CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Eleanor Addison

Project Number

J2101

Project Title

Sunscreen: Protection or Poison?

Abstract

Objectives

This project was done to determine if recent studies suggesting that sunblock is harmful to coral reefs are true.

Methods

Over a period of weeks raise Brine shrimp (as a proxy for coral reefs) from eggs in homemade hatchery. Expose 10 shrimp in a Petri dish to a 1cm square swab of one of 9 sunblock brands, 3 household chemicals, or 1 control, and record the health condition every hour over 36 hours for each.

Results

Zinc-based sunblocks were found to be the least harmful to brine shrimp, while sunblocks containing oxybenzone or octinoxate were the most. Surprisingly, shampoo (which has not gotten as much press) was found to be even more harmful. In addition, cost was not related to environmental harm.

Conclusions

All sunscreens tested were found to be harmful to sea life (as represented by Brine shrimp). Zinc-based sunblocks were less harmful than oxybenzone and octinoxate-based blocks, concurring with recent media reports. Interestingly, at equal concentrations, household shampoo proved to be even more of a threat to Brine shrimp, implying sunscreen is not the only danger beach-goers may bring to the world's coral reefs.

Summary Statement

Using Brine shrimp as a proxy for coral, this study explores the harmfulness of sunscreen to sea life.

Help Received

My dad assisted me by recording some of the data in the middle of the night, helping me order the materials, and helping me with the paper-cutter to cut sheets to glue on the project display board.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Sadik Aref

Project Number

J2102

Project Title

Investigating the Effects of Decongestant and Coenzyme Q10 on the Heart rate of Daphnia

Abstract

Objectives

Studies reported that decongestant increased the heart rate of human, while coenzymeQ10 helped stabilize the heart rate. The goal of my experiment is to find the effect of decongestant and coenzyme on the heart rate of Daphnia magna.

Methods

A Daphnia magna was placed on a petri dish under a compound microscope. The heart beats of the daphnia was counted for 15 seconds. Heart beats per minute was calculated by multiplying by 4. The measurements were taken three times. The daphnia was then allowed to swim in a 5% decongestant (Children's Sudafed) solution. The heart rate of the daphnia in the 5% decongestant solution was measured for three trials on 12 different daphnia. Tested daphnia was stored in a separate jar. The difference in the heart rate before and after adding the decongestant solution was calculated.

A mixture of 5% decongestant (Children's Sudafed) and 5% coenzymeQ10 (Qunol Ultra) solutions was prepared. The heart rate of an untested daphnia in spring water and then in a mixture of decongestant & coenzymeQ10 solution were recorded. Measurements were taken 3 times on 12 different daphnias. The difference in the heart rate before and after adding the mixture of decongestant and coenzyme solution was calculated.

Results

The decongestant increased the heart rate of daphnia by 19.8%. The decongestant and coenzyme decreased the heart rate of daphnia by 2%.

Conclusions

The results of the experiment supported my hypothesis. Repeated trials with multiple Daphnia magna found that the decongestant increased the heart rate, while coenzymeQ10 helped the heart rate to reach the normal level. This study concludes that the adverse effects of the decongestant on the heart can be mitigated by the coenzymeQ10.

Summary Statement

I showed that the decongestant alone increased the heart rate of Daphnia magna, while adding coenzymeQ10 to the decongestant helped maintain the original heart rate.

Help Received

I conducted the experiment on my own. My Science Teacher provided guidance and valuable feedback throughout the experiment.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Lidetu Ayalew

Project Number

J2103

Project Title

Effects of Water Pollution on Radishes

Abstract

Objectives

The objective of the experiment was to find out how different commonly found contaminants around the world effect a plants (radishes) overall growth after a certain amount of days.

Methods

Soil, Planters (4), radish seeds, Measuring cup, motor oil, fertilizer, pesticide, graduated cylinder, scale, ruler, and water. I measured the radishes overall health after being watered with the contaminants using multiple measuring methods, such as length.

Results

The pesticide contaminant effected the radish most negatively in terms of growth, then it was the oil contaminant, afterwards the fertilizer, and lastly the control (water).

Conclusions

Overall, water pollution does effect plants negatively, especially the pesticide contaminant in my case. This informs people, especially people who own large farms where fertilizer or pesticide leakage is common to be aware of what is in the water they are using for their plants.

Summary Statement

I found out the effects of commonly found contaminants on radishes.

Help Received

Besides purchasing certain materials, like the planters, I conducted the research and experiment by myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Michael Bedrosian

Project Number

J2104

Project Title

Comparing the Effectiveness of Different Natural Repellents in Controlling the Vine Mealybug

Abstract

Objectives

The objective of my study is to determine if there is a natural repellent for the vine mealybug. My goal is to prove that organic neem oil will eliminate the vine mealybug the best. This can give farmers, landscapers, and consumers a natural option for spraying their crops and plants, rather than using pesticides.

