Abstract: Science and Engineering Fair of Houston

1377

Does Algae Work as a Biofertilizer?

Charisse Ding
EMERY WEINER JEWISH SCHOOL

Category

Plant Sciences

I wanted to find a project that would address the global food insecurity problem, so I came up with the question, "Will algae as a biofertilizer work better than chemical fertilizer or no fertilizer to stimulate plant growth?" Many regions around the world, like Gaza, Sudan, and Mali, are struggling with food insecurity. Even in the In some parts of the U.S., 13.5% of people face hunger, such as the homeless. This made me realize that global food insecurities are a way bigger problem than I thought. Since many people can't afford food, I needed a solution that doesn't cost too much. That's where bio-fertilizer comes in! Each type of fertilizer had 3 pots of 20 seeds. For the natural plants, there were also 3 pots with 20 seeds each. I watered the plant every other day, and in the end, I learned that algae did not benefit the growth of the radish.

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☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

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Abstract: Science and Engineering Fair of Houston

1378

The Impact of Light Color and Intensity on Photosynthesis in Hedera helix and Gynura aurantiaca

Imaeya Magesh
Conroe ISD /McCullough Junior High

Category

Plant Sciences

The purpose of this experiment was to investigate how light color and intensity affect photosynthesis in Hedera helix (Green Ivy) and Gynura aurantiaca (Purple Passion). Understanding the impact of different light wavelengths on plant growth and photosynthesis can help optimize conditions for indoor plant cultivation, especially during harsh weather. To test this, I set up a plant growth tent with seven types of LED lights: red, blue, white, and full spectrum, with each light set to 100% and 50% intensity. Over seven days, I measured plant growth by height and then assessed photosynthetic activity using the floating leaf disk method, which involved submerging plant leaves in a baking soda and dish soap solution to observe oxygen release. The results revealed that full spectrum light had the highest photosynthetic efficiency overall. While the red 50% intensity light led to the most growth in Purple Passion, the red 100% intensity caused dehydration in Green Ivy due to excessive heat. The blue light was the most effective for Green Ivy, while red light proved to be the best for Purple Passion. Both red and blue lights were ideal for photosynthesis, making them the best light choices for plant growth. This experiment demonstrates that tailored light conditions can optimize plant growth and photosynthesis, offering valuable insights for indoor gardening and agriculture.

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Abstract: Science and Engineering Fair of Houston

1379

Cacti Hybrids: A Grafting Experiment to End World Hunger

Jacob Nunez
Dominic Hernandez
Dante Tamez
Aldine ISD /Hambrick MS

Category

Plant Sciences

The purpose of our project was to see if we would be able to grow beans inside of a cactus so that people around the world would be able to use desert land to grow food and decrease starvation rates. To do this, we began by sprouting a lima bean seed with cotton balls, water, and a ziploc bag. Once the seeds had sprouted, we grafted the sprouts into Nopal Cacti by cutting slits at the base of the cactus, inserting the root of the sprout, and wrapping it with plastic wrap. As of now, our beans have not grown nor died. The roots of the sprouts are still green leading us to believe that the lima bean plants are working to adapt to their new environment and will eventually grow into healthy plants.

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Abstract: Science and Engineering Fair of Houston

1380

How do varying environments affect a rose plant?

Yoshna Gujju
Conroe ISD /McCullough Junior High

Category

Plant Sciences

My field of science was Plant Sciences so I researched about rose plants and the environments they grew best in. My experiment is important to my field because it gives a new perspective on where to grow plants. I decided to answer the question, how do the varying environments a rose plant is located in affect different parts of the plant and what characteristics of the environment impact the rose plant the most, because I wanted to find out which environment would benefit my rose plants the most. My experiment will not only help me but will also help gardeners figure out which environment their plants will grow best in.

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Abstract: Science and Engineering Fair of Houston

1381

Which Type of Wood is the Filter of the Future

Wilhelmina Schuh
Clear Creek ISD /Seabrook Intermediate School

Category

Plant Sciences

Abstract This project is about a plant xylem water filter. The problem that was trying to be solved was, what is the effect of type of wood used in a plant xylem water filter on how clean the filtered water is after? Plant xylem filters were created to help people who don't have access to clean water and need a way to filter what they have. Plant xylem filters are helping people around the world every day to keep them hydrated and healthy without paying lots of money for large water filtration systems. Water was filtered using small pieces of wood from 5 different types of trees. The water that was filtered was distilled water mixed with yogurt which was put into clear rubber tubing so to put pressure inside the tube to filter the yogurt and water mixture. The gymnosperm trees are much better at filtering water than angiosperm trees by a lot. The data found shows that gymnosperm trees are better because all together they had an average of 1 bacteria colony when the angiosperm filters had an average of 11 bacteria colonies in a petri dish. In conclusion, the hypothesis conducted was incorrect because the pine filter was predicted to be the best, but it was cypress that was the best. Pine and cypress are the best for filtering and should be used for filtering water.

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Abstract: Science and Engineering Fair of Houston

1382

Let It Grow!

Nikhil Maheshwari
Conroe ISD /Knox Junior High

Category

Plant Sciences

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Abstract: Science and Engineering Fair of Houston

1383

The Botany Rainbow

Sienna Brewer
Conroe ISD /Irons Junior High

Category

Plant Sciences

The objective of this science project is to find plants that could be a replacement for synthetic clothing dyes. The findings of this project will help improve methods for extracting and applying plant-based dyes by identifying key factors that contribute to their effectiveness such as plant selection and mordant use. The hypothesis stated; if the plant used is more vibrant, then the dye will be more vibrant and last longer. In order to test the hypothesis, the plants were boiled in water to create the dye. Then was tested by simmering the fabric in the dye to see the outcome of the color. Lastly, the longevity of the color was tested by washing the fabric three times. The data showed that the flower that was the most vibrant, marigold, ended up being the least vibrant dye, but the tea which was slightly less vibrant came out with the most pigmented dye. This correlation means that even though marigolds are one of the main commercial sources of natural carotenoids which produce bright colors, it might not be as strong of a dyeing agent as the carotenoids in tea or roses. This study shows that the natural vibrancy of a plant does not always correlate with the effectiveness of its dye.

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Abstract: Science and Engineering Fair of Houston

1384

How will the amount of used coffee grounds affect the growth of a mung bean plant ?

Luz Hernandez
Houston ISD /BCM Academy at James D Ryan - MS

Category

Plant Sciences

Most of the population drinks coffee regularly. The coffee grounds used to make coffee, end up in landfills and go to waste. Instead of being thrown away, coffee can help in many other ways besides helping us stay energized. Coffee grounds help plants grow because of the nutrients they contain, like nitrogen or magnesium. I investigated how coffee grounds can influence the growth of a common agricultural crop to find uses for a common waste and improve agricultural practices. Most of my research has shown me that coffee grounds are great for plants because of all the nutrients and minerals they have. I obtained used coffee grounds from a local branch of a national coffee chain and used commercially available garden soil in varying ratios to compare the growth of mung bean sprouts over four weeks. Each container contained a maximum of 34g of soil-coffee-ground mixture. I found that the largest amount of coffee grounds limited the growth of the plant, and the plant with the least amount of coffee grounds worked best. These findings are important because if anybody wants to do an experiment similar to mine they can see the process and it could add on to their research. It's also important because it can help gardeners or anybody wanting to grow their plants by using other mixtures. My findings could help other people develop ways to improve agricultural yield by upcyling food waste.

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Abstract: Science and Engineering Fair of Houston

1385

Clay vs. Plastic: Which Planter Grows Better Carrots?

