind.
We always thought that photosynthesis is the only big process plants need for survival, but now we understand that the symbiosis with the nitrogen-fixing bacteria is also very important to most plant#s survival.

Summary Statement
Our project is about the effects of nitrogen and symbiotic nitrogen-fixing bacteria on plant growth.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Claire N. Bedbrook

Project Number
S1602

Project Title
Are Organic Tomatoes More Susceptible to Mold than Conventionally Grown Tomatoes?

Abstract

Objectives/Goals
The hypothesis that I have tested is that organic tomato fruit are more susceptible to fungal infection than conventionally grown tomato fruit, because they are not protected with pesticides and herbicides during growth.

Methods/Materials
Conventionally grown and organic cherry tomato fruits (10 fruits/test) were compared for their susceptibility to a) spontaneous infection after puncturing, and b) to two common fruit molds, Botrytis and Cladosporium, after surface innoculation. Washed and unwashed samples of each class were compared, and the microbial populations in the surface washes were examined.

Results
Statistical analysis indicates that organic fruit were significantly more likely to grow mold at experimentally induced punture sites than conventionally grown fruit. On the other hand organic fruit were found to be significanlty less susceptible to experimental infection with Botrytis than conventionally grown fruits. There was no significant difference in the level of susceptibility to experimental Cladisporium infection between organically and conventially fruit. Through examination of the surface microbial flora from organic fruit, I was able to isolate a microbe that appeared to control Botrytis growth.

Conclusions/Discussion
Experiments described here show that organic tomatoes have a diverse microbial flora on their surface, compared to conventionally grown fruit. This microbial flora, coupled with fruit damage, seems to be responsible for the high incidence of black mold growth on organic fruits in the supermarket when compared to conventionally grown fruit. On the other hand this microbial flora on the surface of organic tomato fruit also seems to be responsible for decreased susceptibility of organic fruit to infection by the grey mold pathogen, Botrytis, when compared to conventionally grown fruit. A working model for both observations is proposed.

Summary Statement
My project is about the susceptability and control of microbial infections on organic and conventionally grown tomato fruit

Help Received
Dr Trevor Suslow, UC Davis provided Botrytis and Cladisporium, PDA plates for fungal growth and Dr Jim English, Verdia Inc. provided LB and PDA plates for microbial growth

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Shiraz Ghanimian

Project Number
S1603

Project Title
The Effect of Wind on Phototropism

Abstract

Objectives/Goals
The purpose of this project is to observe how much negative tropism, due to wind (Thigmotropism) is too great for the positive tropism, phototropism.

Methods/Materials
Four Cardboard boxesFour table top fans, Four Plant light bulbs in the light sockets, 7 plants (Nemesia fruticans), Ruler, String, 80 mL beaker, Anemometer, Protractor

Results
The only type of wind that actually allowed for plants to grow and show phototropism was the low level plants. The medium level plants grew only a tiny bit and showed a tiny bit of phototropism. The high level plants did not survive and did not show a bit sign of phototropism.

Conclusions/Discussion
Based on my results, 4.94 meters per second of wind (22.7 degrees Celsius) , which was the medium level, leaves only enough room for minimal phototropism and minimal plant growth. 5.15 meters per second of wind (22.8 degrees Celsius), which was the high level, leaves virtually no room for plant growth and no room for phototropism. However, 4.20 meters per second of wind (22.5 Celsius), which was the low level, was not enough to stop plant growth and the plants grew a decent amount and did display phototropism. This conclusion does prove my hypothesis to be correct.

Summary Statement
The point of this project is to observe how much wind (negative tropism) is too great for phototropism (positive tropism).

Help Received
Ribet Academy's Biology Lab

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Kevin C. Hall

Project Number
S1604

Project Title
Stimulating the Fruit Ripening Process

Abstract

Objectives/Goals
Is the fruit ripening process in bananas, pears, and avocados accelerated the fastest by temperature, amount of sunlight, ethylene gas exsposure, being in an open air environment, or being in an air tight environment?

Methods/Materials
The materials that were used in the course of my project were 24 apples, 16 pears, 16 avocados, 16 bananas, 12 brown paper bags, 24 ziploc bags, 18 open Tupperware containers, 1 digital camera, and 1 card table.

Results
The fruits that were in open containers with apples, and were either in a brown bag or at room tempertature ripened the fastest. The open containers containing fruit rripened faster than those in a ziploc bag by a considerable amount. The slowest ripening condition was the combinations that were inside of the refrigerator.

