CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Vanessa A. Apodaca

Project Number
J2001

Project Title
Water-logging: Do Polymers Inhibit Plant Recovery?

Abstract

Objectives/Goals
The purpose of my science project was to investigate whether the presence of polymer affects the recovery of vegetation when the soil has been water-logged.

Methods/Materials
Separate 45 radish plants into three groups of 15 plants each. Apply topical polymer (Cloud Cover) to one group, soil polymer (Soil Moist) to another, and leave the final group (control) the same. Water log plants until water line is one centimeter above the top of the soil. Wait 3 days for recovery, observe, and record results. Wait additional four days, observe, and record.

Results
When applying soil polymer: After three days, 66% of the plants were still upright after water-logging. After seven days, 46% of these plants remained upright. When applying topical polymer: After three days, 73% of the plants were still upright after water-logging. After seven days, 66% of the plants remained upright. For the control group which had no polymer present: After three days, 86% of the plants were still upright after water-logging. After seven days, 86% of these plants remained upright.

Conclusions/Discussion
Soil Moist, the soil polymer, was the most harmful to plants that had been water-logged. The presence of soil polymer prevented plant recovery from water-logging. Cloud Cover, the topical polymer, was the second most harmful to plants that had been water-logged. The control group which lacked any polymer recovered the most from water-logging. Farmers need to be aware when using polymers for their crops, that an unexpected rainfall, may cause the polymers to actually harm the vegetation.

Summary Statement
To investigate if the presence of polymer affects the recovery of vegetation when the soil has become water-logged

Help Received
teacher helped with topic and materials; mother helped with gathering research

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Luke P. Bockman

Project Number
J2002

Project Title
Effect of Centripetal Force on Length and Angle of Carrot Plant Growth

Abstract

Objectives/Goals

Carrots will grow sideways when grown in a constantly spinning cage. Based on my research, I believe that the stem of the plant will grow toward the light but the roots will grow in between and toward both forces (gravitational + centrifugal). Also, the roots will grow longer with a stronger resultant force. The centrifugal force was caused by the rotation of the pots inside the spinner. The resultant force was calculated at a 127.5 degree angle starting from vertical and equal to almost 1.6X the gravity force (51.2ft/s2).

Methods/Materials

1. Construct a structure to hold and rotate the potted plants.
   a. Build frame that holds the plants.
   b. Attach the crosspieces that hold the frame and put it on the bearings.
   c. Take apart dryer to get electric motor and attach it to the frame.
   d. Put in the lights.
   e. Pot and plant the seeds.
   f. Attach the pots to the outside frame.
2. Grow plants in rotating structure and grow non-rotating plants.
   a. Turn on the lights for 12hrs per day and start the electric motor (run 24 hr/day, 7 days/wk)
   b. Water the plants every 2-3 days until they are finished growing.
3. Take the plants out and unearth them to get results after 6 weeks of growth.
   a. Measure root angle and length of 4 rotating and 4 stationary control pots (4 plants in each pot)
4. Organize the results into graphs and write report.

Results

The plants that were in the spinner grew longer than the ones on the ground. The average was a 77% increase in length (1.77times). In addition, the angle of growth was between 114 degrees and 135 degrees (measuring from vertical). The average angle was 125 degrees.

Conclusions/Discussion

My hypothesis was correct. The roots grew at almost exactly the angle than I predicted. The roots of the plants in the spinner grew longer than the roots of the plants on the ground, just as I had predicted.

Summary Statement

How creating artificial gravity in carrot plants changes their growth and development.

Help Received

Dad helped take apart a clothes dryer, set up the drive system and build the structure for the pots, Mom helped typed the report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Carina M. Cain

Project Number
J2003

Project Title
Life by Light

Abstract

Objectives/Goals
My objective was to determine whether plants grow better in natural sunlight, or artificial light. My hypothesis was that plants would grow best in sunlight because it contains both the blue and red wavelengths needed for photosynthesis.

Methods/Materials
Materials
Two incandescent lights, two fluorescent lights, eight lettuce plants, three boxes to keep out the excess natural sunlight, eight plant pots, potting soil, small watering can, tap water, ruler, and notebook.

Methods
I set up four boxes to keep stray sunlight from the plants that received artificial light and the plants that received natural sunlight also need to be in a box to keep everything the same, except the type of light.I put two small, potted plants into each box and placed one box on the windowsill and the other three boxes on the floor, away from windows.I hooked up lights to the three boxes on the floor so that the plants in one box received fluorescent lighting, the second incandescent lighting, and the third fluorescent + incandescent from 8:00 AM to 6:00 PM. Every two days, starting on day zero (the start of the experiment), I measured the height of each plant and wrote the heights in a notebook,and watered the plants. I subtracted the heights of the plants on day zero from their heights on the last day of the experiment to calculate the growth of each plant and for each type of light treatment, I averaged the growth of the two plants. Then, I compared the growth of plants for each treatment.

Results
After 6 days, the plants receiving the combination of the fluorescent and incandescent light grew the tallest (1.0 in) while the plants receiving natural sunlight grew the least (0.125 in). The plants receiving either fluorescent or incandescent light grew the same amount (0.5 in).

Conclusions/Discussion
My hypothesis was wrong because the plants under the mixture of incandescent and fluorescent grew the most, and the plants under the natural light grew the least. The reason for this, I think, is because there were quite a few cloudy days during my experiment, and the fact that the plants under natural light did not receive direct sunlight for ten hours as did the plants under the artificial light, could have affected the results of my experiment.

Summary Statement
The type of light a plant recieves affects its growth.

Help Received
Father helped explain the light spectrum and photosynthesis; Mother helped with board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Casey M. Campos

Project Number
J2004

Project Title
The Effects of Natural Pre-Emergents on Seed Germination

Abstract

Objectives/Goals
The objective of my project was to determine the effects of natural pre-emergence on seed germination.

Methods/Materials
Cayenne pepper extract, lemon juice, vinegar, and water (as a control) were individually sprayed onto separate gardening trays each containing 72 radish seeds planted in topsoil. The natural pre-emergence were chosen based on their chemical compound, and each individual gardening tray was sprayed with the same amount of respective product. Greenhouse lids covered the trays. They were placed under sun lights and observed daily for six days with notations made on any changes.

Results
The radish seeds that were sprayed with cayenne pepper extract took the longest amount of time to sprout and had the fewest amount of germinating seeds. Lemon juice also took the same amount of time for seeds to sprout, but had more seeds germinate. Seeds sprayed with vinegar, along with the control group sprayed with water, took the shortest amount of time to sprout and also had the most seeds germinate.

Conclusions/Discussion
Cayenne pepper extract contains an irritating alkaloid (capsaicin) that is toxic to other organisms. This may have interfered with the coating on seeds, delaying the germination process. My conclusion suggests that people should spray their weeds with a natural pre-emergent product like cayenne pepper extract.

Summary Statement
My project proves that natural pre-emergence can prevent or delay seed germination.

Help Received
Mother helped with display board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Francesca A. Cerri

Project Number
J2005

Project Title
Who Needs Dirt? A Growth Comparison of Soil vs. Soilless Mediums

Abstract

Objectives/Goals
My project is to determine if plants grow better hydroponically or in soil as measured by plant height. While I believe that using Rockwool as my hydroponic substrate will show the best growth rate, it is not a biodegradable material. As such, my project also compares another hydroponic substrate, Coconut Coir, which is biodegradable.

Methods/Materials
Twenty-seven opaque plastic pots were used to conduct nine trials, labeled A-I, each containing three replications. Basil seeds were seeded into trays for germination using artificial light and heat. Seedlings were then transplanted into pots which had been prepared for with specific growing mediums and labeled. Trials consisted of Fertilized Soil watered with Distilled Water and Outdoor Water (Trials A & B); Rockwool watered with Flora Nova Plant Food "FN" and Distilled Water (Trials C & D); Coconut Coir watered with "FN" and Distilled Water (Trials E & F); and Paper Towels (control trial) watered with Outdoor Water, Distilled Water and "FN" (Trials G, H, & I). Water used in the hydroponic applications was pH balanced between 6.0 to 6.5. Adjustments were made using "pH Down" & "pH Up" products by "Grow More". Each pot was watered as required. The height and general observations of the basil plants were recorded in a log.

Results
Rockwool with the use of plant food was the better medium for plant growth. These plants measured greater heights and generally appeared more vigorous.