London Hart
Houston ISD /BCM Academy at James D Ryan - MS

Category

Plant Sciences

This project tested the effect of planter material (clay vs. plastic) on carrot growth. Two 4-inch planters were used, each filled with soil, bone meal, and given a healthy amount of sunlight (42–56 hours/week) and water (0.6–0.9 gallons/week). After five weeks, my data showed that carrots grew taller and healthier in plastic planters due to holding water better. This shows how important planter material is in plant growth, even when all the other variables are the same.

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Abstract: Science and Engineering Fair of Houston

1386

Soil Types

Junior R Rantsane
SST - Champions College Prep - MS

Category

Plant Sciences

The purpose of the experiment is to find out which soil type affects plant growth the best. The procedure or steps that I will be taking to complete this experiment is first, setting up four plastic cups, then mixing and pouring each soil type with regular soil into each cup. Next, I will place the Marigold seeds in each cup and then water each cup of soil. I will repeat checking and watering the soil for 2-3 times weeks and keep track of the plant's growth. Finally, I will record each measurement after each week and come to a conclusion. The most important result I found from the experiment was the best soil type to use to grow Marigold. Marigold can be used for medical purposes, as repellents, and even for decoration. The conclusion that I found was that silt soil is the best for growing Marigold and possibly plants in general.

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Abstract: Science and Engineering Fair of Houston

1387

GMO vs. Organic Food

Ysabella Macalalad
Conroe ISD /York Junior High

Category

Plant Sciences

This project focuses on the decay of potatoes. The purpose is to determine which potato starts to decompose faster. These findings can contribute to research to reduce the amount of people getting diseases and illnesses from eating spoiled food. To conduct this experiment, you will need 3 Organic potatoes and 3 GMO potatoes. The potatoes will need to be set down on a table and observed until the first sign of rot. When this experiment was performed, the Organic potatoes began to rot faster. 3 trials were conducted, and during one, both types of potatoes began to decompose on the same day, which was interesting, considering the other trials were the same. To build on to this experiment, the independent variable can be changed by other factors. For example, the potatoes can be transferred to a different location like outside or in a dark pantry to prevent sunlight. The hypothesis was not supported by the data because it originally stated that GMO potatoes would decay faster. To conclude, this experiment suggests that Organic potatoes rot faster than GMO potatoes.

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Abstract: Science and Engineering Fair of Houston

1388

Energize Plants

Olivia Dunn
Weis Middle School

Category

Plant Sciences

My project was about testing the effect of caffeine on plants. I decided to do this specific project because of a problem gardeners might be experiencing. Plants don't grow fast enough. So, to save the minds of all the impatient gardeners. I decided to try out something I had seen on the internet. I decided to see if watering your plants with caffeine would make them grow taller and faster. As my experiment went on it seemed pretty clear what was going on. The ones with caffeine weren't nearly growing as fast as the one with tap water. For example, the one with just normal coffee didn't even start growing until the last three days of the experiment! Along with that the other ones that just had normal caffeine, whether it be 100mg or 200mg. Those ones grew but not nearly as tall as the ones with tap water. Of course, there are multiple reasons as to why that could be. It could be because I put too much of the caffeine and I just couldn't find the sweet spot in between, or it could be because of the plant that I used. So in conclusion, while I tried to make it easier for gardeners by finding a way for plants to grow/sprout quicker. It didn't seem to work and plants in fact do not need caffeine to grow quicker. (like humans!)

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Abstract: Science and Engineering Fair of Houston

1389

Will the type of insect affect the growth of a pitcher plant

Luis Castillo
Houston ISD /BCM Biotech Academy at Rusk - MS

Category

Plant Sciences

The purpose of this project is so that many insects that are a problem such as spiders being venomous, mosquitoes carrying diseases or cockroaches just being the most feared insect. To investigate which insects would best nourish plants, I fed pitcher plants different insects for three weeks. The pitcher plant can control the population of these insects. And I learned bigger insects carry more nutrients since those plants grew more during the study.

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Abstract: Science and Engineering Fair of Houston

1390

I've Got Friends in Loam Places

Quinn Watson
Clear Creek ISD /Brookside Intermediate School

Category

Plant Sciences

The project examined if plants and mushrooms were the types of organisms that could feed off each other to survive in an airtight environment. The date that was recorded was to evaluate if the plant and mushroom could survive off each other by exchanging oxygen and carbon dioxide. Plants expel oxygen and intake carbon dioxide, while the opposite is true for mushrooms. (Larisa Teslenkova, 2024) This is important because if scientist need to create a new ecosystem, this method will allow the reproduction of mushrooms and allow new growth for plants. The main issue was that mushrooms need specific growing conditions to thrive but if that environment wasn't present, could the two organisms still survive. The hypothesis failed because the plants could not produce a high enough oxygen concentration to sustain the mushrooms and help them thrive. Although, the mushrooms produced enough carbon dioxide for the plants to survive. In fact, one of the plants started to have new buds. When investigating the problem, looking at how much oxygen and carbon dioxide the plants and mushroom produced on average could show how much growth the two might have. The mushrooms grew at a stable rate but unfortunately, did not grow caps which is important to note because without caps there are no spores that allow reproduction. If the mushrooms cannot reproduce then you cannot create and sustain a new echo system.

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Abstract: Science and Engineering Fair of Houston

1391

Can Vitamin E be an efficient fertilizer

Eesha Desai
Conroe ISD /McCullough Junior High

Category

Plant Sciences

I always wondered how I make an ecologically safer fertilizer that can easily decompose in plants. That's when it hit me, Vitamin E can hit all those points! Vitamin E is in Vaseline, and my original plan was to extract that Vitamin E from Vaseline, but it did not go as well as I thought. After that failed attempt I decided that Vitamin E oil blend would have that same affect, in fact it would enhance the Vitamin E properties. I experimented 4 five different batched with this Vitamin E oil. One batch I froze, next I diluted with vinegar, next I diluted with water, and the last one I left alone. Now, there were five batches of plants that consisted of five plants each. The fifth plant in each batch was a controlling variable that had no fertilizer. My results were slightly inconclusive. I tested that if you froze Vitamin E and put it to just a seed the germination process will speed up, but if you add any type of Vitamin E to a young sapling it just slows down the process.

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Abstract: Science and Engineering Fair of Houston

1392

Fertilizer Frenzy

Audrey Wu
Spring Branch ISD

Category

Plant Sciences

Plants need a wide variety of nutrients to thrive. Three of the most important ones are nitrogen, phosphorus, and potassium. They are vital to plants, which is why they must either be present in the soil or through fertilizer. While most people buy commercial fertilizers, some choose to make their own homemade fertilizers out of commonly discarded items such as washed rice water and banana peels. In order to test whether homemade or commercial fertilizers are more effective when helping plant growth, Miracle-Gro Water Soluble All Purpose Plant Food, GRO-WELL Proven Organic Natural Granules All-Purpose Food, fertilizer made out of washed rice water, and fertilizer made from banana peels were used. Plants given fertilizer made from washed rice water were hypothesized to grow the best. Plants were watered daily, and they were given fertilizer every other day. Based on the average height and number of leaves each plant had after 28 days, fertilizer made from washed rice water was the most effective one among the four tested, while Miracle-Gro Water Soluble All Purpose Plant Food did not perform as well as the other fertilizers, which means that the hypothesis was partly correct.

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Abstract: Science and Engineering Fair of Houston

1393

Effect of Water Type on Plant Growth

Natalia Cruz
The Woodlands Methodist School - MS

Category

Plant Sciences

Plants need five elements to thrive: sunlight, air, nutrients, water, and space to grow. Water is essential for plant growth because plants use water for photosynthesis. Water also provides support for the cell structure and keeps plants from overheating during the process of transpiration. The type and quality of the water used can greatly impact plant health. Rainwater, tap water, and distilled water all contain different amounts of salt and nutrients. This project is meant to answer the following question through experimentation with radish plants: How do different types of water affect plant growth? For the experiment, a total of 90 radish seeds were planted (15 pots/ 6 seeds on each). Five of the pots were to be watered with 100 ml of each type of water (rain, tap and distilled). Measurements were taken once a week for the presence of the plant and the height of the plant. All measurements and observations were recorded. It was noted that the plants with rain water germinated the most seeds, while the ones with distilled water and tap water had the highest plants. The overall highest plant average was for the tap water pots. This experiment is important because people are spending a lot of money in irrigation systems that collect rain water for their home gardens and they might not need to do this. However, it is also important to mention that collecting rain water is good for the environment and will eventually cost less than paying the water bill every month.