Conclusions/Discussion
My conclusion is that the fruits that were exposed to an apple, which produces ethylene gas, and that were in an open air container ripened the fastest. The conditions that stimulated the ripening process the most were the fruits in a brown paper bag (no sunlight) and the fruit at room temperature. I attribute this to the fact that the exposure of the fruits to air, and all of its elements, mixed well with the ethylene to really speed up the process. Fruits that are ripened with apples in an open container at room temperature or in a brown paper bag will ripen at the greatest speed.

Summary Statement
My experiment was on the affects of ethylene gas on the fruit ripening process, and also on all the other favorable conditions for ripening fruit.

Help Received
My mother helped me by driving me to the store to buy the fruits, and also my sister for giving me good ideas on being creative.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Ben D. Hampton

Project Number
S1605

Project Title
Anemia and Chlorosis, Blight of the Third World: The Absorption of Iron in Spinach

Abstract

Objectives/Goals
Anemia, a common disease among third world countries is responsible for many cases of fatigue, mental retardation, stunted growth, and complicated pregnancies. One cause of this disease is chlorosis, which occurs in plants and is traced to a lack of iron. Many solutions are available such as the employment of chelating compounds, sulfur oxidizing bacteria, and biofortification. All of these are effective means of combating chlorosis, yet extremely expensive. This experiment investigated another solution using inexpensive materials.

Methods/Materials
Spinach seeds were planted in varying amounts of steel wool and silica sand. After 9 weeks the spinach was analyzed for iron. Samples of spinach were burned to an ash. Hydrochloric acid was added to each to extract the iron then bonded to potassium thiocyanate. The Fe3+ ion and the thiocyanate ion react to yield a reddish brown complex ion.
Fe3+(aq) + 6 SCN-(aq) # (Fe(SCN)6)3-(aq)
Solutions of known concentrations were analyzed with a spectrophotometer at a wavelength of 480nm. Standards of known concentrations were also made and run through a spectrophotometer. A graph on concentration and absorption was made for the standards.

Results
Comparing the absorption of each cultivar to the graph showed a significant increase between the control (no additives in the soil) and the iron-fortified plants.

Conclusions/Discussion
The results of this experiment affect several aspects of society, one of the most critical being anemia. Anemia is an iron deficiency disease that comes from a lack of iron in the blood. It can lead to mental retardation and impair physical growth in children as well as complicate pregnancies and reduce the capability for physical labor. This project has uncovered a possible solution to this disease. The results of this experiment implicate the plausibility of this affordable answer to the dilemma of chlorosis and anemia in third world countries.

Summary Statement
My project attempts to find an inexpensive cure for anemia and chlorosis using steel wool as an iron source in soil.

Help Received
My dad helped me create my display board and my mom helped me gain access to a laboratory to conduct my experiment.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Sara Imberman

Project Number
S1606

Project Title
Does Coffee Affect Plant Growth?

Abstract

Objectives/Goals
Evaluate affect of coffee addition to soil on radish growth.

Methods/Materials
Various levels of coffee were added to soil. Plant height and survival were measured under various soil conditions.

Results
The addition of 2.5% coffee to soil had the most benificial affect on plant survival and plant height. The addition of higher levels of coffee in soil had negative affects on plant height and survival rates.

Conclusions/Discussion
The addition of low levels of coffee to supplement soil have a benificial affect on plant growth.

Summary Statement
Evaluating the affects of coffee addition to soil on plant growth

Help Received
Father helped with project design.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Michelle Jiang

Project Number
S1607

Project Title
Mathematical Model of Marsh Biomass Distribution in the Upland and Alkaline Margin Environments

Abstract

Objectives/Goals
Biomass, the total mass of living matter within a given unit volume of environment, is an important measurement to ecologists. Biomass shows the productivity of organisms under certain environmental conditions. Many factors affect biomass, including nutrient level, salinity, and water content. The plan is to analyze the characteristics of two marsh environments and find a correspondence to the biomass distribution taken at each site.

Methods/Materials
Actual measurements are gathered on the marsh site, in two sub-environments. Using a 1m by 1m quadrat made out of PVC pipes, calculations of the aboveground plant biomass are taken, by clipping the protruding shoots and sorting the clippings, by location, into separately marked paper bags. Each bag represents an area of 10cm by 10cm. Both wet and dry are measured, two samples for the each sub-environment. After data collection, the measurements are entered into a computer, and statistical analysis is used to find patterns correlations between the different locations.

Results
From the gathered data, it was seen the biomass data taken from the alkaline margin are more varied from square to square. No explicit pattern was found among the individual subplot areas. Variations among these measurements were irregular and unpredictable.