Conclusions/Discussion
Based on observations of plant growth and the review of my data it is my opinion that my hypothesis can be supported, with some reservations. As plants in soil did die, further experimental trialing is necessary to reach a definite conclusion. The problems with the soil were probably due to placement of dry fertilizer. The dry fertilizer is high in salt which can burn the seedling's roots. For future projects, I would consider using potting soil which is made for small containers and has the needed fertilizers pre-mixed in soil. However, even in potting soil some nutrients become attached to soil particles and are not available to the plant. Since the nutrients provided hydroponically are all soluble and readily available to the plants roots, I still believe my findings and original hypothesis will be confirmed.

Summary Statement
A comparison of plant growth in soil versus soilless mediums.

Help Received
My father helped me with pH monitoring of the plant food and water; Scott Glass @ Urban Garden Hydroponic Supplies helped me select materials for projoect which were cost effective; and my teacher helped me by reviewing my project from start to finish.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Keegan C. Dahm

Project Number
J2006

Project Title
What Is the Long Term Effect of Electricity and Metal on Plant Tumors?

Abstract

Objectives/Goals
The objective of this experiment is to determine if repeatedly treating tumorous plant leaves with electric shock will have a noticeable effect on the tumors.

Methods/Materials
A procedure was designed to grow tumors on pinto bean leaves using the tobacco mosaic virus, or T4. After tumors grew, I shocked the leaves using low voltage (6 V) from four C size batteries for five minutes. I also used metal filings to enhance the electrical effect. Finally the leaves were studied under a microscope at 100x.

Results
Based on my previous research, I found that iron filings enhanced the shocking effect. The shock treatment was repeated a second time on a smaller group of plants. Finally the leaves were studied under a microscope at 100x. The unshocked tumorous plants had many white spots where it seemed that all the cells in that area have been destroyed. In the shocked tumorous plants, there were fewer of these spots and they were smaller. I also compared the two groups to controls. In one, the plant had no tumor, but it did have electricity, and the other had absolutely nothing. I found that the control electricity plants looked a lot like the tumor electricity plants, but it was just a little greener.

Conclusions/Discussion
I found that electricity and metal did have an effect on plant tumors. The plants that have been shocked looked healthier than those that haven#t been. I also found that the number of times you shocked the plants didn#t have any visible difference, because both groups, 1 shock and 2 shocks, looked the same.

Summary Statement
The project was about trying to kill plant tumors using electricity, but not kill the plant.

Help Received
Dad helped put together board and work on the project; people from Schmahl Science helped with the project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Colin T. Dowdell

Project Number
J2007

Project Title
The Effects of Micronutrients on Phytoplankton

Abstract

Objectives/Goals
My objective was to discover if varied concentrations of micronutrients affected the population of phytoplankton (nannochloropsis sp.) at the end of six days.

Methods/Materials
Culture set-up was conducted as follows:
1) Make sterilized seawater by pouring 10ml of bleach in 22L of filtered seawater.
2) Make 5ml/1500ml concentration and calculate other concentrations with 5ml concentration and water.
3) Inoculate all flasks with algae and set up with aerators and parafilm.
4) Count on 3rd and 6th day. Record in Excel workbook and graph.

Results
At the end of six days, the control had the highest algae population while concentration 0.2 and 0.5 were the third and second highest.

Conclusions/Discussion
These results do not support my original hypothesis that 2ml of micronutrient/1500ml of seawater concentration would increase the algae population the most. Since, the control increased the algae population the most we can deduce that micronutrient concentration control an algae population. We can also infer that a lower concentration does not control algae such as a higher concentration such as 5ml/1500ml. Knowing how much algae there is in an ecosystem can be essential. Knowing the nutrient level in the water can help scientists predict when the next algal bloom, a period where algae is quickly produced and dies quickly, is. Algae is considered the building block of an ecosystem, one example being life. Just changing one tiny factor in an environment can lead to a completely different type of environment.

Summary Statement
This study showed the effect of micronutrients on phytoplankton population at the end of six days.

Help Received
Used lab equipment at Cabrillo Aquarium under the supervision of Jenn Corpuz.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Ciara A. Dwyer

Project Number
J2008

Project Title
What Drives a Seed?

Abstract

Objectives/Goals
Are seeds driven by Gravity (Geotropism) or by Light (Phototropism)?

Methods/Materials
METHODS:1. You must germinate your bean seeds by placing the seeds in a damp paper towel. Put this in a warm place for 2-3 days. If the paper towel starts to dry out add more water.
2. While your seeds are germinating you must make a place to put your seeds. I chose to make mine out of cardboard. With slots to put the Petri dishes in.
3. Stretch three cotton balls across the smaller half of each Petri dish.
4. Put 30 ml. of water on the cotton in each Petri dish.
5. After your seeds are germinated place one seed in each of the 24 Petri dishes. 12 of the seeds are placed up-side-down and the other 12 right-side-up.
6. Place the Petri dishes in the prepared holders.
7. Put one holder in a box with the light under the trays, one tray with the light above and one tray with the light to the side. The last tray of six dishes will be in a box that gets no light.
8. Leave the boxes for one day and take pictures the next.
9. Take pictures every other day until the seed#s shoots# reach the top of the Petri dish.
10. Repeat all steps with corn seeds.

MATERIALS LIST:30 or more Corn and Bean Seeds, 1 Adult to help, An Exact-o-knife
Card board, 1 role of duct-tape, 3; 18# fluorescent tube lights, 1 blanket, 72(100%cotton) Cotton balls, 24 Petri dishes, 1 large bowl of water, A measuring devise of 30ml. (liquid), A measuring tape or yard stick

Results
The results of this project were that regardless of the position of light or lack of light the stems of both corn and bean seeds grew opposite of gravity and the roots pointed down or with gravity.

Conclusions/Discussion
In conclusion the seeds all ended up being geotropic. This means that my hypothesis was incorrect. Roots of bean and corn seeds grow with positive
geotropism and stems grow with negative geotropism. Meaning roots go toward gravity or downward and stems grow away from gravity or upward. The
direction the light came from did not affect the direction of the growth of the stems or roots of the seeds. They are driven by gravity alone!

Summary Statement
My project is about finding out if seeds react to light (phototropism) or gravity (geotropism) or both when growing.

Help Received
Mother proofread report; uncle helped make cardboard trays and light boxes.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
John P. German

Project Number
J2009

Project Title
When Farmland Is Gone, Where Will We Grow Our Food? Hydroponics Is the Answer

Abstract

Objectives/Goals
The goal of this project was to prove that hydroponics is capable of producing an equal, if not more, yeild than traditional farming in soil.

Methods/Materials
For this experiment I required: Hydroponic growing trays, hydroponic starter plugs, romaine seeds, potting soil, grow lights, aluminum foil, plant labels, work bench, pH tester, All purpose 16-16-16 water soluble concentrate seaweed plant food, micronutrients botanical extract, funnel, 5 gallons of distilled water, general hydroponics "pH Up", calculator, gram scale and measuring cups.
Place the starter plugs in one of the hydroponic growing trays then fill the other tray with potting soil. Plant 50 romaine seeds in the individual holes of the starter plugs, one seed per hole. Plant 50 evenly spaced romaine seeds in the potting soil tray. Mix the watering solution and adjust the pH level of the solution so that the pH is neutral. Water the hydroponic tray with enough of the solution that the plugs become damp. With the same water, dampen the soil tray. Label the trays soil and control. Place aluminum foil on wall to magnify light intensity. Place trays under grow lights with the lights on 24 hours per day. Water the trays in two day intervals. After four weeks of plant growth, harvest exactly half of the plants that grew from each tray. Weigh the plants that were harvested on a gram scale seperatly.

Results
The results of this experiment were that the weight of romaine lettuce grown hydroponically weighed the exact same as the romaine grown in soil. The final weight was 10 grams each.

Conclusions/Discussion
From this experiment I can conclude that romaine lettuce grown hydroponically will produce an equal yeild as romaine lettuce grown in soil. I can also conclude that once all of our farmland is developed, hydroponically grown crops could be one of the possibilities that could sustain our society and perhaps the world.

Summary Statement
My project was to prove that plants grown hydroponically will produce an equal yeild as compared to plants grown in soil.

Help Received
Father got supplies; Mother helped type and developed pictures on my board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Robbie E. Gray

Project Number
J2010

Project Title
Investigating a Practical Eradication Method for the Invasive Parrot Feather

Abstract

Objectives/Goals
The purpose of my science project was to determine if light deprivation would kill parrot feather. I looked at blocking out light for 7, 14, and 21 days. I predicted that after 21 days the parrot feather would be dead and wouldn#t grow back.