Methods

Procedure for Making Natural Repellents: Tomato leaf spray, chopped leaves in blender with water, and strained. Garlic spray, chopped bulbs in blender with water, and strained. Hot pepper spray, chopped habanero peppers in blender with cayenne and water, and strained. Organic white vinegar with 50% water mix. Organic apple cider vinegar with 50% water mix. Organic neem oil, store bought.
Field Testing Procedure: 21 infected vines, using 3 vines per spray type. Measure infected area and pest population. Then apply repellents. After 7 days, record measurements and calculate percentage of infestation remaining. Lab test: Use 7 butternut squash. Inoculate and sanitize at Kearney Ag Research Center. After 6 weeks, estimate vine mealybug population, and apply 1 natural repellent on each specimen. After day 3 and 7, check pest population on specimens. Record results, and calculate percentage of infestation remaining after test.

Results

The results of my investigation shows that organic neem oil did the best. It eliminated 90% of the mealybug population on the field and lab test. Organic white vinegar and hot pepper sprays eliminated 30% on the lab test. On the field test, organic white vinegar spray eliminated 20% of the mealybug population. Hot pepper spray eliminated 30% on the field test. Organic apple cider vinegar spray, tomato leaf spray, garlic spray, and my control (water), had no significant change of mealybug population on the field and lab test.

Conclusions

I found out that my hypothesis was correct that neem oil eliminated the most vine mealybug population. Organic neem oil eliminated 90% of the mealybug population on the field and lab tests. Organic white vinegar and hot pepper spray eliminated 20-30% on the field and lab tests. The tomato leaf, garlic, organic apple cider vinegar sprays, and my control (water) had no significant change to the vine mealybug population. This shows me that there is a natural repellent that we can use to eliminate this harmful pest.

Summary Statement

Neem oil proved to be a natural repellent that eliminated the mealybug, which gives farmers, landscapers, and consumers an option instead of using pesticides.

Help Received

Mr. Bryan Bedrosian, Owner Bedrosian Farms, Fowler; Mr. Kent Daane, Professor Parlier Ag Research Center; Mr. Garrett Rosales, Lab technician, Parlier Ag Research Center; Mr. David Obermiller, Harvest Field Farms, Fresno

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Lola Castorina

Project Number

J2105

Project Title

Can Sodium Bicarbonate Be Used to Kill Mosquito Larvae?

Abstract

Objectives

The objective of this project was to determine if sodium bicarbonate can be used as an economical, efficient, and environmentally-safe method to control the mosquito larvae population by determining the sodium bicarbonate concentration required to achieve a 100% mortality rate of mosquito larvae at 12 hours. This project builds on my prior science project that determined that a 19 ppt road salt concentration killed 100% of mosquito larvae at 12 hours.

Methods

Before performing the experiment, two test trials were conducted to identify and correct potential errors in the proposed method and procedure.

After verifying the viability of the project, 20 mosquito larvae were placed in 500 mL samples of pond water with sodium bicarbonate concentrations of 0 g/L, 6 g/L, 8 g/L, 10 g/L, 12 g/L, 14 g/L, 16 g/L, and 18 g/L. All mosquito larvae were exposed to identical environmental factors (i.e. light, temperature, and homogeneous pond water to maintain identical nutrient content).

Three separate trials for each sodium bicarbonate concentration were conducted. The number of deceased mosquito larvae was recorded hourly for 12 hours. A 100% mortality rate occurred at a sodium bicarbonate concentration between 10 g/L and 12 g/L at 12 hours.

I then compared the environmental impact of using sodium bicarbonate versus road salt to kill mosquito larvae in stagnant water. Three groups of five 15 cm tomato plants were watered with one of the following: pond water, a 12 g/L sodium bicarbonate solution, or a 19 ppt saltwater solution.

Results

The mortality rate of mosquito larvae reaches 100% at 12 hours at a sodium bicarbonate concentration of 12 g/L.

The pond water tomato plants showed no signs of stress and reached an average height of 26 cm at day 21. The sodium bicarbonate tomato plants showed minimal signs of stress and reached an average height of 24 cm at day 21. The road salt tomato plants begin to exhibit signs of stress at day 6 (e.g. stunted growth, drooping and browning leaves) and were completely dead at day 21.

Summary Statement

I determined that sodium carbonate is an effective, economical and environmentally-safe method to kill mosquito larvae in stagnant water.

Help Received

None. I designed and conducted the experiment myself continuing my prior research.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Nicholas Dorgan

Project Number

J2106

Project Title

The Dark Side of Perfume: The Negative Effects of Perfume on Plants

Abstract

Objectives

The problem I am researching is how perfume is affecting plants in the natural world. Many people consistently use perfume in their everyday lives, but they do not realize how much perfume is negatively affecting the environment.

Methods

The unique materials used for this experiment were fast plant seeds, an artificial light source, a planter, and perfume. My procedure included setting up the artificial planter with the three groups (water, air, and control), along with creating the perfume mixture for the water group. I recorded the condition and heights of the plants every three days; and watered them twice a day, as well as replenishing the perfume in the air group once a day. I also closed the vents of the plants at night. The three groups correspond the where the perfume is being exposed to the plant, in the water, or air, respectively.