Conclusions/Discussion
The results show that environmental factors do seem to affect biomass distribution at the sites. Because the dispersal process is random and chaotic in nature, no set method could be found from which to extrapolate more biomass measurements. If the area of experimentation and number of samples are increased, it might result in a somewhat accurate model for total plant biomass.

Summary Statement
to find a evidence of an ordered, predictable structure in natural environments

Help Received

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Mariel A. Lisud

Project Number
S1608

Project Title
The A's Melee: Allicin vs. Acid Rain

Abstract

Objectives/Goals
To determine whether acid rain deters the antibacterial component of garlic

Methods/Materials
Acid rain was applied on one group of garlic plants and another group of garlic was sprayed with normal water. The juices of the two garlic groups were separately extacted then applied to a culture of bacteria then incubated.

Results
The petri dish applied with the acid-rained garlic plant extract developed an average of 121 colonies, while the petri dish with the pure-watered garlic plant extract developed only an average of 22 colonies.

Conclusions/Discussion
Bacteria are inhibited less effectively by garlic plants watered with acid rain than by garlic plants watered with pure water. Therefore, acid rain does discourage allicin, the antibacterial component, from inhibiting bacteria effectively.

Summary Statement
It is about acid rain's effect on the make-up of garlic plants' antibacterial component.

Help Received
Ms. Della Santina supplied laboratory equipments (petri dishes, incubator, refrigerator, etc.)

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Maya J. Mileck

Project Number
S1609

Project Title
Acid Rain and Radishes: How Acid Rain Affects the Growth of Radishes

Abstract

Objectives/Goals
The objective of my project was to determine how different acidities of water affect the growth of radishes.

Methods/Materials
I planted four groups of radishes, six radishes to each group. I watered each group with a different acidity of water. The acidity of my control was 5.6, which is the acidity of normal rain water. The other acidities were 5.0, 4.5, and 4.0. After the radishes grew for a month, I uprooted and weighed them. This weight included both the root and the leaves. I repeated the experiment five additional times.

Results
I found that on average, the radishes watered with the 4.5 water weighed the most. Then came the 5.0 radishes, the control (5.6), and finally the 4.0 radishes.

Conclusions/Discussion
I determined that radishes will be the most productive when grown in an environment that receives rain with a acidity of 4.5.

Summary Statement
The effects of acid rain radish growth

Help Received
Parents and teacher helped organizing the project

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Alva S. Monsalvo

Project Number
S1610

Project Title
The Characterization of Arabidopsis Mutants

Abstract

Objectives/Goals
To analyze the response of Cd Tolerant Arabidopsis mutants in terms of their root growth, shoot growth and Cd accumulation.

Methods/Materials
Root Assay: I grew Mutants and Col. on Petri dishes with 0µM of Cd. Then I transferred the seeds to 20µM of Cd and 40µM of Cd. After 3 days, I measured their root lengths.
Shoot Assay: I recorded the percentage of green color in cotyledon Mutants and Col. For this test I used higher concentrations of Cd; 150µM and 500µM.
Cd Accumulation: I grew Arab. mutants and Col. on 0µM of Cd. After 3 days I transferred them to 20µM of Cd mixed with 80ml hydroponic solution and left them there for 5 days until they had accumulated some Cd. I dried the tissue and weighed the plant. I measured the Cd accumulation in their roots/shoots by using the ICP machine.

Results
Root Assay Results: Cd 29 Activation Tagged (Act.Tag.) reached a length of 6mm, which is the longest length for Act.Tag root growth in 40µM of Cd. Cd 16 (EMS) grew 3.7mm, which is the longest root growth for EMS mutants in 40µM of Cd.
Shoot Assay Results: Act.Tag. Mutants and the EMS Mutants also had a greater percentage of green shoots in 500µM and 150µM of Cd compared to Col. Cd 29 (Act.Tag.) had 86 percent of its cotyledons green, while the Col only had 26 percent of its cotyledons green. Cd 11 (EMS) had 76 percent of its cotyledons green meanwhile the Col only had 10 percent of its cotyledons green.
Cd Accumulation: EMS Graph shows that roots collected more Cd compared to shoots. EMS Mutants reached levels up to 1.7 ppm of Cd in the accumulation process.

Conclusions/Discussion
The response of Arab. mutants and Col. to cadmium helps us analyze the phenotype of the plants. I found that most of the mutants grew longer roots than the control and had greener shoots. Since the roots have easy access to the Cd, they collected more Cd than the shoots. Since the Mutants have their genes mutated differently some had a different response to Cd. Since there are so many mutants it is important that we continue this experiment and analyze the different phenotypes these mutants in Cd.

