

**Project ID: 401****SR - Plant Sciences****Vivien Anderson****Priscilla Iniguez**

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



How Does the Presence of 0.5% Chlorine Affect the Sprouts and Germination of Phaseolus vulgaris?

For this experiment, we planted 5 trials of a control group with 5 pinto beans and 30 mL of water every other day and an experimental group with 5 pinto beans also planted but 10 mL of 0.5% of chlorine and 20 mL of water. We placed both trials under UV light for a total of 15 days and recorded the height of the plants, how many out of the five we planted, sprouted and overall observations of the growing process to document whether or not there was a noticeable difference in germination and growth between the control group and the experimental group. The science behind the issue is due to the amount of chlorine used by bleaching facilities and even households, when bleach reaches the environment through wastewater facilities and eventually into aquifers and soil, is there a negative effect we should be aware of? We hypothesized that the presence of chlorine in the soil would delay plant growth and germination. The reasoning behind this experiment was to identify if there was a significant effect 0.5% chlorine in soil had in plant growth and germination. Overall, there was a noticeable difference between the number of seeds that sprouted between the control trials and experimental trials and a difference in height growth of the plants and noticeable bleaching of leaves in the experimental trials as well as weak stem roots.



Project ID: 402

SR - Plant Sciences

Sarah Delara

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



The Effects of Acid Rain on the Growth and Germination of Lima Beans in the Span of 10 Days

The normal pH level for neutral water is a seven, and anything below seven is considered acidic. Lower pH levels can cause the soil and the plants the ability to get nutrients and bioavailability. A lower pH level such as pH five can decrease the germination of a plant. as well as causing the plants to have difficulty absorbing the nutrients of the water through their roots, which can cause many problems to the leaves. To what extent does oH 7 and pH 5 have on the growth and germination of lima beans in the span of ten days? The hypothesis is that various trials of the control and acid rain experiment will show a difference in the growth and germination of the lima beans.



Project ID: 403

SR - Plant Sciences

Cherise Magtoto

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



The Effects of Ibuprofen on the Growth and Germination of Lactuca sativa.

In recent years, the contamination of water with pharmaceuticals has become a bigger problem and their effects on aquatic organisms and humans are largely unknown. Thus, this experiment will evaluate how varying Ibuprofen concentrations affect the growth and germination of *Lactuca sativa*. The hypothesis is that *Lactuca sativa*. seeds watered with higher concentrations of Ibuprofen solution will result in decreased germination and height.

Procedure: Three Ibuprofen solutions were used: Control= Pure distilled water, 400 mg/L , 800 mg/L IBU, with five trials. Five seeds were planted in each cup, watered with 20 ml of distilled water, 400 mg/L, or 800 mg/L over the course of 14 days. *Lactuca sativa*. were checked at 3:00pm for 14 days, measuring germination of seeds and height.

Results: There was a 72.5% decrease in average growth and a 63.6% decrease in % germination of 800 mg/L compared to pure distilled water. There was a 43.4% decrease in average growth of plants and a 36.4% decrease in % of germination of 400 mg/L compared to pure distilled water.

Conclusion: It was predicted that *Lactuca sativa*. seeds watered with higher concentrations of Ibuprofen solution will result in decreased germination and height. Based on the results, the highest concentration of IBU had the lowest germination rate and growth. Since all the factors of this experiment were kept constant, except the concentration of Ibuprofen, it can be concluded that a higher concentration of Ibuprofen correlates with a lower germination success rate and decreased height.

**Project ID: 404****SR - Plant Sciences****Daniel Robitaille**

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein

*How Does Runoff Affect the Mass of Duckweed*

In San Diego, there is a serious problem that concerns toxic metals getting into the water supply through runoff. Sewage, toxic metals, and other harmful substances get into the waterways and destroy the environments that rely on them. My experiment tries to find out just how harmful this bad runoff is to the environment of San Diego. It contains 2 groups, one control and one experimental. The control group has 200 ml of distilled water in each cup, and the experimental group has 200 ml of runoff in each, collected from National City. In each cup/trial 1.20 g of duckweed will be placed, having been measured beforehand. Then duckweed will be left in the cups for 10 days, and during that time visual observations will be taken and recorded every three days. At the end of the 10 days, water will be drained from the cup and the remaining duckweed will be measured on a scale in grams. I hypothesized that after 10 days, the duckweed submerged in runoff would have a significant decrease in mass. In all five trials of my experiment, the duckweed planted in runoff (experimental group) decreased in mass overall, while the duckweed planted in distilled water increased overall. Since almost all of the factors were kept the same, it is reasonable to assume that the mass of the duckweed decreased due to the fact that it had been planted in highly toxic runoff.



Project ID: 405

SR - Plant Sciences

Esther Dabbah

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



Effects of Acid Rain on Growth and Health of Peas

Problem: Global climate change is causing rain to become more acidic, which as a result is affecting the growth and health of plants and crops all over the world.