Results

My results aligned with, and supported, my hypothesis. The perfume groups not only had significantly lesser end heights compared to the control group, but also were consistently stunted since they sprouted. The water group was also slightly taller than the air group. Despite this, however, the plants still appeared to be green and healthy.

Conclusions

The experiment results suggest that perfume does have a negative effect on plant growth. The air group was most likely shorter than the water group because the materials in the perfume could not fit through the tubules bringing nutrients into and throughout the plants. Because of this, my conclusion is that perfume could be toxic in the environment and that while perfume provides benefit in masking our odor and making us smell better, which sounds like a plus, there could be a greater harm on the ecosystem and plants, which likely has a much greater negative impact on us in the long term.

Summary Statement

Perfume, both in a water solution and a misted/air soulution, has a large detrimental impact on the growth of plants when compared to the control plants just grown with water.

Help Received

My science teacher, Mrs. Conklin, helped me formulate my research hypothesis and revise my conclusion, as well as answering any questions I had. My parents supported me in ordering the proper materials for my project. I set up the project, ran the experiment, and recorded all the data by myself.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Mumtaaz Elmi

Project Number

J2107

Project Title

Can Herbicides Have an Effect on a Planarian Nervous System?

Abstract

Objectives

The purpose of this experiment is to test the effect of commonly used herbicides to see whether or not they cause neurotoxicity on planarian flatworms, which have a very similar nervous system to humans.

Methods

The materials that I used in my experiment were: 200 Planarian flatworms, 20 petri dishes, pipettes, timer, ruler, light, weed killers (Roundup, Pyrethrin, & Spectracide),and worm food (liver).

Results

The results that I found were that all the worms became paralyzed almost instantly in all concentrations after the first 5 days . Roundup was the herbicide that paralyzed the worms the fastest while the other 2 herbicides, Pyrethrin & Spectracide, took a little bit more time to make all the worm's paralyzed. Although, they took more time, all the worms in all herbicides were paralyzed by the end of 5 days. The results show that on the 6th day worms began dying. Again, Roundup was the fastest herbicide to make all the worms dead.

Conclusions

In conclusion, my hypothesis is proven correct. Prolonged exposure to herbicides does have an effect on the Planaria. And this could have an effect on whether or not a human will have some sort of neurological disease in the future. Also the herbicide Roundup did have the most effect on the worms.

Summary Statement

My expirement was about testing whether or not herbicides can cause damage to a Planaria nervous system

Help Received

I did not get any help, I performed all of my expirements by myself. All my mentor did was review my results and my research.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Jagjot Grewal

Project Number

J2108

Project Title

Determining Which Natural Pesticides Will Kill Pests

Abstract

Objectives

I wanted to see if there was a safe way to use pesticide around the house. Something that would harm ants but not humans or pets. I decided to use certain foods. Oranges, lemons, and limes, because they have citric acid. Chile pepper seemed like a food that could kill something.

Methods

I basically made a paste from the natural foods. (Ex; chop lemon and put in blender, include the peel)
I then made a box with the food on one side and ants on the other.
I put the paste between the ants and the sugar.
I then waited 30 minutes to determine if the ants would cross the barrier of paste to get to the food.
I recorded how many were killed or did not cross the barrier.
Repeated with each variable (food)

Results

Chili pepper worked the best. None of the ants crossed the barrier.
Lemons were next 16 out 20 did not pass
Lime 12 out of 20 did not pass
last was orange . 8 did not pass

Conclusions

I learned that i could use chili pepper as a barrier. For example i could put it around plants to protect the plant. Maybe a windowsill.

I also learned that citric acid wasn't a deterrent that we were hoping for. oranges seemed to have no effect on the ants. They stopped at the orange and ate./

I would like to use the chilli pepper as a year 2 project to determine if I could protect plants from insects.

Summary Statement

i want to determine if I can use natural pesticides (food) as a barrier from ants

Help Received

Teacher helped with general knowledge of how to do science fair project. Guided me along the way.
Parents helped with board, and using the blender.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Dylan Kilby

Project Number

J2109

Project Title

What Are the Effects of Various Nitrogen Percentages on Daphnia's Heart Rate?

Abstract

Objectives

The purpose of my project is to determine how the levels of nitrogen in the ocean affect Daphnia. I will be observing and calculating the rate of change in daphnia's heart rate submerged in different percentages of nitrogen-infused water. Everyone loves the ocean. However, could it be our careless actions are affecting our ocean and it s the precious ecosystem? After my investigation, I will discover if nitrogen affects daphnia s heart rate. I will then have a better understanding of how our careless actions are affecting our ocean and it s the precious ecosystem.