Summary Statement
Analyzing the phenotype of Arabidopsis mutants in Cadmium in terms of their root growth, shoot growth and cadmium accumulation.

Help Received
Used lab equipment at Muir College under supervision of Alice Chen, Dad drove me to lab, Mom and brothers helped make the board.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Moriah K. Nachbaur

Project Number
S1611

Project Title
Translatability of Gene Function between Plant Species: From Arabidopsis thaliana to Nicotiana tabacum

Abstract

Objectives/Goals
To investigate the conservation of gene function among plant species, the translatability of two, morphology-governing genes, BREVIPEDICELLUS LIKE (BPL) and NO APICAL DOMINANCE (NAD), was examined. Transgenic Arabidopsis thaliana lines overexpressing the BPL gene exhibit dwarfism and short flower pedicles; lines overexpressing the NAD gene display reduced apical dominance.

Methods/Materials
From a published method, a new, in-vitro transformation protocol was developed and used to introduce the overexpressed Arabidopsis BPL and NAD genes into Nicotiana tabacum. The phenotypes of these T1 generation transformants were examined, and transgene expression was verified through RT-PCR analysis. The expected, Mendelian inheritance of these transgenes was confirmed through Chi-square assessment of T2 generation seedlings.

Results
Overexpressing the Arabidopsis BPL and NAD genes in Nicotiana tabacum produces stable, heritable, architectural effects similar to those found in the analogous Arabidopsis thaliana overexpression lines.

Conclusions/Discussion
Such translatability suggests that comparable genetic mechanisms regulate plant morphology in evolutionarily divergent species. The preliminary results of this project contribute to the growing evidence that Arabidopsis phenotypes are translatable to other flowering plants, validate the specific use of Arabidopsis thaliana as a model species, and demonstrate that Nicotiana tabacum may be a useful second species in which to investigate other Arabidopsis lead genes.

Summary Statement
Overexpressing the Arabidopsis BPL and NAD genes in Nicotiana tabacum produces stable, heritable, architectural effects similar to those found in the analogous Arabidopsis thaliana overexpression lines.

Help Received
All work was conducted in the laboratories of Mendel Biotechnology, Inc. Dr. Oliver Ratcliffe and Mr. Roderick Kumimoto supervised my research.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Ann Nguyen; Annie Tat

Project Number
S1612

Project Title
An Environmentally Friendly Method to Suppress Weeds

Abstract

Objectives/Goals
To find the most effective environmental friendly way to eradicate perennial weeds at Ulistac Natural Area.

Methods/Materials
The materials we used were black plastic, clear perforated plastic, cardboard, string, stakes, mulch, and a measuring tape. We approached this experiment in four different ways; using black plastic, mulch only, clear perforated plastic, and cardboard. We first separated out six plots. We left plot 1a and 1 b like it is (no mulch/cardboard/any type of plastic), as two control plots. Second, we covered plot 2 with a layer of black plastic and mulch. Plot 3 was covered with mulch only, and plot 4 was covered with strips pf perforated clear plastic and mulch. Lastly, we covered plot 5 with pieces of cardboard and mulch.

Results
In a matter of about 2-3 months, the two control plots were covered with weeds. The mulch plot also had many weeds, just not as much as the control plots. The black plastic plot, clear plastic plot, and the cardboard plot had a weed quantity of few to none.

Conclusions/Discussion
From the data that we gathered, we saw that both plastics and the cardboard were most effective. However, since our purpose was to find the most environmental friendly method to suppress weeds, the cardboard turned out to fit those criteria best. This experiment was done on the south facing side of Ulistac and on a slope, therefore getting more sun and less water. Neverless, the cardboard withstood these conditions. The soil was more loose and moist, unlike the clay-like quality of the plastic#s soils, allowing many diverse insects to inhabit it. The cardboard resulted as being the most effective and beneficial way to eradicating weeds, since cardboard is also cheap and biodegradable.

Summary Statement
To show that there is an environmental friendly method to replace the other harmful ways of eradicating weeds.

Help Received
Mr. Dowling and Stanford Tran helped spread the mulch over the plots.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Garrett R. Oyama

Project Number
S1613

Project Title
The Effect of Gibberellic Acid on Salt Tolerance of Pisum sativum

Abstract

Objectives/Goals
To learn if gibberellic acid has any effect on the salt tolerance of Pisum sativum macrocarpon.