Methods/Materials
I located a fresh water natural flowing drainage ditch with parrot feather growing in the streambed. 40 identical plastic plant containers with the bottoms cut out were placed over parrot feather plants and tapped into the streambed/mud. Using a counting grid, identically matched to the opening of the containers, a grid square count of parrot feather was recorded for each of the 40 containers. 10 containers would remain uncovered (control). Each of the remaining 30 trials were covered with a heavy-duty trash bag that had been folded 4 times and secured with rubber bands. 10 trials were covered for 7 days (var. 1), 10 for 14 days (var. 2), and 10 for 21 days (var. 3). When the trials were uncovered a recording of the grid square count of live parrot feather was made. Recordings of the grid square count would then be made on every trial every 7 days until day 70.

Results
The control grew (320%) to full grid square count in 35 days. 7 days (var. 1) of light deprivation slowed the growth down but the parrot feather reached full grid count by day 49. 14 days (var. 2)of light deprivation reduced growth 33% by day 35 but by day 70 the growth had reached 117% of original grid square count. After being covered for 21 days (var. 3) there was no green growth. There was no growth until day 35. At day 70 the average grid square count remained below the original square count by 38%. 3 trials of var. 3 (30%) never had re-growth.

Conclusions/Discussion
Depriving a plant of light is an obvious way to kill a plant but I chose to test this method because conventional ways of eradicating parrot feather have been unsuccessful (herbicides, mechanical harvesting, natural predators). Light deprivation has potential of knocking down the population and leads to further investigation of herbicide use when the plant is weakened.

Summary Statement
Covering parrot feather for 21 days was successful at reducing the growth as compared to the control but it did not totally eradicate it, evidencing that parrot feather is a very difficult plant to kill.

Help Received
My mom helped type the report and take pictures.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Anna C. Gurevich

Project Number
J2011

Project Title
The Most Important Element of Photosynthesis in the Survival of a Viola tricolor hortensis (Pansy)

Abstract

Objectives/Goals
The purpose of this experiment was to find out which element of photosynthesis (carbon dioxide, water, or sunlight) is the most important to a plant's survival. The hypothesis was that sunlight would be the most important.

Methods/Materials
Twelve Viola tricolor hortensis plants were used (three plants in each of four groups). One group was not given water, one was not given sunlight, one was kept in an airtight box that lacked carbon dioxide, and one was the control group.

Results
The plant group deprived of water had the most significant decrease in height (100%) and increase in dead leaves (7), followed by the group without carbon dioxide (88% and 4, respectively), and then by the group deprived of sunlight (84% and 4, respectively).

Conclusions/Discussion
The conclusion of this experiment is that water is the most important element of photosynthesis to a plant's survival. Therefore, proper water management of plants will result in maximized plant growth.

Summary Statement
I tried to determine whether carbon dioxide, sunlight, or water was the most essential to a plant's survival.

Help Received
Stepfather helped with box construction, parents helped operate nitrogen cylinder flow.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Ian C. Hall

Project Number
J2012

Project Title
Is Your Plant Reaching Its Full Potential ?

Abstract

Objectives/Goals
The rate of growth of plants will vary depending on the effectiveness of substrate to facilitate the absorption nutrients & water. My objective is to measure & compare plant growth in 4 different substrates: Coconut Fiber/Perlite, Hydroponic Beads, an Aquaponic system, & soil, and demonstrate more effective, energy-efficient ways of growing produce using sustainable environmentally-friendly resources. These growth substrates will be more ecologically effective alternatives to support Third World & urbanized countries alike.

Methods/Materials
The experiment consists of 4 sets of containers (w/ 3 containers per set), each w/ different growth substrates, to measure & determine the greatest plant growth. The 4 substrates are a Coconut Fiber/Perlite substrate, Hydroponic Beads/Water substrate, an Aquaponic system, and Soil. Plants were grown & observed in each set of containers for approx 6 wks & the plant growth was compared to show which was the most effective growth substrate.

Results
The substrate with Coconut Fiber/Perlite yielded the most growth; the Hydroponic Bead substrate followed; the Aquaponic system was 3rd; the soil substrate was lowest yielding. These results demonstrate alternate substrates are more effective for nutrient absorption than soil. The two most cost-effective & energy-efficient substrates were the Aquaponic system & the Coconut Fiber/Perlite which are inexpensive & made from recycled materials.

Conclusions/Discussion
Soil is the least efficient medium to grow plants. Nutrient absorption is lowest & the energy required to produce is high. Although Hydroponic Beads are a very efficient & effective growth medium, the energy required to produce the ceramic hydroponic beads is very high, making this a very effective growth medium but a higher carbon footprint. Aquaponics is a very effective & efficient growth medium w/ a very low carbon footprint. It relies on a symbiotic relationship between the fish consumption of plant decay & the discharge of nitrogen which then provides the plant w/ nutrients. Coconut Fiber/Perlite substrate is a very efficient & effective growth medium. The energy footprint is very low as it is also a recycling of readily available organic materials.

Summary Statement
My project's goal was to find out alternate plant substrates, which not only yield the highest growth in plants, but are also more cost-effective, energy efficient and environmentally friendly to sustain growing populations and urbanization

Help Received
Father assisted in the substrate set-up for the project; Mentor provided substrate materials ; Mother helped with project board layout ; Father assisted in final typing and applications.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Lindsay M. Harrison

Project Number
J2013

Project Title
Drought Relief: Does Gray Water Harm Plants?

Abstract

Objectives/Goals
California is in a drought and water conservation is critical. Landscape watering is the largest use of water for average households. Given this, I want to find out if watering plants with gray water (used shower water) will harm plants. I want to test the effects of gray water on four types of plants common to most homes. My goal is to determine if reusing gray water on plants is a viable water conversation tool.

Methods/Materials
I will test specimens from four plant varieties: Viola, Dwarf Boxleaf Euonymous, Festuca sod and Dracaena Compacta. Half of the plants will be watered with gray water (used shower water) and will be identified with a gray marking. The other half (the control group) will be watered with tap water and will be identified with a blue marking. The plants will be grown under identical conditions and will receive equal amounts of their respective water type for six weeks. I will record my observations, compare plant growth and take photos of the plants after each week.

Results
There was no evidence of damage from gray water use in any of the plant varieties. The plants that received the gray water did not look any different than the control group that received the fresh tap water. Instead of reacting badly to the gray water, the plants exhibited new growth and in some cases, improved.

Conclusions/Discussion
The gray water did not harm the plants in my experiment. This experiment provided useful information regarding whether or not gray water is harmful to many common plants. By applying these results to daily life, it is realistic to presume that reusing my family#s shower water could be a reasonable way to conserve water without hurting our garden. It#s conceivable that gray water use could benefit thousands of Californians as they try to conserve water during this drought.

Summary Statement
The purpose of this experiment was to determine whether or not gray water (used shower water) would harm common household and landscaping plants.

Help Received
My mother helped me with this project by purchasing supplies and by proofreading.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Monique C. Iuster

Project Number
J2014

Project Title
Befuddled Bean Seeds: The Effects of Gravity and Centrifugal Forces on the Gravitropism and Growth of Bean Seeds

Abstract

Objectives/Goals
The objective of this experiment is to demonstrate and show the effects of centrifugal force and gravitational pull on the rate and the angle of root growth in relation to the vertical.

Methods/Materials
20 seeds were sandwiched between glass slides with moist cotton and rubber bands holding them in. All seeds were placed with the same orientation onto the slides. 2 wheels were constructed, 1 spinning horizontally and one spinning vertically. Also 1 horizontal and vertical stationary controls were used. 5 slide sandwiches were attached each to the spinning wheels and the controls. The two spinning wheels were spun using small electrical motors and a dc regulated power supply at 3 rpm. All of the seeds grew for five days in a completely dark room, then were taken off the apparatus and traced with a sharpie. The slides were put on polar graph paper, photo copied, the line of best fit was drawn and the angle from the vertical was measured. The seeds were taken out of the slides and the root length was measured with a ruler. The experiment was repeated twice.

Results
The seeds spinning in a vertical plane grew longer and deviated more then the seeds spinning in a horizontal plane or either the vertical or the horizontal stationary controls. The length difference was about 30% while the deviation difference was about 90 degrees.

Conclusions/Discussion
My conclusion is that by spinning seeds and rotating the axis in which they grow, makes their roots grow longer. This is because seeds have a sensor in their root cap that helps them sense the direction of gravity. By constantly changing the orientation of the root cap, it senses the direction of the gravitational pull constantly changing and that gets the sensor disoriented.

Summary Statement
My project determined that by spinning sprouting bush bean seeds in a vertical plane increased the average length of the root in relation to stationary grown beans due to the effects of simulated lack of gravitational force.