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Abstract: Science and Engineering Fair of Houston

1394

Go Green with Greywater!

Sarah Sufyan
Clear Creek ISD /Brookside Intermediate School

Category

Plant Sciences

The purpose of this project was to investigate how greywater from washing clothes affects various types of plant species and the plant's growth. The hypothesis is that if different species of plants are watered using greywater, there will be no negative effects towards the plant's growth. To test this, I grew 144 plants total divided into four groups: A: control (water), B: Low- 3 grams of (Tide) greywater, C: Mid- 6 grams (Tide) of greywater, D: High- 10 grams (Tide) of greywater all mixed with 100 ml of water which were watered every day and data was recorded every other day for 30 days. The results showed that Marigold plant grew the tallest along with Snapdragons which grew the second tallest. Purslane and Wild Petunia grew smaller, but they sprouted late due to their germination time which was a little over a week. Overall, all four species of plants grew very well and normally once they sprouted. The greywater source, which was the Tide laundry detergent, did not pose any adverse effects to the plant's soil or growth. The data showed consistent growth pattern amongst all four types of plants and proves that greywater can be re-used to water plants after it has been used to do laundry which makes it an ideal source for water conservation in our society.

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☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

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☒ yes ☐ no

Abstract: Science and Engineering Fair of Houston

1395

How do earthworms influence the absorption rate of water in soil?

Zaria Jones
Houston ISD /BCM Academy at James D Ryan - MS

Category

Plant Sciences

My question is: How do earthworms influence the absorption rate of water in soil? The purpose of my experiment is to see how their tunnels help water soak into the ground better and whether or not earthworms are actually helpful or not. My hypothesis is that, if I apply earthworms to a soil pot, then the soil pot without earthworms will not be able to absorb water as fast as the soil pot with them. In order to test this, I will put soil in 2 pots and apply earthworms to one, and I will measure the water absorption every day for one week. My results showed that the soil pot with earthworms did in fact absorb water faster than the pot without. I can conclude that the soil pot with earthworms absorbs water faster because of the tunnels that the earthworms make in the soil.

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Abstract: Science and Engineering Fair of Houston

1396

Growing Concerns

Jamie Theis
Houston ISD /BCM Academy at James D Ryan - MS

Category

Plant Sciences

Micro plastic can do a lot of damage to us and a lot can be from plants so I want to see how it can effect plants.To do this I basically added shredded up plastic to some pots and some pot with none and took care of them to see the results of how they grow.What I found from it was that at first the plants with most micro plastic grew quicker and sprouted first but they were deformed then the plants with not micro plastic started growing quicker as the plants with most started growing slower.The plants with medium micro plastic seemed to have the most negative effect because for all of them it's either the same or shorter in growth.

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Abstract: Science and Engineering Fair of Houston

1397

IS Water The Only Substance That can Grow a Plant

Jackson Walenciak
Conroe ISD /Irons Junior High

Category

Plant Sciences

My project is about the growth of plants, but for each plant I will use a different substance. I had 6 tomato plants and used 6 different substances Milk, Water, Sprite, Coke, Coffee, and coke. I recorded by data in an Excel form and did my research every day, but only gave fluids every other day. This project went over a course of 15 days. In those 15 days, I learned that sprite and coke make a bad odor. The plants that went all the way to the end were Milk, Water, Gatorade, and Coffee. The ones that grew the best were the milk and water, but the Gatorades growth was stunted. Overall Water grew the plant the best but milk can do about just as good.

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Abstract: Science and Engineering Fair of Houston

1398

Plant Preservation: Does Isopropyl Suffice?

Shayla Mayne
Clear Creek ISD /Westbrook Intermediate School

Category

Plant Sciences

In this experiment, I tested if isopropyl alcohol in different concentrations could be used as a fixative to preserve the structure of cells in Golden Pothos plant tissue. My research allows for safer, cheaper, and more accessible preservation of specimens compared to other fixatives such as formalin. Using isopropyl as a fixative is ideal for schools and homes. Since isopropyl has antibacterial and antifungal properties, as well many similar properties to known fixatives, I believe that if Golden Pothos plants are preserved with Isopropyl alcohol instead of a known fixative, then decomposition will not happen. I went about testing this by injecting groups of 5 plants with different alcohols, and placing them in jars with the same liquid they were injected in. I put all of the jars in a dark place. I checked up on them frequently and noticed signs of decomposition. I measured decomposition qualitatively by recording the color, texture, and structure of the plant to determine if they were decomposing. Results showed that Isopropyl did stop decomposition. The plants stayed almost perfectly in their original condition, with the exact same structure, no shrinkage, and hardened tissues. This proves that my hypothesis was correct, since the plants stayed in their original condition and did not decompose. This method of preserving plants can be used in places like schools who struggle to afford other fixatives. It can also be used in other educational institutions to learn about plants and their structures, such as museums.

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Abstract: Science and Engineering Fair of Houston

1399

PLANTS ON THE LINE

Matias Mora
Alief ISD

Category

Plant Sciences

This experiment investigates how home Wi-Fi affects the growth of lentil plants by comparing how tall the plants grow with and without Wi-Fi. My hypothesis is that if Wi-Fi produces radio waves, then plants exposed to Wi-Fi will grow slower or not grow at all compared to plants not exposed to Wi-Fi. To start the experiment, I turned on the Wi-Fi router and kept it on for the whole experiment. I dampened 9 napkins, folded them in half, and placed 5 lentil seeds in each napkin, for a total of 45 seeds. I placed 3 bags in room 1, 3 bags in room 2, and 3 bags next to the Wi-Fi router. Over the next 7 days, I measured the growth of the plants and took notes on mold or plant color. Afterward, I repeated the experiment with the Wi-Fi off. When the Wi-Fi was on, mold appeared in every bag, and fewer seeds germinated, but the plants that grew were taller and yellowish. When the Wi-Fi was off, there was no mold, more seeds germinated, but the plants were shorter and green. The results suggest that Wi-Fi might affect plant growth, but not in the way I expected.

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☒ yes ☐ no

Abstract: Science and Engineering Fair of Houston

1400

To grow or not to grow

Sherlin Tzurec Charar
Alief ISD

Category

Plant Sciences

My project consisted of three growing methods ; hydroponic, traditional,and soilless cultivation. The fastest growing methods was the soilless cultivation

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Abstract: Science and Engineering Fair of Houston

1401

Finding Ferilizers

Janan Atakova
SST - Champions College Prep - MS

Category

Plant Sciences

My purpose was to figure out if buying fertilizer was necessary. I planted cucumber seeds to test with different fertilizers and measured and compared their heights at the end of the period of time I was testing.

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[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1402

Illuminating Growth: The Power of Light on Plants

Megan Ta
Ashley Cowden
Jennie Gao
Fort Bend ISD /Fort Settlement Middle School

Category

Plant Sciences

Our project is titled: Illuminating Growth: The Power of Light on Plants. We chose to do this project because we've always wondered what exactly the best type of light is to cause plants to grow the most. We each planted basil seeds in 3 different types of light, ceiling light, sunlight, and lamp light. For 2 weeks, we observed the growth everyday for each basil plant. Our hypothesis was that sunlight would cause the plant to growth the most. But we were incorrect, because the lamp light actually caused the plant to grow the most within 2 weeks. We concluded that lamp light is one of the best types of light to grow a plant, but still, it could depend on the type of plant.