Methods

Raw nitrogen (or nitrogen solutions), live daphnia, A notebook (observations and heart rate count), binder, microscope, Petri dishes, triple beam balance, vials, timer, water

Results

The results of my investigation on exposing daphnia to different levels of nitrogen.
When daphnia are exposed to 3 different levels of nitrogen solutions the daphnia's heart rate increases at 3 different average rates.
10% Nitrogen:When daphnia are placed in 10% nitrogen solutions, the heart rates average percentage rates, was 6.81%
20% Nitrogen:When daphnia are placed in 20% nitrogen solutions, the heart rates average percentage rates, was 28.91%
30% Nitrogen:When daphnia are placed in 30% nitrogen solutions, the heart rates average percentage rates, was 31.73%

Conclusions

The results showed the highest increase in heart rate came from the 30% nitrogen group, with an average increase of 84 beats per minute or 31.73%. The lowest average increase of heart rate came from the 10% nitrogen group, with an average increase of 8 beats per minute or 6.81%. As you can see by evaluating the statistics there is a significant increase in each groups average increase heart rate. In conclusion, I found through my investigation that when exposing daphnia to nitrogen their heart rates will increase. Therefore we should try to reduce the amount of nitrogen released in the ocean along with any other toxins to help benefit us and all aquatic life.

Summary Statement

My project replicates and simulates the negative effects of fertilizer runoff or our oceans ecosystem.

Help Received

My mom and dad provided help by driving me to get the materials I needed, along with proof reading spelling error in writing.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Hyun Lim

Project Number

J2110

Project Title

The Effects of Microwave Radiation on Life and Organic Material

Abstract

Objectives

The question being tested in my project was what effects does microwave radiation have on different organic materials and life. One objective and goal of the experiment were to view and compare and contrast certain properties of organic materials when microwaved to that of its non-microwaved counterparts. Another objective was to view the changes that microwave radiation could cause to living things, in my experiment the living thing was bacteria.

Methods

I conducted three different experiments. I first microwaved orange juice for increasing intervals of time to see if microwaves could cause a change to the orange juice's nutrient values. I measured vitamin C(ascorbic acid) in the orange juice after it was microwaved by using pH paper. My second experiment involved activating yeast. I first mixed yeast with sugar and warm water, gave it ten minutes, and then viewed the growth or change in height. The other samples and tests involved microwaving the yeast for increasing intervals of time before mixing it with the water and sugar and again viewing change in height. To start the last experiment on bacteria I swabbed the side of a kitchen sink and applied it to one-half of a Petri dish. To measure the changes caused by microwaves, I then microwaved more swabs from the same location for increasing intervals of time before applying it to another half of a Petri dish. After 5 days, I counted the number of colonies in each sample and put them into size categories of big, medium, and small.

Results

The results of my experiment are as follows. The orange juice experiment yielded no new data, as the pH level of all the samples was ultimately three. The yeast experiment showed that the microwaved samples had less change in height than the controlled(non-microwaved) sample. The bacteria experiment showed that there were less large colonies in the microwaved samples, but more small and medium colonies in the longer microwaved samples.

Conclusions

The results imply very different ideas. The orange juice experiment's results showed that microwave radiation does not change nutrient values, specifically vitamin C or ascorbic acid. However, the bacteria and yeast experiment show that microwave radiation causes deterioration to both life and organic materials.

Summary Statement

My project is about the effects that microwave radiation have on life and organic materials.

Help Received

While my experiments were done by myself, I'd like to mention my dad who gave me a hand in decorating my board.

Name(s)

Zoe Macknicki

Project Number

J2111

Project Title

Effects of Agricultural Pollutants on Mortality Rates of Freshwater Daphnia and Cyclops at the Arcata Marsh

Abstract

Objectives

The addition of fertilizer in controlled amounts determines the effects of agricultural pollutants on the mortality rates of freshwater Daphnia and Cyclops in varying concentrations.

Methods

Arcata Marsh water was collected from the Arcata Marsh Log Pond. A syringe was used to measure out liquid fertilizer which was then added to 100 mL samples of the marsh water to create concentrations from 1ml/100ml to 7ml/100ml fertilizer, but the fertilizer was a concentrate which led to immediate death of all organisms. A second, lower concentration fertilizer was used to create a 1ml/100ml to 7ml/100ml fertilizer solution, and both organism mortality rates increased significantly. A third, low concentration spectrum was created from .2ml/100ml to 1ml/100ml using the low concentration plant food which produced measurable results.

A graduated cylinder was used to collect 25 mL of each sample which was then poured into an 80 mL beaker and observed under a dissecting scope to count Daphnia and Cyclops. Observations were completed daily for two weeks.

Results

In all concentrations using fertilizer concentrate, all Daphnia and Cyclops died immediately. In concentrations above 1ml/100ml of the lower concentration plant food, Daphnia and Cyclops mortality rates increased in proportion to the increase in concentration. In concentrations below 1ml/100ml of the lower concentration fertilizer, Daphnia and Cyclops mortality rates did not increase measurably.

Conclusions

Based on the results, Daphnia and Cyclops mortality rates are affected by increased concentrations of agricultural pollutants due to run-off. Concentrations of 1ml fertilizer/100ml water and higher affect Daphnia and Cyclops measurably and immediately. The Arcata Marsh is set alongside pasture land and in a California county known for growing cannabis. Before cannabis recently became legal, a lot of cannabis grow sites stored fertilizer in large holes in the ground, or in bags stacked on bare earth. Without regulations, the fertilizer from cannabis grows could be drawn into our freshwater watersheds through run-off. The close position of agricultural lands to watersheds also adds to the fertilizer run-off which could affect Daphnia and Cyclops and the food web and ecosystem that rely on them.