Help Received
My dad helped me construct the turntables, my mom bought all the components, Professor Bill Purves helped me understand the principles of how seeds react to centrifugal force and simulated weightlessness.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Laura D. Jennings

Project Number
J2015

Project Title
Aquatic Plants and Their Different pH Levels

Abstract

Objectives/Goals
My project was preformed to see which of 11 different aquatic plants would have the highest pH level when submersed in distilled water and a BTB solution (Bromothymol blue) is added. I believe that the Elodea plant will have the highest pH level.

Methods/Materials
Eleven different aquatic plants were tested in 100ml. of distilled water and 1.25ml. of BTB. I tested the pH levels and color of the water after both 12 and 24 hours. The different aquatic plants were: Elodea, Anubias, Aquatic Combo, Amazon Sword, Aqua Fern, White Ribbon, Argentine Sword, Umbrella Plant, Peacock Fern, Water Wisteria, and Kyoto Grass. In my research I found that when more CO2 is absorbed then a higher pH is present. If a large amount of CO2 is present in the water then a lower pH value is present.

Results
The Water Wisteria had the highest pH level after both 12 and 24 hours, where the Kyoto Grass had the lowest pH level.

Conclusions/Discussion
My conclusion is that the Water Wisteria had the highest pH level after 12 and 24 hours. Also plants are Very important to our environment because they help eliminate green house gasses, which destroy our ozone.

I am in the process of conducting more trials using Dry Ice replacing, exhaling thhrough the frosting bag into the distilled water and BTB solution.

Summary Statement
My project is about the pH levels of 11 different aquatic plantsin water tested in a pH level indicator test kit.Mrs.Bloom

Help Received
Mrs.Bloom helped me prepare for experiment and encouraged me; Brother helped purchase BTB; Mom helped purchase materials.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Rachel L. Kanonchoff

Project Number
J2016

Project Title
Hyperbaric Radishes

Abstract

Objectives/Goals
The objective is to grow radishes in pressurized vessels to determine if increased air pressure will be helpful or harmful to the plants. Plants will also be grown in identical un-pressurized vessel to use as a control.

Methods/Materials
I will build pressure vessels out of 2-liter soda bottles using automotive tire valve stems installed in the screw on tops. Using nursery potting soil as a growing medium, I will plant radish seeds in the bottles, moisten the soil, screw on the tops and pressurize the "vessels" with an air compressor to various pressures ie. 10, 20, 30, and 40 lbs. per sq. inch. I will observe and record the data.

Results
The results of this experiment were that increased air pressure does affect the growth of the plants. A slight increase of pressure causes an increased growth rate as compared to the control, whereas a drastic increase in pressure has a detrimental affect.

Conclusions/Discussion
As stated above, air pressure does affect plant growth. This information could be used to increase yield in food crops in times of famine, or possibly this information could be helpful in trying to grow food crops in space colonies. I think a good follow-up experiment would be to grow plants in negative pressures(vacuums).

Summary Statement
This project is about growing radishes in pressurized vessels and comparing them to radishes grown under normal pressure.

Help Received
Mother helped type report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sophia T. Kawamoto

Project Number
J2017

Project Title
Strong, Stronger, Strongest Fava

Abstract

Objectives/Goals
I chose to do this project because I wanted to use substances that did not have toxic substances to help plants grow. When growing plants, I found that some parts of the plant are more productive and have a higher survival rate than others, and I wondered why this was. I believe this project can lead to using fewer pesticides to influence bean plant growth.

Methods/Materials
Materials: 1. Three Jiffy Pots that have 24 pellets each; 2. Potting soil; 3. Fifty one fava bean seeds; 4. Water; 5. Dried ground alfalfa; 6. Dried ground seaweed; 7. A dark colored sharpie; 8. Measuring cup; 9. An indoor area that is in direct sunlight; 10. An indoor area that is not in direct sunlight; 11. Ruler; 12. Triple beam balance; 13. ¼ teaspoon.

Methods: 1.Expand the jiffy pellets; 2.Plant the fava beans in the pellets; 3.Water with mixtures every day; 4.Once all have sprouted, move the trays to a light area; 5.Water with mixtures every day; 6.Transplant the 5 tallest of each group; 7.Water with mixtures every day.

Results
Once I finished testing I found that over all the plants watered with water had the most growth. On average they had 29 leaves and were the tallest plants.

Conclusions/Discussion
Neither of my hypotheses were correct. My null hypothesis is incorrect because not all of the plants have the same height and leaf count. My experimental hypothesis is also incorrect, because the plants watered with water grew more than the plants watered with alfalfa or kelp.
While testing I faced many problems that may have affected my results. I was also inspired to do other projects after doing this project.

Summary Statement
I grew fava beans and watered them with plain water, water mixed with kelp powter, or water mixed with alfalfa powter and compared the differences.

Help Received
My father cared for my plants while I was on vacation. My sister helped my take pictures while I tested and put together my board. My mother bought materials for my project. George Merilatt supplied a triple beam balance and fava bean seeds. Vini Schoene and Caprice Potter gave me information on fava beans.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Emma K. Lay

Project Number
J2018

Project Title
The Effect of Pre-Soaking Bush Bean Seeds in Different pH Solutions on the Time for the Seeds to Germinate

Abstract

Objectives/Goals
The objective was to see if pre-soaking Bush Bean seeds in solutions of different pH would affect the germination rate. The hypothesis states that if Bush Bean seeds are soaked in different pH solutions and then planted, then the seeds that were pre-soaked in the most acidic solution (vinegar, pH 2) will germinate first.

Methods/Materials
Twenty-five seeds were soaked for twenty minutes in one of three solutions: household ammonia (pH 11), local tap water (pH 5) or white vinegar (pH 2). Twenty-five seeds were not pre-soaked. The pre-soaked seeds were rinsed and then each of the four groups were placed into a glass beaker packed with moist cotton. The beakers were placed in a warm, dark area to allow the seeds to germinate. The seeds were observed every twelve hours for six days and the time was recorded.

Results
After seventy-two hours, the group that had been pre-soaked in tap water had the most seeds germinate followed by vinegar and then the control group. The group pre-soaked in ammonia had the least seeds to germinate. At the end of six days, the group of seeds that had not been pre-soaked had the most seeds to germinate, followed by tap water, then vinegar, and ammonia had the least.

Conclusions/Discussion
The results of this investigation did not support the hypothesis that the seeds pre-soaked in vinegar would germinate first, the seeds pre-soaked in tap water (pH 5) had a faster germination rate over the first seventy-two hours.

Summary Statement
Can germination rate be increased by pre-soaking seeds in acidic or basic solutions?

Help Received
parents bought supplies

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sofia K. Lochner

Project Number
J2019

Project Title
The Effect of Centripetal Force on Plant Growth

Abstract

Objectives/Goals
This experiment helps us get a better understanding of how plants react to what they perceive is gravity. When plants are subjected to centripetal force they react to the new direction of gravity by growing against it. To create centripetal force the plants were grown on a record player at 45(rpm)for 14 days. After 14 days on the record player, the plants grew at a horizontal 70° angle towards the center of the record player. This experiment concluded that plants grow against the vector sum of centripetal force and gravity.

Methods/Materials
Materials:
Two growing dishes, Ten tomato sprouts, 7100 cu cm of potting soil, One record player, One lamp fixture, One sun lamp, One timer on light fixture, 10 ml of Miracle Grow, Ten labels, Five cooking skewers.

Methods:
Place the Experiment growing dish on the record player. Make sure the center is directly under the plant 5E. Turn record player on to 45 rpm.

Results
The plants that were spinning at 45 rpm on a record player for 14 days grew at a 70° horizontal angle. While the control plants grew at a 90° vertical angle. Their angle of growth was because they grew against the centripetal force created by the record player.

Conclusions/Discussion
I concluded that, when plants are subjected to centripetal force they react to the new direction of gravity by growing against it. The new effective gravity is the vector sum of centrifugal force and gravity in a non-inertial. In inertial frame of reference the plants grow against the centripetal force. As the radius of the plants from the center increases the horizontal angle of growth will decrease. As the plants grew towards the center, the centripetal force became less, thus the plants began growing at more of a horizontal angle towards the center.

Summary Statement
In this project I saw how plants angle of growth change when subjected to centripetal force.

Help Received
Robert Keolian taught equations and reviewed final project; Mother reviewed final project.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Grant T. Margerum

Project Number
J2020

Project Title
Algae: Fuel of the Future or Fungus in Your Pond?

Abstract

Objectives/Goals
My project is on algae, and it has to do with the growth of algae and how it grows when other factors are added to it. I was interested in algae growth because I believe algae can be used as a biofuel for cars if we can figure out how to grow enough of it that it makes sense economically to use it in cars.