Methods/Materials
125 P. sativum seedlings were cultivated for 11 weeks in soil containing different concentrations of table salt. Four salinity groups were established, 0 control, 1700 ppm, 5000 ppm and 10000 ppm. These were matched by 4 groups grown under the same conditions except that they were treated with topical GA3 once a week. Plant height, and number of flowers and peas were measured and recorded once a week. On week 11, I removed plants from the soil and measured the fresh weight of the surviving groups. After 12 days of drying in room air, I obtained total dry weights and root weights. Soil samples were then sent to the lab for salinity measurements.

Results
All plants in both of the 10000 groups and in the 5000 control group died by the 7th week, and only 1 plant from the 5000 GA-treated group survived to week 10. However GA-treated high salinity groups had a slightly greater proportion of plants surviving slightly longer. All GA-treated groups showed progressive increase in mean height compared to controls for each salinity level. By week 5 the difference became statistically significant. Surviving GA treated groups also showed greater biomass compared to the controls. Finally, GA treated groups showed greater absolute flower production, but produced fewer peas by week 11. Absolute # of combined pea and flower production was nearly equal between 0-C, 0-GA and 1700-GA groups at 42, 41 and 43 respectively, compared to 31 for the 1700 control. The 1700 GA group outperformed its control and closely approached the performance of the 0C group in all criteria, despite a greater than 7 fold increase in salinity.

Conclusions/Discussion
GA treated groups did better than non-treated groups in terms of growth, biomass and potential harvest. It is uncertain whether GA strengthened plants by general effects, such as dilutional effect from increased cell volume, or whether it may have specifically made the plant more salt tolerant. GA treatment may have enabled the plant to dispose excess salt more readily at the cellular level producing more contractile vacuoles. At the gene level, the SOS1 gene (salt overly sensitive) in Arabidopsis is known to code for a sodium-hydrogen antiporter that can expel salt from the plant. Whether GA has any influence in any of these areas is unknown.

Summary Statement
My project demonstrates the effect of topical gibberellic acid on the salt tolerance of Pisum sativum.

Help Received
My father helped prepare plant containers and shelter and assemble the presentation board. Mr. Mosso at the Soil and Plant Lab provided salinity and pH measurements for my soil samples. My mother helped me find references, taught me to construct tables and graphs and edited my report.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Sophia J. Powers

Project Number
S1614

Project Title
Redesigning Nature: The Life Span of a Genetically Engineered Tomato

Abstract

Objectives/Goals
Genetically engineered (GE) crops have the potential to change the future of agriculture. Transgenic crops may be the solution to environmental problems, such as the run-off of pesticides, herbicides, and organic farming by-products into tributaries and oceans. My goal was to determine if genetically modified tomatoes will have a longer usable life span passing the economical benefit on to the agricultural industry and the environment. My hypothesis was that the simultaneous suppression of expansins (EXP) and hydrolase polygalacturonase (PG) would cause the tomato to ripen slower and the skin of the tomato to deteriorate at a slower rate.

Methods/Materials
I designed three environments for the usable life of transgenic tomatoes and non-transgenic tomatoes: storage, refrigeration and counter. To determine usable life I measured the circumference, firmness, weight, and percentage of mold. Eleven percent of the transgenic tomatoes with simultaeously suppressed proteins, EXP and PG, grew mold. Thirty-six percent of the control group grew mold.

Results
My research and investigation indicated that suppressing EXP decreases cell wall strength and suppressing PG increases the ripening of the tomato. As expected, the tomatoes with the proteins, PG and EXP, suppressed had a longer usable life. On the average the transgenic tomatoes lived about 16 to 20 days longer than the control tomatoes, or any other genotype.

Conclusions/Discussion
This experiment has created an extension to the usable life of a tomato. Accepting GE tomatoes as a commercial crop, could be the key to returning GE foods back as an environmental and economical solution for our world.

Summary Statement
The purpose of this project is to find out if genetically modified tomatoes will have a longer usable life span and ultimately pass an economical benefit to the agricultural industry.

Help Received
My mother was my sponsor.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Sally E. Stanton

Project Number
S1615

Project Title
The Ability of Salicylic Acid to Reduce the Damaging Effects of Salt Water Stress on Phaseolus vulgaris

Abstract

Objectives/Goals
To determine whether or not applying a low concentration of salicylic acid (SA) to green bean plants will reduce any damaging effects caused by exposure to salt water stress during early growth.