Summary Statement

Based on the counts of freshwater Daphnia and Cyclops in differentiated concentrations of fertilizer over the span of two weeks, it is supported that agricultural pollutants affect the health and sustainability of freshwater ecosystems.

Help Received

Greta Turney helped me resdesign my experiment when the concentrations were too high. Jill Macknicki helped me create my backboard.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Krish Maheshwari

Project Number

J2112

Project Title

Effect of Wi-Fi Signals on the Growth of Pea Shoot Plants

Abstract

Objectives

The objective is to determine if Wi-Fi signals affect the growth of pea shoot plant in terms of height, weight and number of leaves.

Methods

Materials required were:- Wi-Fi routers(2),Pea Shoot seeds(16 oz), Soil (30 0z),Peat Moss(30 oz),Growing Trays(8),Spray bottle(1),Measuring tape in cm(1),Cardboard boxes(4),LED growing lamps(4),Kitchen Weighing Scale(1),Sieve(1),Muslin Cloth(1).

The Pea Shoot seeds were soaked and germinated and planted in 8 trays using the soil and peat moss. Two trays with Pea Shoots were put under each of cardboard boxes, which were placed at increasing distances from the Wi-Fi routers. Each cardboard box also contained a LED Growth lamp. The growth lamps were switched on for 7 hours per day for next 3 weeks. Each week the height and number of leaves on the pea shoot plants in various boxes was recorded. At the end of three weeks the weight of pea shoot plants in the four cardboard boxes was recorded.

Results

The height or number of leaves on the Pea Shoot plants did not show any clear correlation to the distance from the Wi-Fi routers. However on the other hand, the Pea Shoot plants that were furthest from Wi-Fi source weighed more at the end of three weeks as compared to the others.

Conclusions

The height and the number of leaves on Pea Shoot plant are not affected by the distance from Wi-Fi source, but the weight seems to increase as the distance from Wi-Fi source is increased.

Summary Statement

I determined that height and number of leaves in Pea Shoot plant are not affected by Wi-Fi Signals but weight is affected negatively.

Help Received

I selected the topic and process. My science teacher asked me to add a few more variables.The experiment was conducted entirely by me at my home.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Caley Miller

Project Number

J2113

Project Title

Salinity Tolerance of Freshwater Green Algae at the Arcata Marsh

Abstract

Objectives

I added measured sea salt to samples of Arcata Marsh water to create differentiated salinity concentrations and determine the salinity tolerance of freshwater green algae.

Methods

Arcata Marsh water was collected from the Log Pond. 100mL of Arcata Marsh water was measured with a beaker and added to 18 sterile jars. Using a triple-beam-balance, I measured sea salt and added it to jars of Arcata Marsh water to create five salinity concentrations of 1%, 2%, 3.5%, 4% and 4.5%. Three groups were made for each salinity concentration, and three were untreated as a control. I confirmed the salinity using a refractometer. I took readings by placing 1 mL of sample water on a slide and counting the green algal cells seen in each observation in each sample using a compound microscope.

Results

In all concentrations of increased salinity, the green algae mortality rates increased to complete eradication within one week. In salinity concentrations above 2%, all green algae died off completely within the first 24 hours. In concentrations of 2% and 1%, the green algae completely died off after four days.

Conclusions

Freshwater green algae is not tolerant of increased salinity. As ocean levels rise, pushing freshwater watersheds inland, the freshwater ecosystems are at risk. The results of this experiment support that green algae will die off if ocean waters enter the freshwater systems, or if drought increases evaporation and allows soil salts and minerals to increase salinity levels in freshwater. If green algae fail to thrive, organisms that rely on green algae as a food source or to keep oxygen levels stable in water environments will also be affected. The producers help to maintain the equilibrium of whole ecosystems, and this experiment supports the importance of preserving freshwater watersheds to maintain the sustainability of the planet.

Summary Statement

Through establishing controlled, artificial environments of increased salinities from 1% to 4.5%, this project supports that freshwater green algae cannot tolerate increased salinities which can lead to ecosystem instability..

Help Received

Greta Turney provided supervision and instruction on how to use a refractometer and triple beam balance. Greta Turney also assisted in collecting the Arcata Marsh sample and sea salt that I used for this project.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Crystal Neilsen

Project Number

J2114

Project Title

Rethink Your Drink

Abstract

Objectives

The objective of my project is to see/show the affects of different types of drinks on human teeth.

Methods

The materials I used in my project were 6 different types of drinks, human teeth, and clear jars. I put about 5 ounces of each the liquids and one tooth in the jar. Over the course of 5 days I made observations and took a picture of each tooth, then analyzed the data.