I tested which of my algae samples grew the most under various conditions. My manipulated variables were the temperature, the presence of protein (fish food) or not, and the presence of an aerator or not. In my hypothesis I hypothesized that warm water with an aerator and fish food would result in the most algae growing.

Methods/Materials
In my project I tested growth in different conditions to determine what environment is the best. I set up 4 different algae samples in my garage where they had a 60 degree temperature and 4 other samples I had inside my house where they had a 70 degree temperature. In each of the different temperatures I tested a sample of pond water, adding protein, adding an aerator, and combining an aerator and protein. My control was plain pond water, but I also had pond water that I kept inside my house so that it would reach 70 degrees to test the difference the water temperature makes.

Results
My results showed that the warm water samples did the best and adding protein improved algae growth even more. My results showed that the warm water with protein had the most algae growth according to the transmittance test. Overall, in my experiment I saw how the protein was the most import part in growing algae, and that the algae with fish food added did a lot better and turned green because of it. The protein mixed with warm water produced the best sample and showed the most algae growth.

Conclusions/Discussion
We need to find a renewable source of energy, because we are running out of fossil fuels, and we need a renewable fuel resource. Algae is easy to grow and renewable, so by finding the most efficient way to produce the most algae, I think I can help companies who are producing algae to be used as biofuel.

Summary Statement
I tested methods to determine the fastest way to grow algae so it can be harvested and converted into biofuel for use in cars.

Help Received
Mother helped type report and create board; father helped contacting algae companies; school provided guidance and test equipment

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

James M. McCabe, III; Gregory M. Regan

Project Number

J2021

Project Title

Can Food By-Products Be Used as a Natural Supplement for Plant Growth?

Abstract

Objectives/Goals

We tested 20 Bright Yellow Swiss Chard plants to see if watering them with food by-products would affect their growth. We selected corn, rice, beans and eggs because they are abundantly available throughout the world. If our hypothesis proved true, then this could be a low-cost,eco-friendly and natural way to produce stronger, larger and healthier plants.

Methods/Materials

We watered 20 Swiss Chard plants over a period of 28 days. Four plants were watered with the water used to boil corn on the cob. Four plants were watered with rinsed rice water and another four with rinsed bean water. Four plants had crushed eggshells embedded in the soil and were given plain water. The last four plants, our control group, were given plain water. Every seven days, we measured the height of the plants and counted the number of leaves.

Results

When we started the experiment, all of the plants were comparable in size and health. However, by day 28, the plants that had eggshells embedded in the soil were significantly taller and had more leaves than our control group. All of the other groups of plants showed positive growth, but it was not significant enough to draw any conclusions.

Conclusions/Discussion

The results of our experiment demonstrated that eggshells can be used as a supplement to increase plant growth. Our research explained that eggshells contain calcium, trace minerals, and small amounts of nitrogen. These nutrients have been proven to boost plant growth. Thus, our research supported our results because the plants that were given eggshells showed a significant increase in height and number of leaves relative to the control group.

Summary Statement

Our experiment examined whether food by-products, such as cracked eggshells, the water used to rinse rice and beans, and the water remaining from boiled corn, can be used as a natural plant supplement.

Help Received

A nursery manager provided guidance on plant selection; our moms helped with the registration, editing processes and cutting the materials for the board; and James' cousin helped with the photos.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Elena Marie S. McConnell

Project Number
J2022

Project Title
The Affect of pH on Blue Lake 274 Bean Growth

Abstract

Objectives/Goals
The hypothesis that I am presenting is that bean plants that are watered with higher levels and the lower levels of pH will not grow as fast or healthy as the ones in the middle, around pH 7.

Methods/Materials
Materials
Bean seeds,Jiffy Pots,plastic cups,pH UP & DOWN,soil,Water,pH strips,5 one gallon sterilized jugs,5 gardening pots,measuring device,marker,labels,Ruler,Notepad.
Methods
Mix pH solutions.Use pH strips to make sure the pH is correct.Mark jug with pH number.
Use 25 small Pots to start the seeds,five pots per pH labeled.Fill each pot with soil with 4 seeds.
Place plants by inside where they get sunlight.
Water with marked plastic cups,water daily, water the same amount for each pot.
Measure growth rate each day, Record data.
Transplants plants into larger pots.
Water plants with 7 oz,of water,Increase to 14 oz. when they double in size.

Results
The first sprout was from pH six and had the highest average in the beginning, Most of the time pH seven had the highest average and the other plants followed close behind.The last bean plant to sprout was from pH five and it had the shortest average in the beginning, but after time it caught up to the other plants.Most of the time pH five and pH nine were growing at the slowest rate as my hypothesis indicates.All the plants look healthy and are beginning to sprout flower buds.

Conclusions/Discussion
All the plants appeared healthy, there only slight differences in growth rates.There appears to be flower buds on all the plants which are the beginning of bean pods.The pH six plant containers sprouted first,but all the pH plants have basically been growing at the same pace since the beginning.Currently pH seven is growing at a slightly faster rate and pH nine is growing the slowest.
My hypothesis was on the right track though because I hypnotized that the bean plants watered with a pH in the middle would do better, my data indicates this. There was not a significant difference in growth rates and was not as dramatic as I thought it would be.If I had more time I would also measure and compared the growth rates of the bean pods.
Although it appears that the pH 7 did better, I would need to do additional studies and experiments to

Summary Statement
The Affect of pH on Blue Lake 274 Bean Growth

Help Received
My Mom helped with the poster and my Dad helped with the materials, methods and graph.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Matt C. Moropoulos

Project Number
J2023

Project Title
Electrifying Soil

Abstract

Objectives/Goals
The purpose of my project was to determine whether or not an electric field would affect the growth of a snow pea plant.

Methods/Materials
I chose snow pea plants because they grow quickly, and are easy to monitor. Now, for soil to conduct electricity, it needs to be somewhat moist. To make sure that all the soil had the same amount of water in it, I mixed all the soil and water together in a single bucket before distributing it to my three terrariums. The first terrarium was the control, with no electricity in it. The second bin had A/C current running through it, at 15 volts. The third and final bin had D/C current running through it, also at 15 volts. The electrical setup consisted of copper electrodes, hooked up to a model train transformer. It had a separate A/C output, which I utilized to power the A/C bin, at a constant 15 volts. Every day I would add the same amount of water to the soil to ensure it still conducted electricity, usually about ½ cup, evenly distributed using a spray bottle. Every third day I rotated the bins position and orientation to the sun, so that no plant would get more sun than another. I then measured the plants daily.

Results
Contrary to my original hypothesis, instead of stunting the growth, it was accelerated! While the D/C current did stunt the growth, the A/C accelerated it quite a bit. I got to a fairly conclusive result, but I would like to grow the plants to a mature height this summer, to see if the beans produced would taste normal. I think that I completed my objective because I found that it did in fact effect the growth.

Conclusions/Discussion
My results completely contradicted my hypothesis, which was surprising. While my results were surprising, I think I still managed to achieve my goal, just in an unexpected way. This project left me baffled as to how some of the plants grew faster, as I would have to view the plant on a cellular level to even come close to understanding what happened. I have neither the budget nor the equipment to look at this right now, though I would love to do so. But when I had finished, I thought to myself, #This could really benefit society#we might be able to supply surplus food to countries with not enough of it#and since it takes very little energy#is electricity the next fertilizer?#

Summary Statement
To effectively determine if an electric field has an affect on plant growth.

Help Received
Father taught me how to solder, and helped with electrical equations and setup.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alyssa Naritoku; Wendy Tsai

Project Number
J2024

Project Title
Fast Plants in Motion!

Abstract

Objectives/Goals
The objective of our project was to see how different amounts of rotation might differently affect the growth of plants. We placed Brassica rapa plants on a turntable for varying amounts of time, and observed the effects of prolonged geotropism on the plants.

Methods/Materials
We used an old record player and fit a cardboard circle the size of a record on the player. On the circle, we placed Brassica rapa plants in 1 oz containers of Miracle Grow Moisture Control soil and secured them to the cardboard with Quake Hold. Each plant was labeled in a group; namely, groups A, B, C, D and E. Group A, the control, received no rotation, and groups B, C, D, and E received 4, 8, 12, and 16 days of rotation respectively. As the plants rotated, we observed how the height, biomass, pigment, number of flowers, and angle growth of the plants were affected.

Results
We found a parabolic relationship between many of the groups in several variables. The average heights and biomasses produced parabolas between groups B, C, D, and E, with B and E as the lower extremes and C and D as the upper extremes. Coloration also showed a slightly parabolic relationship. This consistent parabolic trend may indicate that there is a certain amount of rotation, or the height of the parabola, that will make the plants grow at the ultimate best that they can, probably between 8 and 12 days of rotation.