Methods/Materials
I planted 72 green bean plants from seeds under an indoor fluorescent light with one of four different treatments: one group (of 18 plants) was given only a treatment of water for a total of 11 days, the second group (18 plants) was given a treatment of .5mM SA at the time they were planted and then only water for 11 days, the third group (18 plants) was planted with only water and then treated with 15 cc#s of 100mM NaCl every day from day 6 to day 11, and the last group (18 plants) was treated with .5mM SA when first planted, and also exposed to five days of salt stress. After 11 days of growth I cut the plants and measured their stalks, their two largest leaves, and took their biomass.

Results
I analyzed my data by finding the standard deviation for each measurement, and then I did a t test for all three measurements of growth comparing the results.
I found that the results of biomass and height of the plants treated with SA and exposed to salt stress were significantly greater than those only exposed to salt stress but only slightly significantly greater for the length of the leaves. All of the results of plants exposed to salt stress were significantly less than results of the control plants.

Conclusions/Discussion
In my experiment the use of salicylic acid on green bean plants helped them to resist damages caused to green bean plants by salt water stress. Salt water stress inhibited the growth of green bean plants so that they were shorter, had smaller leaves, and less biomass than plants grown without any extra chemicals. A pretreatment of salicylic acid significantly increased the mean height and mean biomass of green bean plants exposed to salt stress, but not the mean leaf length. A .5mM treatment of SA alone did not have any significant damaging effects on the green bean plants.

Summary Statement
Looking at whether or not salicylic acid helps green bean plants resist damages caused by salt water stress.

Help Received
Cathy Messanger (friend of my teacher) helped me find an interesting topic idea.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Lul H. Tesfai

Project Number
S1616

Project Title
The Effects of Organic vs. Inorganic Fertilization on Ophiopogon japonicus and the Impact on Various Ecosystems

Abstract

Objectives/Goals
I plan to examine the contrasting results in plant growth, development, and health, as well soil pH and nitrogen concentration that result from the use of organic and inorganic fertilization. My experiment will closely observe the reaction of mondo grass to various types of fertilizers. The legume based organic fertilizer will be compared to the chemical fertilizer with an exceptional amount of nitrogen solution in order to determine which method better fosters plant growth in addition to maintaining a healthy terrestrial and aquatic ecosystem.

Methods/Materials
3 crates of Ophiopogon Japonicus (Mondo Grass), pH level testing kit, Nitrogen level testing kit, Miracle-Gro lawn food, Legume seeds (Clovers), Ruler.

Results
The highly concentrated nitrogenous inorganic fertilizer yielded the best results. The mondo grass treated with the Miracle-Gro was approximately 9 cm tall to being with, but over the span of three weeks, rose to a height of 18.5 cm. Similar growth was seen in the organically treated mondo grass, as the height managed to go from 8.5 cm tall to 12.8. Yet height growth was not solely limited to the naturally and chemically enhanced plants. Over the three week period, the untreated mondo grass grew a total of 2.15 cm. With the presence of growth came the increase in both pH and nitrogen levels. The two crates of mondo grass treated with legumes and nitrogen fertilization became slightly more acidic. In both the organic and inorganic soils, the number of hydrogen ions were offset, thus contributing to the increase in the levels of pH and nitrogen.

Conclusions/Discussion
According to my experiment on the comparative effects of organic verses inorganic fertilizes, inorganic fertilizers proved to instigate plant growth substantially more than organic fertilizers.
In general, organic fertilizers release nutrients slowly, which results in less leaching than a one-time application of inorganic fertilizer. Organic fertilizers contain minerals that improve the physical properties of the soil, providing spaces for gas movement, root growth, and drainage. On the other hand, inorganic fertilizer provides an almost instantaneous supply of soil nutrients and can be formulated to meet the requirements of a particular soil yet at the same time can be detrimental to the environment.

Summary Statement
The comparative effects of organic verses inorganic fertilization on Ophiopogon japonicus and the subsequent impact on terrestrial and aquatic ecosystems

Help Received
Mr. Levy, Ed Schnutenhaus, Hodge Morioka, Albert Wapstra

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Benjamin T. Tsai

Project Number
S1617

Project Title
The Effect of Cover Crop Growth Time on Its Effectiveness in Enhancing Plant Growth

Abstract

Objectives/Goals
The objective is to determine if the time a cover crop is allowed to grow will affect its ability in enhancing the growth of a target plant grown in the same soil afterwards. I hypothesized that the longer the cover crop is allowed to grow, the more beneficial effect it will have on the target plant.