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Abstract: Science and Engineering Fair of Houston

1403

Soil Secrets: Unearthing the impact of acidity on plant growth.

Dhruvi Od
Houston ISD /BCM Academy at James D Ryan - MS

Category

Plant Sciences

The soil composition, especially its acidity levels, plays a crucial role in nurturing plant growth. In this exploration, we dive into how different types of soil acidity shape plant growth. Soil Acidity varies across different regions due to factors such as natural composition and human activities. PH can negatively impact a plant's growth by affecting nutrients availability, root development, ect. Understanding this problem that exists in this world is essential, as plants suffer from nutrient deficiency,poor growth and death which can lead to food supply issues. Through experimentation, this project aims to determine how soil pH impacts plant growth, providing insights that can lead to an improvement of agriculture and environmental practice. Gather soil samples with verifying pH level (high, neutral, and low acidity), container, seeds (similar species for consistency), a pH meter or pH test strips, watering can, and finally a ruler in order to measure plant height.. Few weeks later, the plants will be measured and their growth will be recorded to see how different soil acidity impacts their development. The data illustrates the poor growth of the plants each trial caused by the acidic soil with the higher presence of toxic chemicals. Understanding the impact of soil acidity on plant growth is crucial for sustainable agriculture. By identifying the factors that contribute to soil acidification and implementing effective management strategies, we can improve soil health and reduce the need for chemical fertilizers.

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Abstract: Science and Engineering Fair of Houston

1404

Ripening Race

Daniel Bustamante
Fort Bend ISD /Lake Olympia Middle School

Category

Plant Sciences

This experiment involves three different fruits: a banana, a mango, and an avocado. These 3 types of fruits were put into 5 different environments: on a counter at room temperature, in a paper bag, in a container of rice, in water, and in the fridge. All of the fruits were left in their environments for one week to see which environment caused the fruits to ripen the quickest. It was determined that the fruits placed in rice ripened the fastest.

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Abstract: Science and Engineering Fair of Houston

1405

How does the type of water being used affect how the plant grows?

Julianna Blackman
Conroe ISD /Knox Junior High

Category

Plant Sciences

The purpose of this project is to find a new, and more efficient way to grow plants. Since plants are an extremely important part of life, this project could be very useful, as it teaches a better way to grow plants. In this project, there are 5 pots of parsley. Each pot is watered with a different type of water. The goal is to see which water grows the best plant. The plants should be watered every day, or every two days. Every time there is new growth, observations should be written down. There were five types of water, Tap, Filtered, Distilled, Bottled, and Rain. The hypothesis was that the plant watered with Rainwater would grow best. However, the experiment went a little different. In the end, the plant that was watered with Bottled Water ended up growing best. Distilled water came second. The results were consistent in all three trials. Overall, this project ended up being very successful. It helped to find a new way to grow our plants efficiently, and could help the environment in a small, but very important way.

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Abstract: Science and Engineering Fair of Houston

1406

Growing Green on the Red Planet: Comparing the Effects of Two Synthetic Nutrients in Nutrient-Deficient Soil With and Without Additives

Elizabeth Kennedy Ellison
Homeschool

Category

Plant Sciences

This project aimed to determine whether certain plants could grow in nutrient-deficient soil in a simulated Mars environment with or without synthetic additives. The Mars One program has received over 200,000 reservations from individuals interested in living on Mars. To sustain life on the red planet, it is essential to find a way to grow food in sandy soils lacking critical nutrients. Nutrient-deficient soil lacks essential nutrients such as nitrogen, phosphorus, and potassium, which are critical for healthy plant growth. This deficiency can lead to dead plant tissue, stunted growth, and loss of pigmentation. However, some plants can still thrive in these conditions. According to Farm Box Co., legumes, millets, leafy greens, and root crops can grow in nutrient-poor soil, typically sustaining growth for about two to three weeks. Basil is another plant capable of surviving in such soil if it receives plenty of sunlight and is grown in well-draining soil, as it cannot tolerate shade or cold temperatures. In contrast, pitaya does not thrive in nutrient-deficient soil, though it has significant nutritional value. Radishes, on the other hand, prefer cooler temperatures and adequate light, making them fast growers that perform well in poor soil. Interestingly, Pitaya also thrives in temperatures ranging from 21 to 26 degrees Celsius, similar to radishes. The environment plays a significant role in plant growth. NASA mentions that Mars has 24-hour days with 12 hours of complete sunlight and 12 hours of complete darkness, along with frigid temperatures. On Mars, the temperature variations might feel like spring at your feet and winter near your head, which could negatively affect basil. However, with added nutrients, basil might have a chance to survive. Plant Food A contains phosphorus, potassium, nitrogen, magnesium, iron, manganese, copper, zinc, and boron. In comparison, Plant Food B contains calcium oxide, nitrate nitrogen, and magnesium.

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Abstract: Science and Engineering Fair of Houston

1407

Flower Power

Adalyn Santos
Aliyah Quezada
Fort Bend ISD /Lake Olympia Middle School

Category

Plant Sciences

My partner and I love flowers, but they always die within four days in a vase. We had an idea: why not test roses in different liquids to see if they last longer? Over seven days, we used four roses and four liquids: milk, orange juice, water, and Coke. On Day 1, everything looked normal. By Day 2, the milk rose had two petals falling off, but the others were fine. On Day 3, the milk started to get chunky and smell bad, and the milk rose began to tilt. By Day 4, the milk rose was fully tilted, and its petals looked dead, but the others were still okay. On Day 5, the milk rose was dead, the Coke rose was thriving, the water rose looked okay, and the orange juice rose started to tilt. On Day 6, the milk rose was completely dead, the Coke rose still looked beautiful, the water rose looked healthy, and the orange juice rose was tilting more. By Day 7, the milk rose was ugly and dead, the Coke rose looked better than when we started, the water rose looked great, and the orange juice rose was dead too. In conclusion, the Coke rose was the best for roses. The sugar in Coke might have helped. Orange juice was not good for roses; it seemed okay for a few days but then died. Milk is not good for roses at all, and water is just okay.

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Abstract: Science and Engineering Fair of Houston

1408

Photomorphogenesis

Tejaswinee Kamala Kannan
Twin Creeks - MS

Category

Plant Sciences

This experiment aimed to investigate how different colors of light influence plant growth. Based on prior research, it was hypothesized that plants exposed to red and blue light would exhibit the most significant growth, as red light promotes flowering and stem elongation, while blue light enhances leafy development. To test this, seeds of the same species were planted in identical pots and placed under LED lights emitting red, blue, green, or white light. Each plant received the same amount of water and light exposure (12 hours per day) for 40 days. Growth was measured by plant height, number of leaves, and average leaf size. The results confirmed the hypothesis. Plants under blue light showed the healthiest and most vigorous growth, reaching 18 cm in height with an average of 12 leaves and the largest leaf size (4 cm). Red light promoted taller plants (15 cm) but resulted in weaker, elongated stems. Green light produced the least growth (10 cm), supporting the idea that plants reflect green wavelengths and use it less efficiently for photosynthesis. White light led to moderate growth, indicating a balanced effect but not as specialized as blue or red light. These findings highlight the importance of light color in plant development and suggest that blue light is optimal for promoting strong, leafy growth. This has practical applications in indoor farming, hydroponics, and controlled agricultural environments. Future research could explore the effects of light intensity or mixed light spectrums to further optimize plant growth for different agricultural needs.

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Abstract: Science and Engineering Fair of Houston

1409

Do different soil types affect the growth of plants?