Hypothesis: I predict that the pea plants watered with the most acidic pH solution will have the slowest and least amount of growth, while the pea plants watered with the most neutral Ph solution will have the fastest and most amount of growth.

Procedure: I have conducted an experiment where I watered pea plants with pH solutions of 3, 4, and 7. There are 5 trials and each of them was conducted for 10 days

Results: There was a slight difference in the growth and germination of the pea plants that agrees with my hypothesis, but it is not significant.

Conclusion: Overall, the results were not as significant as i expected and do not show any significant results on how acid rain can affect plants.



Project ID: 406

SR - Plant Sciences

Hiram Angulo Hernandez

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



*The Effect of Unused Motor Oil on Pea Plants (*Pisum Sativum*) Growth and Germination*

Hypothesis: I predict that the pea plants are going to perish due to motor oil contamination, as well as the contamination of the soil, this is true because motor oil contains countless hydrocarbons that may affect the plants negatively. Furthermore, if the plants are not to die they are to diminish in quality.

Procedure: 1. set up the cups, 5 control, 5 experimental (5 trials total, each including an experimental and control group) 2. Place tape on corresponding cups with labels "control" and "experimental" 3. Fill 2.5 inches of miracle growth potting mix per cup 4. Poke 4 holes in the bottom part of the cup on 4 separate sides for drainage of water per cup 5. Place 3 Pea beans per cup (one on each side in the middle of the cup) 6. Push the pea seeds down to cover the pea seeds with soil 7. Water all the plants with 25 ML of water 8. Add motor oil on the 5 experimental (quantity to be determined) 9. Water every other day if necessary, if not add it the next day 10. Measure the growth, germination, and physical qualities every other day

Results: All trials showed signs of growth. Although minuscule differences, the control group outperformed the experimental in both the germination and growth rate, with the exception of standard deviation.

Control % germination (Average) - 13.34% increase

Control % germination (Standard Deviation) - 2% lower

Control Growth rate (Average) - 1.408 cm higher

Experimental Growth rate (Standard Deviation) - 0.29 cm lower

Conclusion: It was predicted that the pea plants would perish or die in their entirety. It was then concluded based on the results that the experimental did not perform very low in comparison to the control. In fact, the control had a very close standard deviation in % germination of 51%, only 2% lower, and a lower standard deviation of 5.36, 0.29 cm lower than the control. As such it can be concluded that the acute spill of 1 ml of unused motor oil in 16 oz cups did not deteriorate the growth and germination of the pea plant drastically, but it did have some effect although very minuscule.

**Project ID: 407****SR - Plant Sciences****Diego Nava**

Grade 12

Bonita Vista High School

Advisor: Michelle Mardahl

*The Effect of San Diego River Water on Raphanus raphanistrum Seed Germination*

Water pollution has become an ever-present issue in modern society, including here in San Diego with the highly polluted Tijuana River. To test the extent of pollution of other bodies of water in San Diego County, a sample of water from the San Diego River was tested by observing the germination rate of *Raphanus raphanistrum* (radish) seeds. Germination rate when exposed to Arrowhead bottled spring water was also measured to compare the results and determine if river water had any effect on germination rate. This was accomplished by setting up six petri dishes, three for river water and three for bottled water (labeled as Trials), with paper towels soaked with 2 mL of each type of water, and thirty seeds in each dish. Seed germination in each petri dish was then recorded over a period of five days, with an additional milliliter of water being administered on the third day. This experiment was then repeated, and the results are labeled "Batch #1" and "Batch #2" accordingly. The final results of t-values 0.71 and 0.78 (for Batch #1 and Batch #2 respectively) indicate that there is no statistically significant difference between the germination rate of the two types of water tested.



Project ID: 409

SR - Plant Sciences

Nicholas Sanchez

Grade 11

Bonita Vista High School

Advisor: Jennifer Ekstein



*To What Extent Does Increasing Temperature Affect the Growth and Germination of the Pinto Beans (*Phaseolus vulgaris*)?*

Background - My project was about how the increasing temperatures affect the growth and germination of pinto beans. I did this project as global warming is becoming a big problem, and I wanted to see how this not only affects plants but also our crop yield. I expected that the increased temperatures would result in lower germination and plant growth.

Method - I executed this by setting up 6 experimental and 6 controls to get valuable and reliable data. Then I put the data into bar charts to compare the results.

Results - For my results I got 94.5% with a Standard Deviation/error bar of 13.47% for my Average Germination. For the average germination of the experimental I got 72.5% with a Standard Deviation/error bar of 24.84%. For my Average Final Height I got a 18.96% with a Standard Deviation/error bar of 3.94% for my control group. For my experimental, I got a 19.80% with a Standard Deviation/error bar of 10.02% for my Average Final Height.

Conclusion - My data proved inconclusive due to the Standard Deviation/ error bars. However when I removed the Standard Deviation/error bars, my data for percent germination supported my hypothesis as there was a lower germination rate for the experimental than my control. However for my average final height data, after removing the Standard Deviation/error bars, it did not support my hypothesis as the average final height was greater than my control group by .84%.