Conclusions/Discussion
Each person had her own hypothesis. Alyssa thought rotation would make the plants grow inward, towards the center of the turntable. She also believed that rotation would affect the height, biomass, and angle of growth of the plants, but not pigment or number of flowers. Wendy, on the other hand, predicted that rotation would make plants grow outwards, away from the center of the turntable, and that only the angle of growth would be affected. It turns out that the angle of growth produced inconclusive results, because of the factor of phototropism, which made the plants grow towards the light. However, we noticed that height, biomass, and pigment all produced parabolic trends, suggesting a height of a parabola that indicates the best amount of rotation. The number of flowers was also inconclusive, due to insufficient time to see flowers bloom. Nonetheless, this information could be valuable, as there can be a certain controlled amount of rotation, that could make plants grow significantly healthier than without any rotation.

Summary Statement
The objective of our project was to explore how different time periods of rotation and geotropism would affect the height, biomass, pigment, number of flowers, and angle growth of Brassica rapa plants.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Connor Nelson; Ryan Thomas

Project Number
J2025

Project Title
Carbon Dioxide's Relationship to Plant Growth

Abstract

Objectives/Goals
There is no doubt that the earth's atmosphere is changing. Since the Industrial Revolution, the CO2 level has risen 30%. Knowing that CO2 plays such an integral part in photosynthesis, would this increase in CO2 mean an increase in plant productivity? Afterall, for years agriculturalists have been using CO2 to boost plant production. Our objective for this project was to see if increased CO2 would in fact cause increased plant growth.

Methods/Materials
Two sets of six Shasta Daisies were placed in a sunny, indoor location. They were seperate from one another yet, with equal temperature, water and sunlight. Set one had a drip system of vinegar (one drip per second) and baking soda. Set two was the control set with no drip. Weekly measurements were taken over the course of a month to see which set produced the most biomatter.

Results
Several factors influenced our results. It was a time of year with large temperature variances. It was difficult to accurately monitor CO2 levels. Once weakened, the plants were susceptible to insects and disease.

Taking these factors into account, results did show a rise in plant productivity at first with set one. After a peak in the first two weeks, this productivity slowed down. At this point, set two overtook set one in size and vitality. By the end of the experiment, set two was obviously healthier and larger overall.

Conclusions/Discussion
Our conclusion is that there is a distinct correlation between increased CO2 and plant productivity. However, over a period of time this increased productivity may put too much stress on the plant and decrease overall health and stamina as well as production. Short-term crop production may benefit. However, in the long run this stress may negate the benefit as plants peak and then fail.

Summary Statement
Our project is about the affects of increased carbon dioxide on plant growth.

Help Received
Mom typed the report for the backboard. She also did the drawings. We colored them in ourselves and pasted them on the board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Leah M. Ostermann

Project Number
J2026

Project Title
The Germinator

Abstract

Objectives/Goals
The purpose of this experiment is to determine how soil salinity affects seed germination. Soil salinity is the salt content of soil. As soil salinity increases, plants cannot grow, like in playas or dry lakes. Seeds germinate when conditions are right, such as adequate water & nutrients, for growth. The hypothesis of the experiment is that because soil from the China Lake playa contains the most salt (highest pH), seeds will grow the least.

Methods/Materials
Four soils were tested as variables: 1) China Lake playa soil; 2) Mirror Lake playa soil; 3) desert soil; and 4) potting soil. The pH of each soil was first tested. Then 40 grams of each wet soil along with 10 radish seeds were placed on 3 paper towels. The paper towels were folded and placed in a plastic bag. As a control, 10 radish seeds were placed on 3 wetted paper towels without soil. Root length and appearance (health) of the seeds were recorded every 24 hours for a period of five days.

Results
For all 5 days the amount of root growth increased as the pH and salinity of the soils decreased. The health (number of leaves & root hairs) of the seeds did not exactly increase as the salinity and pH of the soils decreased.

Conclusions/Discussion
The hypothesis was proven correct because none of the seeds were germinated in the China Lake soil (highest pH &salinity) over the 5 days. The salts in the China Lake soil held onto the water. As expected, the soil with the most ideal pH and salinity (potting soil) showed the most root growth and health (number of leaves & root hairs) over the 5 days. The control developed better than the other soils in the beginning (Day 2), but then, except for the China Lake soil, stopped developing better over the last 3 days. This is probably because the paper towel gave up water easier than the soils in the beginning. But after 3 days the seeds needed nutrients to grow which the paper towel did not have.

Summary Statement
This experiment determines how soil salinity affects seed germination.

Help Received
Father helped with the idea and experiment setup. Mother helped with the display.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alexis L. Pace

Project Number
J2027

Project Title
Grow Grass Grow: An Investigation of Grass Growth Using Different Types of Water

Abstract

Objectives/Goals
The objective is to determine how effective various types of bottled water is for grass growth and does it hold an advantage over different types of water? I predict the grass watered with Suburban water will have the best growth rate because Suburban water contains minerals including added fluoride which are essential and play an important role in water uptake and grass growth.

Methods/Materials
8 Jiffy transplant pots, 2 1/2 cups dirt, Premium Planting Mix & Mulch, 3/4 teaspoon grass seed, 1/4 inch seed cover, Distilled water, Suburban water, Filtered water, Arrowhead water, Measuring cups, Camera, Ruler, Labels, Scissors, Tape
1. Collect dirt from backyard 2. Add Premium Planting Mix & Mulch to dirt for a ratio of 70% dirt, 30% mulch 3. Place 2 1/2 cups of mixture in each of the 8 Jiffy transplant pots 4. Sprinkle 3/4 teaspoon of grass seed over mixture 5. Add 1/4 inch of seed cover on top of grass seed 6. Separate the 8 cups evenly into four sets of 2. Two plants will be grown in each type of water and results will be averaged for the two plants. 7. Label plants as follows: Arrowhead A & B, Distilled A & B, Filtered A & B, Suburban A & B, 8. Fill each plant with 1/2 cup water that is written on each of labels 9. Observe daily and keep seed cover wet under seed germinates. Then water plants according to dryness. 10. After seed germination, set plants in sunlight 11. Measure and record plant height & number of sprouts daily

Results
After 4 weeks, the average number of germinated Distilled grass seeds was 276 sprouts and of the growing sprouts, the average height was 13cm. The Filtered average was 279 sprouts and the average height was 11 1/2cm. The Arrowhead average was 300 sprouts and the average height was 12cm. The Suburban average was 324 sprouts and the average height was 14cm.

Conclusions/Discussion
The results proved my prediction that the Suburban water grass grew the quickest and tallest. The Suburban water grass also had the most germinated seeds. The grass watered with distilled water grew the least, and overall had the least number of seed germination. It appears that amongst the waters I tested, Suburban water is the most effective water to use for watering plants. This supports my hypothesis that the minerals and Suburban water are important in the uptake of water. With the population trend toward #going green#, here is a great opportunity to capture our used Suburban water for recycling.

Summary Statement
My project is about the affect various types of water has on grass growth.

Help Received
Grandfather helped with dirt collection, Mother took photographs while I preformed the procedure.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Morgan C. Riggins

Project Number
J2028

Project Title
Enhancing the Biomasses of Raphanus sativus with Different Manures

Abstract

Objectives/Goals
The objective is to determine which manure, chicken, donkey, goat, horse, pheasant, or sheep, has the greatest effect on radishes' biomass.

Methods/Materials
Each type of manure was composted for two weeks with the same type and amount of ingredients, and then added with potting soil to six separate planting containers. Sixty radish seeds were then planted among the manure. All the radishes were harvested after thirty-seven days, and measured for length, mass, and ratio of root to sprout length.

Results
Of the manures, radishes fertilized with sheep produced the longest and most abundant root mass. However, chicken and pheasant manure grew the radishes with the highest mass and sprout growth. (See my project's conclusion for a more in depth explanation)

Conclusions/Discussion
In conclusion, this project showed that when using manure to fertilize plants, one should base their manure type on whether they want healthy leaf growth above ground, or a large root mass tunneling their soil. From their experiment, I discovered that sheep, chicken, and pheasant manures all contribute to a radish's biomass, given that their individual nutrients benefit different aspects of the plant.

Summary Statement
In this experiment, different manures were composted and used to fertilize radishes for later inquiries on the effects of manure on a radish's biomass.