Avi Dabi
Clear Creek ISD /Westbrook Intermediate School

Category

Plant Sciences

Different soil types may affect the vegetation and growth of plants very differently. To find which soil is the best when growing different plants, I planted 4 different plants in 3 different soil types which are sand soil, clay soil and loam soil, the control group will be the topsoil or in other words the regular garden soil. The soil containers were all kept under similar conditions (sunlight, watering, temperature and weather). Each day the plants were checked on height, with a ruler and daily pictures. After 15 days of daily observation, I found that the gardencress and radishes grew the tallest in the clay soil and topsoil. Watercress grew the best in clay soil while mung beans grew the tallest in topsoil. According to my experiment the overall best soils for growth were the clay soil and the topsoil. Using this knowledge, we can choose the appropriate plants depending on the soil type when working with plants.

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[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1410

Native Plants: Nature's Defense Against Flooding!

Ike Bagoly
Tomball ISD /Tomball Int

Category

Plant Sciences

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Abstract: Science and Engineering Fair of Houston

3373

The Effect of Varying Polystyrene Microplastic Sizes Obtained from UV Photodegradation on the Transpiration Rate of Laurus Nobilis

Varun Venkataraman
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

Microplastics pose a serious threat to the environment, with many studies showing adverse effects on marine life, and recent studies showing potential impact on plant ecosystems. Polystyrene is a significant contributor to landfills, and UV radiation has been shown to degrade it forming small pieces on the outer layer. In this study, the effect of photodegraded polystyrene on the transpiration rate of a Bay Laurel (Laurus nobilis) was investigated to assess how microplastics in water may impact key biological functions in plants. In order to test this, polystyrene beads were left out in the sun to photodegrade for 10 days, and then ground using a coffee grinder to make a fine powder. This powder was then filtered using a Buchner filter apparatus using filter paper <10um and <2.5um to create a suspension containing microplastics less than that size in Reverse Osmosis (RO) water. This suspension was introduced into the Ganong's potometer setup to measure the impact on transpiration rate of Laurus nobilis. Upon testing, the plant demonstrated a statistically significant reduction (95% Confidence Interval) in transpiration rate when the microplastic solution was present, and the rate persistently declined when larger sizes were incorporated. Interestingly, the effect remained persistent even when the control was repeated at the end of the experiment, suggesting that the effect that microplastics have on plants is either permanent or may take a long time to recover. This research can be applied to develop countermeasures to reduce microplastics in water runoff and increase agricultural yield.

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Abstract: Science and Engineering Fair of Houston

3374

Effects of Coconut Water on Bean Sprout Germination

Lance Ngo
Fort Bend ISD /Hightower High School

Category

Plant Sciences

This study investigates the impact of pink organic coconut water on plant germination, with the central research question focusing on whether the composition and usage of pink organic coconut water speeds up plant germination. Mung beans were chosen as the test subject, and two sets of seeds were subjected to either water or pink organic coconut water for germination. The germination process was monitored over a period of 4 days. The results showed that the mung beans treated with water germinated within 3 days, while those treated with pink organic coconut water exhibited minimal germination, with very few seeds sprouting during the observation period. These findings suggest that pink organic coconut water does not accelerate plant germination as predicted, but instead appears to hinder it under the experimental conditions tested. The composition of the coconut water, which contains various sugars, minerals, and phytohormones, may interfere with germination, though the specific mechanism remains unclear. While this study suggests a negative effect of pink organic coconut water on mung bean germination, further research is necessary to explore the underlying factors influencing this outcome. Future studies should examine the effects of varying concentrations of pink coconut water, different application methods, and a wider range of plant species to determine whether the observed results are consistent across conditions.

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Abstract: Science and Engineering Fair of Houston

3375

"Feed Me Seymour"

Mia Mallory
Ball High School

Category

Plant Sciences

For my project, I will be monitoring and studying how Venus flytrap plants grow in different environments. I will be keeping flytrap A in a warm and sunny place, and I will be keeping flytrap B in a dark, room temperature (75 degrees F) place. I will be feeding and watering the plants the same way two times per day. Each day, I will photograph the plants to monitor growth and keep data.

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Abstract: Science and Engineering Fair of Houston

3376

Toxics in Plants

Sara Horiuchi
Ball High School

Category

Plant Sciences

Abstract Project Research Plan Toxics in Plants - Sara Horiuchi Cleaning ammonia and Epson salts are sometimes used as plant fertilizers. While the concentrations used for plants are much lower than usage for cleaning or humans, we do not know the best concentrations and toxic concentrations of these chemicals for plants. My questions are: 1) Does cleaning ammonia and Epson salts help plants grow better? 2) Do different plants need different concentrations of N and S? and 3) Are high concentrations of N or S toxic to plants? Whether cleaning ammonia and Epson salts have toxicity if given to plants with too high concentrations and if the toxicity is different in different plants. To test the questions, I used seeds and beans: basil, lettuce, radish, clover, navy bean, and lentil bean in varying concentrations of combinations of cleaning ammonia (NH_4OH) and Epson salts ($MgSO_4 \cdot 7H_2O$), observed daily, and plotted the results to compare results for concentrations of N and S, and plant species. Percent concentrations and molar concentrations of N and S were calculated. These plants had different preferences for each concentration of nitrogen (N) and sulfur (S). When given with the combination of S+N, basil, clover, and lentil preferred high N and high S. Lettuce preferred high N with medium or high S. Navy bean preferred high N with low S or no S Radish preferred 0 N or medium N+ medium S. High concentrations of N and S had suppressed their growth.. When giving plants fertilizer, we need to be careful to adjust the concentration for each plant.

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Abstract: Science and Engineering Fair of Houston

3377

Saving Every Drop: A Study on the Benefits of Hydro-gel Blended Soil in the Conservation of Water on Romaine Lettuce Plants

Mikayla Marroquin
Amiya Casperson
Alix Duggan

Category

Plant Sciences

Over the years, water runoff has become an enormous issue in agriculture. [3] Thousands of gallons of excess water have been wasted, carrying dangerous pesticides, chemicals, oil and other pollutants into our drinking water supply and ocean. [1] The purpose of this experiment was to examine whether hydro-gels decrease water runoff while allowing sufficient plant growth. This project required 20 romaine lettuce seedling plants, which were equally split into two groups: one containing hydro-gel infused soil and one group containing plain soil. Each of the two groups was then split into five separate groups in which the pair was watered daily, 3 days, 5 days, 7 days and 10 days. Over 50 days, the plants were watered according to their specific watering cycle. The amount of runoff in each plant was measured prior to the next watering cycle. The percent change in growth was calculated from the difference in plant height from the beginning to end, while standard deviation was used to measure waste runoff data. The results concluded there is a statistical difference between the growth medium (hydro-gel containing soil vs plain soil) of romaine lettuce plants and the time lag between water cycles, which prevents excess irrigation waste. By using hydrogels, farmers could potentially conserve millions of gallons of water therefore getting one step closer to the full prevention of wasted water on our planet earth.

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Abstract: Science and Engineering Fair of Houston

3378

Phytoremediation of Ibuprofen (NSAIDs) using Lemna minor (Duckweed)

Selina Song
Jessica Wang
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

Ibuprofen (IBU) is a NSAID drug that is popular for its anti-inflammatory characteristics. However, due to global IBU usage, production of this organic compound has increased dramatically, thus resulting in a rise in IBU contamination of the natural environment. IBU is found in waters at levels as low as in the ng/L or µg/L, classifying it as a micropollutant. The presence of IBU as a micropollutant has resulted in ecological damages to the organisms, causing hormonal imbalances and cellular degeneration. Lemna minor has been identified as a potential phytoremediation agent that could help in the removal of IBU due to its versatility, cold tolerance, and rapid growth. To test the success of using Lemna minor for phytoremediation, an experiment was set up with three trials of water contaminated with 200 ppm of IBU. Then, 10 grams of Lemna minor was placed in each container, and the values of the IBU was tracked using the LC-MS over the course of 8 days. It was found that while Lemna minor was capable of removing IBU, it took around 30-40 days, making it unsuitable for short term remediation projects. This indicates the success of the project, but also the need for more refined phytoremediation techniques. By using the natural capabilities of aquatic plants like Lemna minor, it can reduce reliance on traditional treatment methods, minimizing the ecological footprint produced by wastewater treatment systems as a whole.