Results

At the end of the five days, the Coca-Cola affected the tooth the most. Then, Gatorade, Dutch Brothers, Mountain Dew, Starbucks Tea, and then Starbucks Coffee.

Conclusions

Out of the six drinks, Coca-Cola is the worst for your dental hygiene.

Summary Statement

In my project, I showed what the affect of the six drinks, and Coca-Cola affected the tooth the most.

Help Received

I revived minimal help from teachers on the editing and revising of my project.

Name(s)

Noah Patterson

Project Number

J2115

Project Title

Daphnia Heart Rate: How Do the Central Valley's Most Common Water Pollutants Affect the Heart Rate of Daphnia magna?

Abstract

Objectives

I wanted to learn how the Central Valley s most common water pollutants, which are chlorine, motor oil, and pesticide, affect the heart rate of Daphnia magna. My hypothesis was that chlorine would affect the daphnia s heart rate the most, followed by pesticide, with motor oil effecting the daphnia the least.

Methods

To begin my project, I sorted out 480 daphnia into 48 plastic cups filled with 100 mL water so that each cup was filled with 10 daphnia. Then, I extracted 1 mL of water from 36 of the cups and replaced what was taken with chlorine solution, motor oil, and pesticide. At this point, 12 cups were holding 10 daphnia and had 99 mL water and 1 mL chlorine, 12 cups held 10 daphnia and had 99 mL water and 1 mL pesticide, and 12 cups held 10 daphnia and were filled with 99 mL water and 1 mL motor oil. In increments of 10, 20, 30, 60, and 960 minutes, I tested the daphnia s heartrate for 15 seconds and multiplied my results by 4 to find the heart beats per minute.

Results

Motor oil ultimately caused the daphnia s heart rates to decline the most and ended up leading the daphnia to death quicker than the other two pollutants. Pesticides effected the daphnia in a different way as it increased the average daphnia s heart rate so that they ended up dying as their rates spiked so high to the point of a heart-attack. What stuck out to me the most was that chlorine effected the daphnia the least (and I hypothesized it would be the most effective) because even though the daphnia s heart rates slowly declined, and many of them died, the daphnia that did survive made a full recovery. My results proved my hypothesis wrong as they told me motor oil affected daphnia the most, pesticide affected them second most, and chlorine affected them the least.

Conclusions

My results and data proved my hypothesis wrong as they conveyed that motor oil affected daphnia heart rate the most, followed by pesticides, and chlorine affected them the least as I hypothesized the exact opposite. My results have also showed me how much each pollutant is affecting our environment. When the daphnia are affected, the entire environment is affected. In conclusion, my project has showed me that whenever a chemical or pollutant is introduced to our environment, our whole community is going to end up effected.

Summary Statement

My project is about how much the Central Valley s most common water pollutants, which are chlorine, motor oil, and pesticides, will ultimately affect the heart rate of Daphnia magna.

Help Received

I borrowed a microscope from Duncan Polytech, a local high school. I asked questions to a college aged science mentor, Titus Patton, who is a former Science Fair participant. My adviser, Reggie McLean, helped lead me through the science fair process. My parents helped me purchase my used materials.

Name(s)

Aisha Randhawa

Project Number

J2116

Project Title

Essential Oils: Impact on Reproductive Timing and Health in Daphnia magna

Abstract

Objectives

Recent studies have shown that puberty is occurring earlier in both boys and girls for unknown reasons. Some studies suggest essential oils may disrupt the hormonal system, triggering early puberty. This project investigates whether essential oils affect the reproductive timing and fecundity in Daphnia magna. My hypothesis is that the Daphnia magna exposed to essential oils will reproduce earlier with normal brood sizes compared to the non-exposed Daphnia magna.

Methods

The tested Daphnia magna groups were: control, lavender, orchid and gardenia essential oils. Ten Daphnia magna were tested per group. One newborn Daphnia magna was placed in each container. On the 2nd day of life, a 1:500 diluted drop of essential oil was applied to each container of its respective group. Plankton served as food. Daily observations of each container were made to determine when offspring were born as well as the number produced. Secondarily, I noted how long each parent Daphnia lived.

Results

Essential Oil	Age (days) of Daphnia when 1st offspring born	Average number offspring born	Lifespan (days)
Control (no oil)	12.5 +/- 1.6	4.4 +/- 1.2	24.1 +/- 9.8
Lavender	*9.7 +/- 1.9*	*1.9 +/- 0.8*	23.9 +/- 7.6
Orchid	10.9 +/- 1.8	4.1 +/- 1.2	22.8 +/- 9.4
Gardenia	14.3 +/- 1.5	3.6 +/- 1.0	22.9 +/- 9.1

*statistically significant compared to controls

Conclusions

Compared to the controls, the parent Daphnia magna exposed to lavender oil produced offspring significantly earlier, but surprisingly with significantly less offspring. Therefore, my hypothesis was partially supported. Both the orchid and gardenia groups showed a trend toward significant difference in the timing of reproduction with delayed reproduction for the gardenia group. The data shows lavender oil predisposes Daphnia to early reproduction with a decreased brood size, which suggests some essential oils trigger early puberty and negatively impact future reproductive fertility.