Methods/Materials
This project consisted of performing the experiment using a growth container that was built consisting of 12 equal cells. The cover crops were allowed to grow for varying lengths of times, which were 0, 10, 20, and 30 day periods. Three trials were performed using the fava bean as the cover crop. Two cover crop seeds were planted in each box of the 30-day cells. 10 days later, the seeds for the 20-day cells were planted, and this continued in the same manner until all the specified growth times were completed. After the cover crops were removed, the soil was then transferred into individual containers. About four seeds of the brassica rapa plant, which served as the target plant, were planted into each container. The plants were then exposed to a constant fluorescent light to promote quicker growth. After the plants were grown for 10 days, they were removed and heights were measured from the soil lines to the tips of the stems.

Results
In this experiment, it was found that the longer the cover crop was allowed to grow in the soil, there would be a greater beneficial effect on the target plant grown afterwards. The soil that had the cover crop growing for 30 days promoted the most growth in the target plants. As the days that the cover crop grew decreased, the heights of the target plants in the corresponding soils also decreased. The length a cover crop is allowed to grow varies directly to its effect on enhancing plant growth.

Conclusions/Discussion
The results supported the hypothesis that the longer the cover crop is allowed to grow, the greater the beneficial effect it will have on plants grown in the same soil afterwards. The experiment was useful in determining one factor to regulate the use of cover crops in a more effective way. The data suggests that growing the cover crops longer will have a more benefiting effect on target plant growth, which provides useful information for the future of cover crop use.

Summary Statement
My project tests to see the effects that growth time of cover crops has on its ability to improve target plant growth.

Help Received
Father helped make growing space; Robert L. Bugg helped with background information and getting me started

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Janelle A. Williams

Project Number
S1618

Project Title
Does Cottonseed Prehydrated in Gibberellic Acid Germinate Faster than Simple Water?

Abstract

Objectives/Goals
The purpose of this year's experiment is to build on the previous five years work on presoaking of cottonseed before planting. This year's project is to see if presoaking cottonseed in Gibberellic Acid in different concentrations has the same positive results as the presoaking of cottonseed in water only.

Methods/Materials
Materials: Greenhouse, paper towels, Micrometer, Cottonseed, Water, Gibberellic Acid, pen, Identifying Sticks, Stopwatch, Buckets, storage bags, Soil, Planting Containers Procedure: 1.Count out 320 cottonseeds. 2.Divide into eight equal lots. 3.Mix with water Gibberellic Acid concentrations of 1ppm, 5ppm, 10ppm, 15ppm, 20ppm, and 25 ppm (parts per million). 4.Presoak 40 cottonseeds for ten minutes in Gibberellic Acid concentration of 1ppm. 5.Repeat for five, ten, 15, 20, 25 parts per million concentrations, and simple water. Set one group of 40 seeds off to the side as the control group. 6.While soaking lay out paper towels in eight different groups and place soil in seeding containers. Place one paper towel strip over another, the cottonseeds will rest between the two strips. Wet the paper towels and soil so that both will be wet when seeds are placed between them. 7.Drain the seeds from the concentrations and water after ten minutes. 8.Place 20 seeds of each concentration and water spread out about 4mm away from another in the eight groups of paper towels, this includes the control group. Place paper towels in Zip-lock bags and close. Keep like groups together and label. 9.Take the other 20 seeds for each group and plant in soil as if planted in the ground to later be harvested. Label and then place in a greenhouse. 10.Water each day, just enough to soak the paper towels and soil. After two, four, six, eight, and ten days have passed check plant emergence, and measure the radical for length on the 8th day of seeds in the bags. Record results.

Results
The results show that presoaking of cottonseed in Gibberellic Acid with the concentration of five part per million germinated faster than other concentration, presoaking of simple water, and not presoaking at all.

Conclusions/Discussion
The results from this year's trial showed that presoaking cottonseed in five parts per million Gibberellic Acid solution germinated faster than any other treatments. This means that by taking the results of past experiments, there is a better treatment of presoaking cottonseed than by just using simple water.

Summary Statement
The project is on prehydration of cottonseed in different concentrations of Gibberlic Acid to find a concentration that will germinate faster than prehydration in simple water.

Help Received
Russel Carlson - Supplied Gibberlic Acid, Mr Krafthefer - Helped with concentrations and provided pipet, Mrs. Jennifer Wilke - Provided the Bakersfield High agriculture department greenhouse.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
Jonathan M. Williams

Project Number
S1619

Project Title
Effect of Water Sources on Sprout Time and Early Growth Rate of Seeds

Abstract

Objectives/Goals

1. Problem Statement: Does the source of water from which a plant seed is watered affect its rate of germination and early growth rate?