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Abstract: Science and Engineering Fair of Houston

3379

Led Lights Revolutionizing Plant Growth

Shekemi Taiwo
Diarra Niang
Alief ISD

Category

Plant Sciences

Our purpose of this experiment is to grow plants in areas without as much sunlight. The hypothesis that we investigated was whether plants grew faster under lighter colors rather than darker colors. We experimented on behalf of our hypothesis using 8 procedures which consist of adding soil in each pot and filling each one to the top, sowing the cranberry beans 1.5 inches deep in the soil, adding water to each pot, inserting the light bulb socket, connecting the light bulb socket into the wall plug, adding the plant under the led light sources, waiting 1-2 week for each plant to sprout, and recording each plant on now which grew best under the light sources. This results in the growth of three plants. In conclusion, the plant grown under the blue light grew the most compared to the other two plants and grew an average of 30cm, supporting our hypothesis that plants grow faster under lighter colors.

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Abstract: Science and Engineering Fair of Houston

3380

Analyzing the Effects of Rhus coriaria (Ground Sumac) as an Alternative Food Preservative

Bruno Reis
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

Ground sumac is a spice derived from the berry of a Rhus coriaria shrub. This spice's tangy flavor and dry sensation influenced the researcher to test its effects in food preservation. To conduct the experiment, the researcher tested four foods which each underwent three tests; one where the food had no sumac, another where the sumac was present in the controlled environment, and the last where the ground sumac was in full contact of the food. Their hypothesis was that the foods in contact with the sumac would prevent the most mold growth. According to the results, this was proven to be false. The foods tested in the presence of the sumac prevented all mold growth, above expectations. Now the foods in contact with the ground sumac had some mold growth due to osmosis. When the sumac was drying out, it reached a point where the ground sumac had more water than the food itself. This led to the diffusion of water from the sumac, enough for the food to develop mold. These tests can be applied to the real world as ground sumac is a fantastic alternative. The spice can be grown in dry environments such as those in Africa where food preservation is a struggle making it convenient. It can also be used to dehydrate foods. Although the original intention of the ground sumac experiment was not to desiccate, it could still be used for dehydrated foods which offers nutrient retainment, promotion of weight loss, and more.

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[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

3381
Dielectra

Lakshay Yadav
John Teerman
Angelo Reyes
Cinco Ranch - HS

Category

Plant Sciences

Agricultural waste and inefficiencies result in 350 million tonnes of harvested food waste every year, creating a dire need for innovation in crop monitoring. Dielectra offers fast, non-intrusive capacitance-based measurement systems using dielectric spectroscopy to produce accurate nutrient concentration detection in plants, offering cost-effective plant nutrient monitoring unparalleled by other monitoring methods. Existing nutrient monitoring solutions have a dependency on invasive protocols and expensive equipment to deliver their results, while the molecular-targeted dielectric spectroscopy of Dielectra provides real-time measurements at a fraction of the cost. Our system detects capacitance signatures at the atomic level, allowing us to measure chemical concentrations within all types of plant tissue with precision. Our proposed technology utilizes our team's printed circuit board with a waveform generator to produce frequency-specific currents aligned toward target molecular vibrations, a capacitance detector module, and an electromagnetic coil enhancing the potential difference of the molecules on the target plant. Our system applies a variety of signal processing mechanisms such as Fast Fourier Transform, Kalman, and clustering algorithms for classification, cleaning, and amplifying molecular concentrations from capacitance measurements. Dielectrica's application turns sensor data into human-focused insights, exposing nutrient deficiencies, metrics regarding field vitality, and real-time alerts for optimal crop management. Our research methodology focuses on quantifying and optimizing the performance of devices through experimental validation, starting with microgreens and scaling towards commercial applications, identifying deficiencies and surpluses that impact plant growth. This innovation can offer potential breakthroughs in agricultural resource management, environmental protection, and precision farming research.

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Abstract: Science and Engineering Fair of Houston

3382

Bioplastic-Coated Fertilizers for Sustainable Agriculture: A Novel Solution for Optimizing Nutrient Release, Minimizing Runoff, and Eliminating Microplastic Pollution

Shri Chada
Chada Homeschool

Category

Plant Sciences

The widespread use of synthetic fertilizers in agriculture is a major cause of environmental pollution from nutrient runoff. Polymer-coated slow-release fertilizers, such as Osmocote, reduce runoff but introduce harmful microplastic pollution. This study explores bioplastic-coated fertilizers as a sustainable alternative and seeks to design a coating that releases nutrients slower than uncoated fertilizers to prevent runoff but faster than Osmocote to align with the growth cycle of fast-maturing plants such as lettuce. In the first phase of this research, bioplastic materials were optimized for strength, flexibility, and controlled nutrient release by varying the type of starch and proportions of glycerin and vinegar. Tapioca starch was selected for its performance. A fertilizer blend emulating Osmocote 15-9-12, was encapsulated between bioplastic layers to create crystalline and crushed variants. Five treatment groups - control, uncoated fertilizer, Osmocote Plus, bioplastic-coated crystalline fertilizer, and bioplastic-coated crushed fertilizer - were tested with leachate experiments in soil pots. Leachate analysis revealed that bioplastic-coated fertilizers exhibited a smaller initial nutrient spike and maintained higher release rates across the lettuce growth cycle. Bioplastic coatings decomposed naturally, eliminating microplastic pollution. In a follow up plant growth experiment, buttercrunch lettuce was cultivated using the same five treatment groups with a grow tent and grow lights ensuring a controlled environment. Plants treated with bioplastic-coated fertilizers demonstrated superior growth metrics, including increased leaf count and biomass. The results indicate that the bioplastic-coated fertilizer developed in this research can effectively reduce nutrient runoff and eliminate microplastic pollution while optimizing nutrient delivery for short-cycle crops.

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Abstract: Science and Engineering Fair of Houston

3383

Investigating the Impact of Allelopathic Plants on the Germination and Growth Dynamics of Adjacent Plant Species

Dhruti Nukala
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

The detrimental effects of weeds on crop production are a significant concern, as they can lead to substantial yield loss. Allelopathy is a biological phenomenon where one organism produces biochemicals that influence the growth, survival. Development, and reproduction of its surrounding plants. The purpose of this research is to explore which allelopathic plant best aids in plant growth. The allelopathic plants that were selected included: eucalyptus, wheat grass, and sunflower. They were paired with two non-allelopathic plants: fenugreek and bean plants. Their growth and sprouting date were observed. The results displayed that the fenugreek and bean plants grew significantly faster when paired with the eucalyptus plant, compared to the other two types. The fenugreek and bean plants grew over 4 inches in just three weeks when paired with the eucalyptus plants. The pairs with the eucalyptus plants also managed to sprout first before the control pot. The sunflower pots seemed to show the least growth with the plants slowly dying after the second week. The wheat grass pots had average growth but still displayed slower growth than the control pot. Overall the eucalyptus plants showed the most growth and promise of being beneficial in agricultural terms. The integration of allelopathic plants into agriculture could improve crop yields and reduce the need for harmful herbicides. By harnessing the power of allelopathy more sustainable and efficient food production systems could be put into place by pairing different crops with different allelopathic plants and observing growth and germination patterns.