Summary Statement

I found essential oils like lavender lead to significantly earlier reproduction of offspring and decreased offspring numbers in Daphnia magna.

Help Received

My parents helped problem solve issues that arose during my project and Dr. Eugene Furnace provided me with several excellent articles and discussion on my research study.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Joshua Rangel

Project Number

J2117

Project Title

Effects of Radiation on Plants

Abstract

Objectives

The objective of this experiment was to determine the effects of electromagnetic radiation on seed germination and plant growth.

Methods

I planted groups of radish seed that were radiated with several different amounts of electromagnetic radiation using a medical x-ray machine. I also planted a control group of seeds that were not exposed to radiation. Seeds were exposed to the same environmental elements and observed for 14 days. Observations and measurements were recorded.

Results

Plants in the control group and experimental group all sprouted and grew at about the same rate.

Conclusions

The radiation exposure did not cause the plants to grow or develop any differently in the experimental group compared to the control group.

Summary Statement

Exposing seeds to electromagnetic radiation does not have an effect on plant germination and growth.

Help Received

I performed the research and experiment. Sandra, an X-Ray technician radiated the seeds. Rangel Chiropractic allowed access to the X-Ray machine.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Simone Rothaupt

Project Number

J2118

Project Title

The Annihilation of Nature

Abstract

Objectives

The objective of this project is to study the impact of environmental changes on the survival of brine shrimp.

Methods

18 petri dishes, 180 brine shrimp. Recorded survival rates of 10 brine shrimp in each petri dish over 7 days by varying the temperature, pH, salinity and pollution with refrigeration, a heat light, lemon juice, baking soda, salt, oil and distilled water.

Results

Temperature decreases and increases cause brine shrimp to die prematurely. When pH and salinity levels increase, there is a higher brine shrimp survival rate than when these levels decrease. Although water pollution slightly decreases the survival rate of brine shrimp, it does not significantly influence the survival rate in comparison to clean water.

Conclusions

When the climate changes in a brine shrimp environment, the survival rate of brine shrimp decreases, thus lowering the overall brine shrimp population. As the base of the food web, this decreasing population of brine shrimp could eventually result in the future collapse of the food chain.

Summary Statement

When the climate changes in a brine shrimp environment, the survival rate of brine shrimp decreases, thus lowering the overall brine shrimp population and potentially destroying the food web.

Help Received

None

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Jonathan Tabb

Project Number

J2119

Project Title

Can Planaria Be Used as an Alternative Toxicology Model?

Abstract

Objectives

The objective was to test if the planaria Dugesia dorotocephala could be used as a model to predict toxicity.

Methods

Planaria were cut in half and tails were placed into petri dishes with treatments of 6 different pesticides or an herbicide, and their regeneration was observed for 10 days. The photoreceptors in the head of the planaria were used as a way to judge if the planaria had regenerated. Then a dilution series of a pesticide and an herbicide were used to test effects of using higher and lower concentrations of the original treatments.

Results

Glyphosate and pyrethrins were the most toxic treatments and killed the planaria on day 1. Bifenthrin and cypermethrin killed the planaria by day 2. Pyrantel pamoate treated regenerated the quickest and were fully regenerated by day 9 which was similar to the untreated planaria. Deltamethrin and tetramethrin treated regenerated more slowly than untreated planaria but were still able to regenerate. Dilution series of glyphosate and deltamethrin showed more concentrated treatments killed the planaria, middle concentrations slowed the regeneration and more dilute treatments had no effect.

Conclusions

Planaria were able to be a model of toxicity because they are an organism that rapidly regenerates its parts. When cells are rapidly growing during regeneration, they are more sensitive to compounds that are toxic or that affect their growth. They were also a good model because photoreceptors in the head of planaria can be easily seen and used as a physical feature of head regrowth to judge regeneration. The treatments that were more toxic or were stronger blockers of cell growth affected planarian regeneration more while those that were not as toxic to cell growth slowed down regeneration but did not kill the planaria. The quick regeneration of planaria allows the effects of toxic compounds to be seen in a few days. Many planaria can be grown quickly, and they are also easy to take care of and cheap to maintain. These features make planaria a good substitute for screening toxic compounds instead of using animals.

Summary Statement

As measured by the time it took to regenerate, I found that planaria could be used as an alternative model to test for toxicity.

Help Received

My mom who is a scientist taught me how to do a dilution series and supervised me during the testing.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Nora Thompson

Project Number

J2120

Project Title

Lights of the Sea

Abstract

Objectives

Dinoflagellates are bioluminescent planktons that float near the ocean's surface and flash brightly when disturbed to scare or distract predators. This project examined how four common chemical mixtures affected the lifespan and glow of the dinoflagellates.

Methods

Dinoflagellates (Pyrocystis Fusiformis), distilled water, white vinegar, motor oil, RoundUp weed killer, Dawn ultra dish soap. Dinoflagellates with small portions of pollutants added were exposed to indirect sunlight during the daytime and disturbed at nighttime to prompt them to flash. Three judges assigned a brightness score based on a scale of 0 to 5. This was repeated daily until no flashes were seen (assumed dead).