2. Hypothesis: I believe that sweet pea seeds will sprout faster and grow taller when watered with water from the head waters of the Colorado River Aqueduct at the Colorado River. I also believe that the sprouting time and growth rate of the same type of sweet pea seeds will diminish when the water source is further from the headwaters of the Colorado River Aqueduct and is closer to large metropolitan areas.

Methods/Materials

Methods: 1. Presoak seeds in their respective water groups; 2. Plant 4 seeds in each peat pot (24 seeds per group x 6 groups); 3. Grow light to be turned on at 7 a.m. and turned off at 6 p.m.; 4. Take Measurements of each plant, once a day at 5 p.m.; 5. water each "peat" pot with 20mL of its respective water at 5 p.m.; 6. Record data and average each groups daily growth using Microsoft Excel; 7. Repeat 1-6 for a second test.

Materials: 84 6 centimeter "peat" pots; 6 graduated cylinders; 288 sweet pea seeds; 8 liters: {distilled water, chlorinated water, Palm Springs tap water, Colorado river water (from beginning of Colorado River Aqueduct), Riverside tap water, Santa Ana tap water}; 2 white racks; 2 tin baking pans; 6 , one liter water containers.

Results

In the first test, the groups watered with the distilled water, Colorado River Aqueduct water, Palm Srings CIty, and Riverside water grew the best, with Santa Ana water and Chlorinated water behind the rest.

In the second test, no similar patterns were found, except for the fact that the group watered with the Chlorinated water once again finished last.

Conclusions/Discussion

1. Due to the consistent fact that the "Chlorinated Water" group showed the worst results in both tests, it is clear that chlorine is a harmful element to plants.
2. Due to the inconsistencies between the two tests, it is difficult to say whether or not my hypothesis is correct.
3. I believe that this topic poses an interesting question regarding the contaminants found in many tap waters. I think there should be further research on the topic.

Summary Statement

My project is about testing whether or not I will see differences in plant growth with plants watered with water from different sources.

Help Received

Father provided transportation and funded the project.

CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

Brieana P. Marticorena

Project Number

S1699

Project Title

Transgene Expression in Wheat Engineered through Particle Bombardment

Abstract

Objectives/Goals

My objective is to reduce the amount of material necessary to make Andros spring wheat herbicide resistant by showing that the use of the GFP gene could simplify the process of homozygous plant selection at an early stage of embryo formation.

Methods/Materials

5 wheat lines were transformed using the plasmid psGFP-BAR and 5 lines were transformed using the plasmid psGFP-BAR and the plasmid pAct1-F. These lines were grown to maturity and were tested for GFP and GUS expression, as was their progeny. All transgenic wheat plants were tested for resistance to the herbicide BASTA.

Results

All analyzed transgenic lines generated after co-bombardment with psGFP-BAR and pAct1-F showed 3:1 ratio of inheritance in T1 progeny for both GFP and GUS genes. The segregation ratio in the progeny of self-pollinated T1 plants vary at a high degree. Chi square analysis revealed that some of the ratios otained are very close to the predicted 2:1 heterozygous: homozygous pattern which is characterized for the single locus insertion (3:1 Mendelian segregation). However, there was significant variation in expression levels of reporter genes among independent transformants. All tested homozygous progeny were resistant to 1% BASTA.

Conclusions/Discussion

Primary transformants with high GFP and/or GUS activities produced progeny plants with the same characteristics. Inheritance of both reporter genes was stable, and the transmission of the transgenes and the inheritance of their expression followed Mendelian ratios in the majority of the analyzed lines. A gradual reduction in gus expression was observed over two generations, which was not accompanied by a similar reduction in gfp expression. No embryos were found which showed GUS expression without GFP activity. This suggests that the reporter genes are linked together in the genome. Lack of GUS gene expression may reflect some inherent instability of GUS gene in the population examined. The results show that activity of GUS gene is more difficult to determine in wheat transgenic tissues, probably due to a lower sensitivity of histochemical methods of GUS expression compared to the highly sensitive fluorometric method of GFP expression analysis. This suggests that not only genetic and physiological factors may potentially contribute to distorted segregation.

Summary Statement

This study surveys the inheritance and expression of the gfp gene in comparison with gusA gene in T1 and T2 transgenic progeny in order to produce homozygous wheat population resistant to the herbicide BASTA.

Help Received

Used lab equipment at the Station Biotron in Pushchino, Russia under the supervision of Dr. Dmitry Miroshnichenko