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Abstract: Science and Engineering Fair of Houston

3384

Assessing the Genetic Diversity of Endangered Lady's Slipper Orchids Local to New England

Lyla Eve Bauer
ST. JOHN'S SCHOOL

Category

Plant Sciences

Showy lady's slippers orchids (Cypripedium reginae) are a critically endangered species in the New England area. Lady's slippers generally are known to grow in small isolated populations and have very specific habitat preferences. Additionally, lady's slippers reproduce both through sexual and asexual methods. The aim of the experiment is to see the genetic diversity of showy lady slipper's populations in New England; specifically, in Eshqua Bog natural Area in Vermont. Low genetic diversity within a species can lead to the extinction of their species in a changing and industrialized world. To determine genetic diversity, 39 different primers were used on multiple samples of DNA within this showy lady's slipper population, to target specific microsatellite regions, with the use of PCR. Since some of these primers were new to the lab, an additional experiment was performed to determine the annealing temperatures for these primers. After sequencing the samples made during this experiment, the differences and similarities between individuals within this population were evaluated to determine their genetic diversity. This research will contribute to the future goal of strengthening populations of showy lady's slippers in the New England area by increasing the genetic diversity within them.

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Abstract: Science and Engineering Fair of Houston

3385

Rooting out the Secrets of Vitamin D2

Elise Bernadac
Stratford - HS

Category

Plant Sciences

Rooting out the Secrets of Vitamin D2. Does Vitamin D2 increase root growth in sprouts when misted onto the leaves of the sprouts? In this paper I use the records of bean sprouts and how the plants were affected when they were misted with vitamin D2. As our world population grows it is important we find a way to accommodate the people and the crops. Vitamin D2 could help minimize the space needed for crops increasing the space for people to live. This experiment went off of the sprouts measuring the root length and thickness to see if the hypothesis was correct. It also measured the leaf width and length to make sure it was a healthy plant, and vitamin D2 would not cause the plant to wilt. The results of this experiment was that the root lengths and root thickness of the Vitamin D2 plant did much better than the Control Plant. Furthermore, the leaves of the Vitamin D2 plants and the Control Plant followed a very similar line of growth. In conclusion adding vitamin D2 to the leaves of the plants everyday ended up helping the plants grow longer and thicker roots. This will help allow facilities to grow larger and faster growing crops by just misting vitamin D2 onto the leaves of their crops.

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Abstract: Science and Engineering Fair of Houston

3386

pH-abulous Peas: How Acidity Affects Plant Growth Rates

Sebastien Dietlein
Jerry Li
Fort Bend ISD /Clements High School

Category

Plant Sciences

The purpose of the study we conducted was to determine the pH of water that would best grow pea plants. We planted eleven plants in the exact same environments, watering each plant the with the same amount of water, but with a different pH (in 0.2 increments from 6 to 8). We collected the plant heights weekly, and summarized and published our data after five weeks. From the data, we concluded that the plants watered with more basic pHs (7.2-8.0) grew taller than those watered with more acidic pHs (6.2-6.8). The outliers of the data (6.0, 7.0) suggested that there may be other factors that hindered the growth of the pea plants, such as the nutrients in the seed, genetics, etc. In addition to that, we determined that the growth rates of the plants watered with more acidic pHs were higher during the beginning stages of the experiment (Week 1 - Week 3), but lower towards the end. This was likely due to the plants' exhaustion of their energy during germination, resulting in the scarcity of energy to maintain its structure as it grew taller. On the other hand, the plants watered with more basic pHs had lower growth rates during the beginning stages, but higher at the end (Week 4 - Week 6), likely due to its little use of energy during the germination process.

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Abstract: Science and Engineering Fair of Houston

3387

Sprouting Success

Adeola Badejo
Alief ISD

Category

Plant Sciences

Once thought to be poisonous, hydrogen peroxide is now safe to use as a crop herbicide before eventually making it into human bodies. It has been demonstrated that hydrogen peroxide, a widely used disinfectant, damages cell organization to varying degrees, resulting in the loss of cell viability. It is now safe for crops because the EPA has certified it as a pesticide. Even while the EPA is confident in its work, I disagree, which leads me to the crucial question. As stated in the publications, does hydrogen peroxide impact seed germination? Let's start by defining hydrogen peroxide. How does hydrogen peroxide affect plants? My experiment aimed to see how varying hydrogen peroxide concentrations affect seed germination. Throughout the experiment, I investigated why hydrogen peroxide had such an impact on seed germination. This was performed using different amounts of household hydrogen peroxide (3%) on lima bean seeds. Based on the experiment I found that 30 ml of hydrogen peroxide had a surprisingly high germination percentage. Seed death was experienced in the 5 ml and 15 ml of hydrogen peroxide. All in all, the 30ml of hydrogen peroxide proved to have a positive effect on seed germination percentage.

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Abstract: Science and Engineering Fair of Houston

3388

Barium Boost: Barium Chloride-Assisted Phytoremediation in Chromium-Contaminated Soils

Norah Simon
ST. JOHN'S SCHOOL

Category

Plant Sciences

Hexavalent chromium (Cr-VI), a highly toxic and carcinogenic compound, poses a severe threat to public health and ecosystems, especially in regions like Houston, Texas, where its concentrations in water and soil are alarmingly high, Houston being the fifth-highest in the nation. Cr-VI contamination, primarily from industrial activities, disrupts plant growth, impairs nutrient absorption, and threatens food safety, with long-term exposure linked to cancer and other severe health conditions. This study investigates the impact of Cr-VI on plant growth and explores a remediation method using barium chloride (BaCl2) to reduce Cr-VI contamination in soil without depleting essential nutrients. Mung bean plants (Vigna radiata) were cultivated under controlled conditions and exposed to Cr-VI to assess its detrimental effects on plant health. A chemical remediation approach using a BaCl2, treatment plan was tested by precipitating Cr-VI as barium chromate (BaCrO4), a stable compound. Cr-VI concentrations were quantified before and after treatment using spectrophotometric analysis with diphenylcarbazide (DPC) at 540 nm. The results demonstrated that BaCl2, effectively reduced Cr-VI levels in soil while preserving essential nutrients, as evidenced by improved plant growth in treated samples compared to untreated controls. The spectrophotometric curve and consequent graphs illustrate the success of the experiment by quantifying the reduction in Cr-VI concentrations after barium chloride treatment, highlighting the effectiveness of the remediation process on soil health and plant growth. This research highlights a practical, small-scale solution for mitigating Cr-VI contamination, offering potential applications for ecosystem conservation and environmental health protection. Future research could explore the effects of this treatment on food safety in edible crops, addressing broader concerns about environmental contamination and human health risks.

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Abstract: Science and Engineering Fair of Houston

3389

A Green Alliance: Evaluating the Synergistic Dynamics of PETase Expression and Plant-Microbe Interactions in Enhancing Microplastic Degradation Pathways in S. alterniflora

Vibhan Emmi
Adam Siddiqi

Category

Plant Sciences

Microplastics, originating from various sources, present an escalating threat to ecosystems such as the Gulf of Mexico, where they accumulate in food chains and impact vast wildlife & humans. On the other hand, microorganisms equipped with enzymes like PETase offer a promising solution for breaking down plastics into less harmful components. Current plant-microbe symbiotic relationships continue to enhance this bioremediation by employing microorganisms to degrade microplastics. Wetlands, functioning as natural filters before particles reach larger water bodies, such as oceans, provide a perfect environment for such interactions. This experiment delves into how these relationships can help tackle the microplastic crisis. Over 44 bacterial species were isolated from Spartina alterniflora, a resilient grass species native to the Galveston Wetlands, with six bacteria showing PETase activity effective in a PET microplastic-infiltrated environment, the common type of plastic found in many modern plastic containers. After isolation, sequencing, & replication of these enzymes, the PETase-enhancing gene was optimized & inserted into a plasmid, which was later transformed into S. alterniflora through Agrobacterium-mediated transformation. Enzymatic assays revealed that the transgenic plants enhanced PETase expression in their root exudates, resulting in a 60% degradation of PET microplastics in 72-hour laboratory tests. Additionally, the plant health and structural integrity of the transgenic plants were maintained, demonstrating that the introduced PETase-enhancing gene did not negatively impact their growth or development. These findings exhibit the potential of engineered wetland plants as a natural, sustainable solution for mitigating microplastic pollution.