Help Received
Parents purchased needed supplies and tools for the experiment.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Zachary A. Rose

Project Number
J2029

Project Title
A Study of the Effect of Simulated Zero Gravity on Plant Growth

Abstract

Objectives/Goals
I investigated the effect of zero gravity on plant growth. I chose this topic because plant physiology is a topic that I wasn#t well versed in and wanted to learn more about.

Methods/Materials
In order to observe the effects of zero gravity on plant growth I had to simulate zero gravity. I did this by turning the plants on a clinostat, which is a slow rotating motor.

Results
The plants grew slower and developed a spiral growth pattern.

Conclusions/Discussion
These effects may be caused by the plant following rotation of the clinostat, or possibly the spiral growth is the true effect of zero gravity on plant growth.

Summary Statement
My project investigates the effect of simulated zero gravity on the growth of Brassica rapa.

Help Received
Mother helped edit report; Dad helped with construction and the experiment; Dr. Boolootian assisted with editing, concept, and interpretation.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Keren O. Rosenthal

Project Number
J2030

Project Title
Fibonacci Numbers in Nature

Abstract

Objectives/Goals
In order to measure the angles of leaves in rotation around a stem I visited the Fullerton Arboretum with my father and sister. We identified a variety of plants, and took pictures and measured the angles. Measurement was not easy using a simple protractor, and sometimes the leaves were disturbed by simply touching them. However, in the end we were able to collect good measurements on six different samples. In each case we measured from three different places on the plant.

Methods/Materials
Various Plants at the Fullerton Arboretum, Apples, Cauliflowers, Pinecones, Pineapples, Camera, Protractor, Knife, Ruler, and Research Materials

Results
The table below shows the results of my data collection at the Arboretum
.Name
Measurement
1st 2nd 3rd
Fullerton Centennial Miniature Rose 137o 137o 134o
Lady#s Finger Banana 135o 136o 139o
Black Sapote, Chocolate Pudding Tree 132o 136o 137o
Nepeta Tuberosa, Catmint 137o 137o 139o
Cereus Peruvia, Peruvian Apple Cactus 134o 140o 138o
Valencia Orange 137o 138o 136o

Conclusions/Discussion
My averages for this experiment were very close to what I had expected. All of the angles I measured were within 6o of 137o. Therefore, this experiment supports my hypothesis and predictions. The angle really maximizes the space between leaves, allowing each leaf to receive the maximum amount of light. This experiment also helped me understand that there are times when things that happen in nature are really based upon the way math works.

Summary Statement
My project was to determine if the Fibonacci series and the Golden Angle appear in nature, and if so hypothesize on why this may be so.

Help Received
Father helped drive me to the Fullerton Arboretum.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alicia M.J. Sadowski

Project Number
J2031

Project Title
Going Green with Greywater

Abstract

Objectives/Goals
How do you keep a green lawn, save almost half of your water bill and conserve water? The answer is to use greywater, any used water around the house (except toilet water). In my experiment, I explored the question "Can plants thrive on greywater?" My hypothesis was that the plants watered with tap water would thrive while the plants watered with greywater would just barely survive.

Methods/Materials
I planted three different types of plants--marigolds, beans and foxgloves. I watered each kind of plant with three different types of water--Tide greywater, Ecover (eco-friendly) greywater and tap water. Over a period of five weeks, I studied how well each plant grew based on the type of water that was used to water them. In my experiment, the experimental variable is the type of water used to water the plants. The dependent variables are the number of days for seeds to sprout, plant height, and overall condition of the plants.

Results
Based on plant growth and overall condition of the plants, tap water marigold, eco-friendly bean, and tap water foxglove and eco-friendly foxglove did the best for each type of plant.

Conclusions/Discussion
My hypothesis was not correct because Tide greywater and tap water had the same total number of sprouts for all plants, with eco-friendly greywater only a little behind. The growth of the plants watered with greywater did as well as or better than the growth of those plants watered with tap water. My experiment can have a big impact on the environment and how people should conserve water in the future because I have proved that you can use greywater to water plants.

Summary Statement
My project is about whether you can use greywater to water household plants.

Help Received
Mother and father helped assemble display board.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Rebecca I. Shane

Project Number
J2032

Project Title
Do Plants Want a Lemon? The Effect of Varying pH Levels in Acid Rain in Phaseolus limensis

Abstract

Objectives/Goals
How is Phaseolus limensis (lima bean) growth affected by the varying pH levels of the water it receives? This will help us understand the impact of acid rain on plant growth.

Methods/Materials
METHODS:

1.Prepare each of the four plates, pouring appropriate liquid, with varying pH levels(ratio of lemon juice to water)over 15 seeds on each plate.
2.Continue program of pouring liquid on each sample for duration of 37-day program.
3.Measure mass of germinating seeds and take pictures weekly; measure germination by visible results.

MATERIALS:

Major Materials: 60 Lima Bean Seeds (Burpee Bush, Phaseolus limensis),ReaLemon 100% Lemon Juice from concentrate, graduated cylinder, balance scale, digital camera ,weights measured in grams, litmus paper

Results
The pH levels, germination rate and total mass of each sample were measured on a regular basis. As hypothosized, the germination and growth rates were directly related to the pH level of the acid (lemon juice) poured over the seeds. The higher the persentage of lemon juce, th lower the growth and germination rates.

Conclusions/Discussion
Phaseolus limenesis growth was affected by the amount of acidity in the solution because the more acidic the solution, the slower the plant developed, as my hypothesis states.
My data shows that lima bean seeds grow faster when only water is the only solution used. The conclusion I made was that the higher amount of acidity the lima bean seed received, the greater the negative impact on its growth.

From my experiment, you will see what effects acid rain will have on phaseolus limenses. This will prove the idea that stopping global warming, which will minimize acid rain.

Summary Statement
My project is about the effects acid rain has on phaseolus limensis seed growth and showing what we should do to stop acid rain from hurting our plants.

Help Received
My mother, Melanie Shane, for transporting me to get the materials required for my project and for helping me with my board. My father, Bill Shane, for helping me with my notebook.My Science Teacher, Mr. Nelson, for supplying the litmus paper, balance scale, the gram weights, and for encouraging me in

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kaylee S. Steiner-Olson

Project Number
J2033

Project Title
Plant Function in a CO(2) Enriched Environment

Abstract

Objectives/Goals
The objective of my experiment is to determine what affect increased atmospheric carbon dioxide levels have on plant growth.

Methods/Materials
Controlled environments were designed by preparing terrariums within three large, 80 ounce, glass pickle jars. A small hole was made in each pickle jar lid, 1/8 inch tubing fed down the hole and the area around the hole sealed with silicon caulking. After plants were added to the terrariums, a simple oxygen measuring device (steel wool/water measurement)was added and the lid was placed on the jars. A second large, empty 80 ounce pickle jar was connected to each of the terrarium pickle jars by the tubing in the lids. To the first empty jar 0.8g of CO(2) in the form of dry ice was added and the lid placed on it. Twice as much, or 1.6g, of dry ice was added to the second jar and the lid placed on it. The third jar was used as a control so nothing was added and the lid was placed on it. All jars were placed in front of the same window and received the same amount of indirect sunlight during the experiment. The jars were observed and the CO(2) was allowed to sublimate for 48 hours then the jars were opened to measure oxygen and plants. This process was repeated for 2 weeks.

Results
Evidence of increased transpiration was witnessed with those plants exposed to higher levels of carbon dioxide. Visible signs of brilliant green leaves and white stems were also observed with the plants in the CO(2) enriched environments. The oxygen percentages were higher in the CO(2) enriched terrariums than in the control terrarium. Plant height and mass also increased.
However, towards the end of the 2 week period, the plants in the CO(2) enriched environment began to wilt first then the control plant and eventually all the plants died.

Conclusions/Discussion
A carbon dioxide enriched environment did increase plant activity and growth but at some point the carbon dioxide became a hazard, at least for the type of plant I chose.

Summary Statement
With the global concern of increased CO(2) in our environment, my project investigates whether plants will have a greater production of plant biomass and CO(2) - O(2) homeostasis within the Earth's atmosphere.

Help Received
My mom explained and showed me how to handle dry ice safely.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Dana M. Thibodeau

Project Number
J2034

Project Title
Algae: Made in the Shade

Abstract

Objectives/Goals
The objective of this experiment was to discover how sunlight direction affects the growth of algae

Methods/Materials
The materials that were used were 10 small plastic containers, black spray paint, tap water, green algae, and medium grid sand paper. After completely setting up the containers; each day recordings and observations were taken, including final algae growth.