Results

Untreated controls had the longest lifespan (33 days) while dish soaps and weed killer high had the shortest lifespan (2 days). The highest average brightness occurred in dish soap high and low (2.8 and 2.4) and weed killer high (2.5). Control had an average brightness of 1.5 while the vinegar high group was the dimmest at 0.9.

Conclusions

The results demonstrated that pollutants contributed to a decreased lifespan. Based on the Lethal Dose 50 value, the effect of dish soap should have been weak in the dinoflagellates, but it was actually the most harmful, killing them within two days. As for brightness, pollutants did not apparently make the dinoflagellates dimmer. All except the high concentration of vinegar had a higher average brightness level. These results showed how sensitive marine life can be to common chemical pollutants.

Summary Statement

I discovered that these pollutants shortened the lifespan and for the most part, increased the brightness level of the bioluminescent dinoflagellates.

Help Received

Throughout the observation period, I had two assistants in addition to myself, judging the brightness of the dinoflagellates' flashes.

CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Lillian Todd

Project Number

J2121

Project Title

The Effect of Sodium Chloride on Pennisetum clandestinum

Abstract

Objectives

The objective of this study was to discover a concentration of sodium chloride in water that would negativity effect Pennisetum clandestinum without harming other turf grass.

Methods

I built a temperature and lighting controlled greenhouse to grow 36 specimens of Pennisetum clandestinum and 36 lawn grass turf samples. Each sample received the same amount of water and light. I introduced different concentrations of sodium chloride in water once all samples were established. My controls did not receive any sodium chloride in their water solution.

I measured the mass of each sample after finishing my experiment to determine the effect of the different concentrations of sodium chloride in water.

Results

I found that concentrations of 35 grams of sodium chloride and higher per liter of water was effective in controlling Pennisetum clandestinum. Concentrations of 20 grams of sodium chloride per liter of water seemed to have minimal effect on Pennisetum clandestinum growth. Any concentration of sodium chloride had a negative effect on the lawn grass growth.

Conclusions

My results showed that Pennisetum clandestinum is more tolerant to sodium chloride than my lawn grass. This means that sodium chloride is not effective in controlling Pennisetum clandestinum in lawn grass. My results are still interesting since Pennisetum clandestinum is tolerant to high levels of sodium chloride it may be possible to grow it where conditions are not favorable to other types of grasses.

Summary Statement

By measuring the mass of each sample at the end of my study, I found that Pennisetum clandestinum is more tolerant to sodium chloride than lawn grass.

Help Received

I designed and built my experiment on my own. My science teacher explained the concept of hypertonic and hypotonic.

Name(s)

Isabella Worley

Project Number

J2122

Project Title

Are Lower Percentages of Glyphosate with Natural Herbicides as Effective as Full Strength Glyphosate?

Abstract

Objectives

The objective is to determine if lower percentages of glyphosate with natural herbicides is more effective than using full strength glyphosate. Because glyphosate is a possible carcinogen, I wanted to test if lower percentages of glyphosate with natural herbicides could be a possible herbicide alternative.

Methods

Seven sections of weeds were sprayed with a different herbicide. In the first plot 50% glyphosate with 20% vinegar and soap was sprayed. In the second plot 25% glyphosate with 20% vinegar, and soap was sprayed. In the third plot 25% glyphosate with 20% vinegar, orange oil, and soap was sprayed. In the fourth plot 12.5% glyphosate with 20% vinegar, orange oil, and soap was sprayed. In the fifth plot full strength glyphosate was sprayed. In the sixth plot 20% vinegar, orange oil, and soap was sprayed. In the seven plot of weeds nothing was added. Each mixture of herbicides were placed in its own spray unit to prevent cross contamination. Observations were recorded daily for the first two weeks then weekly for the remaining 3 months.

Results

All the lower percentages of glyphosate with natural herbicides and the natural herbicides by itself were equally effective and appeared completely dead by day 4. Full strength glyphosate appeared completely dead by day 14. Regrowth did occur in natural herbicides by itself on day 35. Regrowth occurred in 12.5% glyphosate with 20% vinegar, orange oil, and soap on day 84. Regrowth occurred in the 25% glyphosate with the 20% vinegar and soap on day 56. No regrowth occurred in the full strength glyphosate, 50% glyphosate with 20% vinegar and soap, and the 25% glyphosate with 20% vinegar, orange oil, and soap.

Conclusions

At the end of the 3 month study two combinations of herbicides, 50% glyphosate with 20% vinegar and soap and 25% glyphosate with 20% vinegar, orange oil, and soap, were found to be equally effective as full strength glyphosate. These two combinations worked faster than full strength glyphosate in the beginning of my experiment and had no regrowth at the end of my experiment. Therefore these two combinations are the best alternative to full strength glyphosate.

Summary Statement

I found lower percentages of glyphosate with natural herbicides to be at least as effectice as full stregth glyphosate during a three month study.

Help Received