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Abstract: Science and Engineering Fair of Houston

3390

Harvesting Electricity from Plants

Mauricio Andrade
Calvin Lim
Jade Nguyen
Aldine ISD /Eisenhower HS

Category

Plant Sciences

A vast majority of greenhouse gas emissions come from burning fossil fuels to create electricity. The purpose for this project is to further experiment with a renewable energy source. Using different plants, we tested which would produce the most electricity.Native and slow growing plants, like moss, were prioritized to see if non agricultural plants could be of use. We tested each plant 3 times, and compared the mean of each plant to one another. Native plants were found to produce the second most electricity at .035 and .034 volts. Compared to the straggler daisies .036 volts, the native plants are close. This project shows that non agricultural plants are able to be used as a renewable source of electricity assisting in lowering greenhouse gas emissions. These native plants that grow everywhere can be used to benefit the environment.

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Abstract: Science and Engineering Fair of Houston

3391

Phytodesalination using Lemna minor and Portulaca oleracea

Shubam Vennu
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

<1% of the entire Earth's water is usable freshwater. Of that, 88% is used for irrigation, agriculture, or other non-consumption uses. If there was a way to utilize Earth's salt water for uses that involve freshwater right now, that would increase the amount of freshwater available for consumption. Current desalination methods are energy intensive, create greenhouse gases, and dispose of highly concentrated brine into marine ecosystems, killing off wildlife. If there was a way to combat these setbacks and increase portability, desalination would hold a large position in the water usage sector. Some plants like Duckweed (Lemna minor) and Purslane (Portulaca oleracea) are halophytic, meaning they live, can live, or thrive in salty environments. If they live in salty water, then it'd be reasonable to hypothesize that they could remove salt from water, through a process called Phytodesalination. The researcher set up 12 jars with salt concentrations of 0.5%, 1%, 2.5%, and 5%, and placed either 25g Duckweed, 20g Purslane, or both into each jar. The researcher then measured the desalination rate over 3 weeks to see if the plants purified the water. The results came back with the mix of plants doing best in 0.5% and 1%, Purslane in 2.5%, and Duckweed in 5%. Phytodesalination can be used in all aspects. The water can be used for drinking, commercial uses, irrigation, agriculture, or energy via electrolysis. The leftover plants can be used for compost for new plants, food for cattle, or medicinally.

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Abstract: Science and Engineering Fair of Houston

3392

Examining the Synergistic Effects of Hydrotropism, Magnetotropism, and Simulated Microgravity on Allium fistulosum Morphology Using a Novel 3D Clinostat

Aarushi Pandey
Conroe ISD /AST: Academy of Science and Technology

Category

Plant Sciences

As humanity ventures into extraterrestrial agriculture and advances controlled-environment farming, understanding how plants integrate directional growth cues under altered abiotic conditions is essential. This study examined Allium fistulosum growth responses to hydrotropism, magnetotropism, and gravitropism under combinations of normal gravity, simulated microgravity (via a 3D clinostat; 0.02 g, 0.10 g, 0.25 g), homogeneous and heterogeneous water distribution, and moderate magnetic fields (pull forces of 0.10 kg, 0.20 kg, 0.50 kg, 1.00 kg). ANOVA revealed significant treatment effects on shoot and root architecture, biomass, and chlorophyll content. Shoot length increased under microgravity, with elongation amplified in static magnetic fields (SMFs), likely due to disrupted directional signaling and accelerated cell cycles. Shoot biomass declined under microgravity, with further reductions observed in moisture gradients, potentially linked to abscisic acid (ABA) biosynthesis reallocating resources to root development. Root biomass and count increased in SMFs, hypothesized to result from enhanced ion fluxes, reactive oxygen species (ROS) signaling, and upregulation of cell division genes in meristems. Microgravity caused random root growth and reduced secondary root formation, likely due to impaired auxin redistribution from disrupted statolith sedimentation. Hydropatterning was observed in heterogeneous water distributions, evidenced by lateral branching and elongation toward high-moisture zones. Chlorophyll a and b content decreased under microgravity, likely due to impaired plastid differentiation, while SMFs were associated with increased pigment levels. Chlorophyll content was reduced in moisture gradients, potentially from ABA-induced suppression of photosynthesis.

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3393

Chlorophyl

Courtney Williams
Aurora Bernhart
Fort Bend ISD /Hightower High School

Category

Plant Sciences

The purpose of this experiment is examine is to create a natural dye using plants that is not harmful in the clothing that people wear. In recent times, new age green dyes are often packed with harmful chemicals that can lead to long-term health issues down the line. These include conditions such as cancer, autoimmune disorders, respiratory issues and allergic reactions along with other health complications that can impact your well being. We want to combat this issue by developing a natural green dye by using organic leaves grown form seeds. We extract the green hue through the chlorophyll process. Therefore, our experiment consisted of extracting chlorophyll from an elephant ear plant to create a natural dye. Below are the procedures that we used. Procedures: 1.Cut yarn into 4 even pieces and breakdown the leaves. 2.Boil the water 3.Rip up one elephant ear and place in a separate container with your picked liquid then place the container in a pot of boiling water for 10 minutes 4.Pour mixture over a piece of yarn, then let sit for 3 minutes. 5.Hang to dry 6.Repeat with the other liquids The following were our observations and results: - 2 out of 4 liquids extracted color from the elephant ear's chlorophyll. - The water and acetone seemed to be the best for color extraction. - The vinegar and Sprite had no physical or chemical reaction to the plant's chlorophyll. In conclusion, our experiment proved that you can make green dye from a plant when using certain liquids. The liquids that were most successful were water and acetone. Observe

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Abstract: Science and Engineering Fair of Houston

3394

Advanced Morphological and Nutritional Optimization of Genovese Basil and Cilantro Cruiser via Precision-Controlled Environment Agriculture

Jeswith Reddy Mekapati
Houston ISD /DEBAKEY HIGH SCHOOL FOR HEALTH PROFESSIONS - HS

Category

Plant Sciences

This study investigates the impact of controlled environment agriculture (CEA) on the morphological and nutritional optimization of Genovese Basil and Cilantro Cruiser, focusing on their suitability for distinct agricultural systems. Experimental conditions leveraged spectrum-specific lighting and environmental controls, yielding significant morphological and physiological enhancements compared to controls. Genovese Basil demonstrated marked improvements in structural metrics, including a 6.3% increase in root depth under experimental conditions, alongside notable width enhancements, underscoring its adaptability for outdoor cultivation. Cilantro Cruiser exhibited superior nutrient profiles under blue-red spectrum treatments, suggesting its efficacy in vertical farming systems prioritizing nutrient density. Analysis of Variance (ANOVA) confirmed statistically significant variations across experimental and control groups, with p-values indicating high confidence in observed differences. Specifically, Genovese Basil showed consistent superiority in growth under experimental conditions, while Cilantro Cruiser displayed substantial potential for maximizing nutrient bioavailability. The findings highlight the differential responses of plant species to tailored environmental manipulations, providing insights into optimizing crop performance based on targeted agricultural goals. By leveraging CEA techniques, Genovese Basil emerges as a robust candidate for large-scale outdoor farming, capitalizing on its structural growth enhancements, while Cilantro Cruiser offers a promising solution for nutrient-focused urban agriculture. These results underscore the transformative potential of precise environmental interventions in advancing sustainable agriculture, enabling resource-efficient cultivation systems that address both productivity and nutritional demands in an increasingly urbanized world.

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