Results
A 30-day and shorter 20-day trials were conducted. The first trial proved that algae grew best with shades blocking sunlight from the west and east. The trial proved that no shading was not optimal for growth. Complete shading ranked last in total growth. Algae growth was found to be similar in opposite directions. As an example east and west had a difference of only 11%. Second trial results were similar, although there was a slight change in the direction that the optimized growth occurred. The optimum direction was southwest, with the northeast being a close second. Just as the first trial these were opposite directions. Total growth in the two trials was similar but the direction shifted counter-clockwise 45 degrees. It was found that average water temperatures stayed between the high/low daytime temperatures over 90% of the time. Warm temperatures lead to water level drops due to evaporation. Temperatures were cooler in the second trial as a result of the winter season and more rain.

Conclusions/Discussion
It was found that shading in specific directions resulted in optimal algae growth. In the fall season it was determined that east and west shading resulted in optimal growth. In the winter season the optical growth occurred with shading provided in the southwest and northeast directions. To grow algae well, it does not necessarily mean that algae needs complete sunlight. This was proven when multiple partial shaded containers grew better. Therefore, algae will grow more efficiently when receiving some shading. Results proved that this experiment was extremely accurate. This can be validated by facts. When each container and the opposing container (ex: north and south) received similar results, it proved that it was not a coincidence. The shift was most likely due to the change in the position of the sun; however, further research is required to prove that hypothesis.

Summary Statement
This project determined how sun light direction and shading can be used to optimize alga growth.

Help Received
Father showed how to spray paint containers used to grow algae.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Corrina R. Thompson

Project Number
J2035

Project Title
Investigation for Conservation: The Observation of Which Grass Grows the Best with the Least Amount of Water

Abstract

Objectives/Goals
My objective was to see which type of grass would grow the tallest, densest, and greenest with the least amount of water. I wanted to determine if one grass is more drought tolerant so that golf courses and residences could change to a more water efficient grass.

Methods/Materials
I used 3 large lasagna tins and filled each with potting soil and three types of grasses in each (Perrenial Rye Grass, Annual Bluegrass and Creeping Bentgrass). Each sample of grass was the same size. I took initial measurements of height, density, and color. I measured and watered the grasses in each tin with different amounts of water each day, 100ml in tin #1, 200ml in tin #2, and 300ml in tin #3. After 3 weeks, I measured the height, density, and color of each of the 3 grasses in each of the 3 tins.

Results
The Perennial Rye Grass was a rich green color and grew the tallest with a daily amount of 100ml of water. It grew a height of 5.5 mm, followed by Creeping Bentgrass at 2.2mm, and Annual Bluegrass at 1.4 mm. The Annual Bluegrass had excellent color and grew the densest with the least amount of water.

Conclusions/Discussion
Perennial Rye Grass grew the tallest no matter how much water it was given, it had excellent color, and it maintained its initial density. My conclusion is that Perennial Rye Grass will grow the tallest, densest, and greenest with the least amount of water because it can adapt to the amount of water it is given.

Summary Statement
I studied three different types of grass to see which grass grew the tallest, densest, and greenest with the least amount of water.

Help Received
Brian Archbold, Golf Course Superintendent, El Niguel Golf Club, provided me with the 3 types of grasses and suggested how to water them. My mother helped me find websites to research and assisted with the assembly of my board. My family helped me water the grasses each day.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Adam D. Walker

Project Number
J2036

Project Title
The Curious Death of Stomata by Carbon Dioxide

Abstract

Objectives/Goals
To determine if high concentrations of carbon dioxide influence stomata numbers and function.

Methods/Materials
Drill one hole in experimental 1 gallon plant container for surgical tubing insertion. Assemble dry ice container (put Vaseline around the holes, duct tape the plugs in place and put glass tubing through one of the plugs). Fill 2 wide mouth containers with Vermiculite(1lb) 2½ inches deep. Plant 2 plants(one philodendron and one aluminum pilea)in each container. Cut 5lb. dry ice with screwdriver and hammer and place(wearing gloves)inside dry ice container. Put dry ice container inside of Styrofoam ice chest and surround with newspaper. Connect the tubing. Start experiment by releasing carbon dioxide into one container while the other container remains open to ambient air. Water control container every other day and experimental only on the first day because water evaporates and condenses at the top of the container and falls.Keep the plant containers exposed to sun keeping a 70-80 degree environment. Replenish dry ice every 2 days and select one leaf from each plant in both containers for stomata counting. Paint clear nail polish on the undersurface of the leaves. After nail polish dries, remove the nail polish film impression with forceps.Place impressions on microscope slides with a drop of water.Count stomates under microscope.Mark slides with date as back-up to written data. Continue experiment for 8 more days (experiment is a total of nine days).Collect data as measurements are made.

Results
By exposing experimental plants to high levels of carbon dioxide, stomata numbers decreased and the plants died. After two days, the experimental plants were starting to wilt while the control plants were fine. After a week of exposure to only carbon dioxide and water, the experimental plants were completely brown and lifeless. In the end, the experimental plants had zero stomata while the control plants had eighty-one stomata (philodendron) and one hundred sixty-six stomata (aluminum pilea).

Conclusions/Discussion
I found that if a plant is in an environment saturated with Carbon Dioxide for too long, its photosynthetic process shuts down, and the plant virtually starves itself to death.I have learned that if the carbon dioxide levels on earth rise too high, it will not only cause global warming, but also might kill all of the plants and animals.

Summary Statement
How do high levels of carbon dioxide effect stomata numbers and function.

Help Received
Parents helped get materials; Received some advice from teacher.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Christopher W. Weddington

Project Number
J2037

Project Title
Reduced Irrigation Affects Citrus Fruit Size

Abstract

Objectives/Goals

A field experiment on 12 four year old Minneola citrus trees was conducted using a completely randomized experimental design. The experiment compared the farmer's practice of 10 GPH (gallons per hour) application to 3 reduced irrigation treatments: 1 GPH, 1.5 GPH, and 2 GPH. The irrigation season for this project was from June to November 2008. Water was applied every third day for a total of 367 hours over 43 applications. All treatments received the same frequency and time of water application. The hypothesis stated that the 2 GPH treatment would save water, produce a profitable crop in fruit size and number while having acceptable tree growth. Tree growth and crop yield variables were evaluated. Tree height, trunk circumference, canopy width and density, and new shoot counts were measured. Fruit size development, harvest fruit size and number, and fruit maturity were measured. Irrigations were recorded as to date and hours of application. The results showed that the 10 GPH control performed the best. The performance of the 1 GPH and 1.5 GPH treatments was so poor as to be not profitable to the farmer. The 2 GPH treatment of the hypothesis performed well in some parameters, but not as well as the control. It saved water, but did not have as much high value sized fruit as the control. Tree growth seemed adequate, but a second year of growing under this reduced irrigation treatment would be needed to clearly determine if acceptable growht can be achieved at this irrigation rate. Fruit size was found to be significantly different between the control and all treatments. The conclusion was that the farmer's current practice is applying more water than needed and he can benefit from reduced irrigation, but how much to cut back was not reveled by the experiment. The experiment showed that the 2 GPH treament may be close to the desirable farming practice of making a profit and conserving water. Thus, further investigation would be useful to find the best irrigation rate.

Summary Statement

Reduced irrgations affected tree growth and fruit size in minneola citrus.

Help Received

Science teacher advised and encouraged; father supplied trees and materials; mother assisted in data recording, editting tables, and helping with statistical analysis.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Timothy A. Westerfield

Project Number
J2038

Project Title
Does Growing Bell Peppers in Soil or Hydroponically Produce Better Results?

Abstract

Objectives/Goals
To determine whether growing plants hydroponically outperforms traditional growing methods.

Methods/Materials
Fifty bell pepper seeds planted in a #Rapid Rooter# rooting system. After the sprouts had roots extending beyond the rooting plug, twelve similar sized plants were chosen to complete the experiment. Six bell peppers were planted in 15cm square pots with potting soil and six bell pepper plants were grown hydroponically in Rockwool growing cubes. A pH testing kit with base and acid was used to maintain proper pH level of the water prior to adding Flora Nova One-Part Growth Plant Food. A grow light was used to supplement the natural light from the window where the plants were placed.

Results
The hydroponically grown plants grew taller with longer, wider leaves during the experiment. Overall health of the hydroponically grown plants was superior to the plants in potting soil. None of the plants reached the flowering or fruiting stage.

Conclusions/Discussion
My conclusion is that the hypothesis was correct. Growing bell pepper hydroponically produces better results than growing them in potting soil.

Summary Statement
Testing to determine if growing bell peppers hydroponically will produce better results than planting them in a traditional growing method.

Help Received
Travis Notarianni of Discount Hydroponics of Riverside helped me in selecting the supplies for my project. My father helped by reviewing my report and assisting me with the display board preperation.